**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **09CS204 / 12CS204** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING IN JAVA** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1 | List any two features of Java. | | CO1 | R | | 1 |
| 2 | Predict the output of the following Java program  class Increment{  public static void main(String m[]){  int a=5;  System.out.print(17 - 8 \* 3 - ++a);  }  } | | CO1 | A | | 1 |
| 3 | Demonstrate the difference between Boxing and AutoBoxing. | | CO3 | U | | 1 |
| 4 | Summarize the use of “super” keyword in inheritance. | | CO3 | U | | 1 |
| 5 | Predict the output of the following code  String c = “Rose”  String d = “rose”  System.out.println(c.equal(d)); | | CO5 | A | | 1 |
| 6 | List any two uses of final keyword. | | CO1 | R | | 1 |
| 7 | Illustrate the code snippet to convert the string “karunya institute of technology and sciences” to a character array. | | CO5 | A | | 1 |
| 8 | Predict the output of the following program.  class multithreaded\_programing {  public static void main(String args[]) {  Thread t = Thread.currentThread();  System.out.println(t.isAlive());  }  } | | CO5 | A | | 1 |
| 9 | Identify the method used to register a mouse motion listener. | | CO4 | U | | 1 |
| 10 | State the event generated while clicking a Button. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11 | Demonstrate the usage of for-each loop by printing a two-dimensional array. | | CO1 | | U | 3 |
| 12 | Illustrate the method overriding process in java with a suitable example. | | CO1 | | A | 3 |
| 13 | State any 3 built-in methods of the String class. | | CO5 | | R | 3 |
| 14 | Compare abstract class and interface. | | CO1 | | U | 3 |
| 15 | Describe the purpose of enumeration in Java with a suitable example. | | CO3 | | R | 3 |
| 16 | Differentiate Byte Streams and Character Streams. | | CO2 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17 | a. | Construct 3 (2x2) matrixes (A,B&C) and perform matrix addition and store it in a matrix D. Display the matrix D. | CO1 | | A | 6 |
|  | b. | Employing a ternary operator, check if a person is eligible to get a voter id card or not. (Constraints: The candidate should have (i) age above 18, (ii) a Citizen of India) | CO1 | | A | 6 |
|  |  |  |  | |  |  |
| 18 |  | Illustrate TCP Socket programming model with client and server implementations. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19 |  | Develop a java swing GUI application for the Login functionality as per the sample design given below. Show a message box “Login Successful” if the username is “User1” and the password is “mypassword”, otherwise show a message box “Login Failed”. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 20 |  | Develop custom exceptions in Java for the following conditions:  a) Get the age of a student, if attendance is less than 80% then throw Low Attendance Exception.  b) Get five marks from a student, if any mark is negative then throw a NegativeMarkException. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 21 |  | State any three different layout managers in Java Swing with sample code. | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 22 |  | Write a program to get a string from the user and capitalize every odd position letter. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 23 |  | Develop a java program to calculate the area and perimeter of  various shapes such as cube, rhombus and square using the concept of interface. | CO1 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24 | a. | Compare and contrast the method overloading and method overriding with the necessary code. | CO5 | | U | 6 |
|  | b. | Implement the below-given hierarchy of inheritance by demonstrating its purpose with necessary objects.  Inheritance Hierarchy - an overview | ScienceDirect Topics | CO5 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the format and use of objects. |
| CO2 | Understand basic input/output methods and their use. |
| CO3 | Understand object inheritance and its use. |
| CO4 | Understand the development of JAVA applets vs. JAVA applications. |
| CO5 | Understand the use of various system libraries. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 6 | 29 |  |  |  | 37 |
| CO2 |  | 15 |  |  |  |  | 15 |
| CO3 | 3 | 2 |  |  |  |  | 5 |
| CO4 | 13 | 1 | 12 |  |  |  | 26 |
| CO5 | 3 | 6 | 32 |  |  |  | 41 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **09CS216** | **Duration** | **3hrs** |
| **Course Name** | **VISUAL PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | What is the use of Common Language Runtime(CLR)? | | | U | 1 |
| 2. | List down the components of the IDE. | | | R | 1 |
| 3. | The project settings should be set as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ for creating an MFC application. | | | R | 1 |
| 4. | Define Device Context. | | | R | 1 |
| 5. | \_\_\_\_\_\_\_\_\_\_\_ template class stores an object and key combination. | | | U | 1 |
| 6. | The message map entry for handling edit control is \_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | | R | 1 |
| 7. | What is the use of serialize ( ) member function? | | | U | 1 |
| 8. | Windows calls \_\_\_\_\_\_\_\_\_\_\_ function when DLL is first loaded into memory. | | | R | 1 |
| 9. | OLE stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | | U | 1 |
| 10. | What is a record? | | | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the fundamental parts of VC++. | | | R | 3 |
| 12. | Identify the purpose of COleDocument, CView, CFramewnd and CDocTemplate. | | | U | 3 |
| 13. | Describe in detail about the working principles of dialogs and controls. | | | R | 3 |
| 14. | List down the steps for making a serializable class. | | | R | 3 |
| 15. | Compare DAO and ODBC. | | | U | 3 |
| 16. | What is meant by record locking? Enumerate the locking modes. | | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | |  | What is Integrated Development Environment (IDE)? Explain all the components of IDE. | U | 12 |
|  | |  |  |  |  |
| 18. | |  | Write a complete WinMain( ) function and explain all the segments of WinMain ( ). | An | 12 |
|  | |  |  |  |  |
| 19. | |  | With an example, explain the purpose of any five Drawing classes in MFC. | An | 12 |
|  | |  |  |  |  |
| 20. | |  | Write the steps and MFC program to create a modal dialog box. It should have 3 radio buttons, each button to represent the size of the line width of 0.1pixels, 0.2 pixels, 0.3 pixels respectively. Based on the selection of the line width, draw a line. | U | 12 |
|  | |  |  |  |  |
| 21. | |  | What are the various types of MFC Collection Classes? Explain the CList template class in detail. | U | 12 |
|  | |  |  |  |  |
| 22. | |  | Discuss how DLLs can be handled in MFC applications. | An | 12 |
|  | |  |  |  |  |
| 23. | | a. | Write a code routine for updating the text of a status bar. | U | 6 |
|  | | b. | Explain the different functions of the SpinButton control. | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | |  | Assume a student recordset containing the fields – Name, City, Street. Write code routines for adding, deleting and updating the information available in the recordset. | An | 12 |

**Graphical user interface, application

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| **Course Code** | **09IT207/ 12IT201/ IT240** | **Duration** | **3hrs** |
| **Course Name** | **SIGNALS AND SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Examine the odd component of the signal DTFT of the sequence  *x(t) = cost + sint + cost sint.* | | CO1 | R | | 1 |
| 2. | Sketch the signal x(n)=2u(t-2). | | CO1 | A | | 1 |
| 3. | Define BIBO system. | | CO2 | R | | 1 |
| 4. | Define LTI system. | | CO2 | R | | 1 |
| 5. | Show the characteristics diagram of LPF. | | CO3 | U | | 1 |
| 6. | List the properties of DTFT. | | CO3 | R | | 1 |
| 7. | Define sampling. | | CO4 | R | | 1 |
| 8. | List the properties of ROC of Laplace Transform. | | CO4 | R | | 1 |
| 9. | Estimate the Z transform of the following signal  X[n]={1,2,3}. | | CO5 | U | | 1 |
| 10. | State the linearity principle of Z transform. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Identify the following signal is energy signal or not  *x(t) = e-4t u(t)*. | | CO1 | | R | 3 |
| 12. | Determine the linear convolution of the following signals  x1[n]={1,2,3,4} x2[n]={2,2,2}. | | CO2 | | A | 3 |
| 13. | Recall the Dirichlet conditions of Fourier Transform. | | CO3 | | R | 3 |
| 14. | Examine Laplace transform and ROC for the following signals  x(t)=e-a (t-2) | | CO4 | | R | 3 |
| 15. | Determine the Nyquist rate for the following message signal  m(t)=cos (200Πt) cos (300Πt). | | CO4 | | A | 3 |
| 16. | Summarize any one application of adaptive filters. | | CO5 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Let be a DT signal with  Determinein graphical representation.  (a) (b)  (c) (d) | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Test the properties of the system y(t) = 10x(t-2)+8  (a) Static or Dynamic. (b) Linear or Non-linear.  (c) Time invariant or variant. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | Explain impulse train sampling and the reconstruction of signals from its samples with necessary diagrams. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Examine and prove the Time scaling, Time shifting, Time Reversal, Convolution properties of CTFT. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | A signal has Laplace transform of X(s)=s+2/(s2+4s+5). Estimate Laplace Transform of Y(s) for the following signal  (a) y1(t)=e-tx(t) (b) y2(t) = x(2t) (c) y3(t) = x(t-2) | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Determine the response of the system y(t) using CTFT.  impulse response h(t)=u(t-3)  input is x(t)=e2tu(-t). | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Determine the convolution of input signal x(n) and impulse response h(n) using graphical method. x(n)={1,2,4,5} h(n)={3,3}. | CO2 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Estimate x(n) by using long division method  X(Z)=(1+2z-1 )/(1-2z-1 +z -2 )  (a) x(n) is causal.  (b) x(n) is anti-causal. | CO5 | | An | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Students will able to understand the fundamental characteristics of signals and systems for both analog and discrete domain. | | | | | | | |
| CO2 | Students will able to understand the concept of impulse response and convolution in both analog and discrete time domain. | | | | | | | |
| CO3 | Students will able to obtain the mathematical skills to solve problems involving convolution, filtering, modulation and sampling. | | | | | | | |
| CO4 | Students will able to understand the concept of sampling and reconstruction of analog signals. | | | | | | | |
| CO5 | Students will able to understand the concept of Laplace transform and Z-transform and their applications in analysis of linear and time-invariant analog and discrete systems. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 4 | - | 13 | - | - | - | 17 |
| CO2 | | 2 | - | 15 | 12 | - | - | 29 |
| CO3 | | 4 | 1 | 24 | - | - | - | 29 |
| CO4 | | 5 | - | 27 | - | - | - | 32 |
| CO5 | | 1 | 4 | - | 12 | - | - | 17 |
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**Graphical user interface, application

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| **Course Code** | **11CS101/12CS101** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING IN C** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Identify the usage of header file. | | | CO3 | R | | 1 |
| 2. | Generalize the structure of C program. | | | CO3 | U | | 1 |
| 3. | Enumerate any two delimiters used in C language. | | | CO2 | R | | 1 |
| 4. | Evaluate the following expressions and show their hierarchy.  R= x \* x + 2 \* x + 1 / 2 \* x \* x + x + 1;  (x = 1, assume R to be an int) | | | CO2 | R | | 1 |
| 5. | Differentiate between while loop and do-while loop. | | | CO3 | U | | 1 |
| 6. | Define the use of goto statement in C. | | | CO3 | R | | 1 |
| 7. | Identify the format specifier used to print a string or character array in C printf or scanf function. | | | CO1 | U | | 1 |
| 8. | Tell how the data is stored in a 2-D array. | | | CO1 | R | | 1 |
| 9. | Represent a recursion. | | | CO1 | U | | 1 |
| 10. | Differentiate static memory allocation and dynamic memory allocation. | | | CO2 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Survey on the input devices used with a neat sketch. | | | CO3 | | An | 3 |
| 12. | Express an algorithm to find the average of 5 numbers. | | | CO1 | | U | 3 |
| 13. | Appraise on the unconditional statements in C with examples. | | | CO3 | | An | 3 |
| 14. | Differentiate while loop and for loop. | | | CO3 | | U | 3 |
| 15. | Develop a function in C that accepts a year as input and returns whether the year is a leap year or not. | | | CO2 | | A | 3 |
| 16. | Interpret the use of malloc() with a code. | | | CO3 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Discuss on the generation of computers with the features. | CO3 | | U | 6 |
|  | | b. | Compute the following number systems:  (i) 7CF to decimal  (ii) 43F to binary | CO3 | | A | 6 |
| 18. | | a. | Construct a C program to check whether a number is odd or even using conditional operator. | CO2 | | A | 4 |
|  | | b. | Develop the generation of Fibonacci series with an algorithm. | CO1 | | A | 8 |
| 19. | | a. | Develop a C code to print all the even numbers from 1 to 50 using for loop. | CO2 | | A | 6 |
|  | | b. | Appraise on the switch-case statement with an example. | CO3 | | An | 6 |
| 20. | |  | Develop a C program to create a menu-driven approach to perform the following string functions.  Length of a string  Copying a string  Comparing strings  String concatenation | CO1 | | A | 12 |
| 21. | |  | Write a C program using function which accepts a string and returns the number of vowels and consonants in the string. | CO2 | | A | 12 |
| 22. | |  | Write a C program to implement the usage of bitwise operators. | CO3 | | A | 12 |
| 23. | |  | Develop a C program to add 2 3\*3 matrices. | CO1 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Write a C program to swap two values using call-by-reference mechanism with / without using a third variable. | CO2 | | A | 6 |
|  | | b. | Develop a C program for student information storage and retrieval using file handling. | CO2 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | To enhance the problem-solving skills. |
| CO2 | To empower the students with an idea of developing the programming logic. |
| CO3 | To learn about the basics of C programming. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 5 | 32 |  |  |  | 38 |
| CO2 | 2 | 1 | 37 |  |  |  | 40 |
| CO3 | 2 | 14 | 18 | 12 |  |  | 46 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **12CS230/14CS2047/17CS2021/18CS2021** | **Duration** | **3hrs** |
| **Course Name** | **THEORY OF COMPUTATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the machine that accepts regular language. | | CO1 | R | | 1 |
| 2. | Construct a DFA for the language L={anb}. | | CO1 | A | | 1 |
| 3. | Compute the yield of the parse tree given below. | | CO2 | A | | 1 |
| 4. | Eliminate ε – production for the following grammar.  S→aaS |aS | ε  A→ bA | ε | | CO2 | A | | 1 |
| 5. | Let: s(0) = {anbn | n ≥1}.Give s(1). | | CO3 | U | | 1 |
| 6. | State the properties that are closed under CFL. | | CO3 | R | | 1 |
| 7. | In the definition of TM, T= (Q, Σ, Γ, q0, δ). Recall what Γ represents. | | CO4 | R | | 1 |
| 8. | If T1 and T2 are two Turing machines. Give the expression representing its composite. | | CO4 | U | | 1 |
| 9. | A recursively enumerable language L can be recursive. Justify. | | CO5 | E | | 1 |
| 10. | L = {w | M is a DFA and M recognizes input w}. Give L. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Give the formal definition of Deterministic Finite Automata. | | CO1 | | U | 3 |
| 12. | Enumerate the string “a – a \* a” using left most derivation for the given grammar.  E 🡪 E + E | E – E | E \*E| a | | CO2 | | R | 3 |
| 13. | Convert the given PDA to CFG.  𝛿(q0,a,A)={(q0,A)} | | CO3 | | U | 3 |
| 14. | Define Turing machine. | | CO4 | | R | 3 |
| 15. | Construct a Turing machine that accepts the language L={w€{a,b}/w ending with bb}. | | CO5 | | A | 3 |
| 16. | Differentiate decidable and undecidable problems. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Construct the DFA for the NFA given below: | CO1 | | A | 12 |
| 18. |  | Convert the following Context Free Grammar into Chomsky Normal Form.  S->bA/aB  A->bAA/aS /a  B-> aBB/bS/b | CO2 | | U | 12 |
| 19. |  | Construct a Push Down Automata for the language L={0n1n| n>=0}. | CO3 | | A | 12 |
| 20. |  | Construct TM for the language L = {0n1n2n; n>=1}. | CO4 | | A | 12 |
| 21. |  | Illustrate the variations in the standard Turing machine model. | CO5 | | A | 12 |
| 22. | a. | Construct NFA for the regular expression (a\*/b\*)\*. | CO1 | | A | 6 |
|  | b. | Construct NFA for the regular expression (0 + 1)\*1(0 +1). | CO1 | | A | 6 |
| 23. | a. | Let G be a CFG with the following productions:  S->aB/bA  A->a/aS/bAA  B->b/bS/aBB  Find the i) Leftmost derivation, ii) Parse tree for the string “*aaabbabbba*”. | CO2 | | A | 6 |
|  | b. | Convert the following CFG into Chomsky Normal Form.  E->dA/aD  A->dAA/aE /a  D-> aDD/dE/d | CO2 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate the properties of recursive and recursively enumerable language with suitable proof. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define and use abstract models of various computational models such as finite automata, push-down automata, and Turing Machines. |
| CO2 | Classify various computational models based on their expressive power. |
| CO3 | Solve various computational problems using mathematical models. |
| CO4 | Analyze and differentiate the capabilities of various models. |
| CO5 | Design various mathematical models for any computable problems. |
| CO6 | Explain and justify various theorems and select appropriate mathematical models of computers. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | 25 | - | - | - | 29 |
| CO2 | 3 | 18 | 8 | - | - | - | 29 |
| CO3 | 1 | 4 | 12 | - | - | - | 17 |
| CO4 | 4 | 1 | 12 | - | - | - | 17 |
| CO5 | - | 1 | 15 | - | 1 | - | 17 |
| CO6 | 3 | - | 12 | - | - | - | 15 |
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Graphical user interface, application

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| **Course Code** | **13CS101/14CS1001/17CS1001** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF COMPUTING AND PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Appraise on the classification of computers and the input devices used with a neat sketch. | CO1 | An | 10 |
|  | b. | Compute the following number systems:  (i) 11001010 into decimal number.  (ii)octal number 540 into binary number  (iii) 7CF to decimal  (iv) 43F to binary  (v) (56)8 to Hexadecimal. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Express an algorithm and flowchart to check whether the given number 25 is odd or even and examine on the importance of flowchart in any programming language, | CO2 | U | 10 |
|  | b. | Explain the logical operators used in C with examples. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write a C program that accepts a number from 1 to 10 and print whether the number is odd or even using switch case construct. | CO3 | A | 10 |
|  | b. | Construct a C program to check whether the number 153 is an Armstrong number or not. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Support the concept of function by developing a code in C which accepts a string and returns the number of vowels in the string. | CO4 | E | 10 |
|  | b. | Appraise on the call-by-reference for swapping 2 numbers. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write a recursive function in C to return the factorial of a number. | CO5 | A | 10 |
|  | b. | Write a function that accepts a year as input and returns whether the year is a leap year or not. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Appraise on the various string functions and relate it with a C program. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Construct a C program to check whether the given number is a prime number or composite number. | CO3 | A | 10 |
|  | b. | Write a C program to display numbers from 1 to 20 using for loop. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Construct a C program to find the sum and difference of 2 matrices. | CO3 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss on the concept of Dynamic Memory Allocation with C code. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic functions of computers. |
| CO2 | Extend the pseudo-code into coding by using C programming. |
| CO3 | Use the C program to solve the real-world problems. |
| CO4 | Illustrate the C programming concepts to solve the computational problems. |
| CO5 | Develop C programs using arrays, strings and functions. |
| CO6 | Select the required user defined data types according to given problem statements. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 10 | 10 |  |  | 20 |
| CO2 |  | 10 | 10 |  |  |  | 20 |
| CO3 |  |  | 60 |  |  |  | 60 |
| CO4 |  |  |  | 30 | 10 |  | 40 |
| CO5 |  |  | 20 |  |  |  | 20 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

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| **Course Code** | **14CS2008/CS251/17CS2005** | **Duration** | **3hrs** |
| **Course Name** | **CRYPTOGRAPHY AND NETWORK SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | In order to achieve \_\_\_\_\_\_\_\_\_\_\_\_\_, the private key of the sender is used in encryption of plaintext in public key cryptography. | | CO1 | U | | 1 |
| 2. | The number of S-boxes which map 6 to 4 bits used in DES is \_\_\_\_\_\_\_\_\_. | | CO1 | R | | 1 |
| 3. | Define a trapdoor one way function. | | CO2 | R | | 1 |
| 4. | Calculate value of ‘n’ given p=17 and q=29. | | CO2 | A | | 1 |
| 5. | ElGamal cryptography uses a public key based on \_\_\_\_\_\_\_\_\_\_\_\_ logarithms. | | CO3 | U | | 1 |
| 6. | \_\_\_\_\_\_\_\_\_ is the security requirement to be satisfied for electronic health records. | | CO3 | A | | 1 |
| 7. | For a client-server authentication, the client requests from the KDC a \_\_\_\_\_\_\_\_ for access to a specific asset. | | CO4 | A | | 1 |
| 8. | In asymmetric encryption \_\_\_\_\_\_\_\_\_\_\_\_ keys are used for encryption and decryption. | | CO4 | R | | 1 |
| 9. | In \_\_\_\_\_\_\_\_\_\_ mode, IPSec protects the entire IP packet. | | CO5 | U | | 1 |
| 10. | \_\_\_\_\_\_\_\_\_ is software that is installed using an internet connection or they come by-default with operating systems. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the strength of DES. | | CO1 | | R | 3 |
| 12. | Show the order of a point on an elliptic curve. | | CO2 | | U | 3 |
| 13. | Mention a few merits of digital signature. | | CO3 | | R | 3 |
| 14. | Differentiate Kerberos Version 4 and Version 5. | | CO4 | | R | 3 |
| 15. | List the functions of SMIME. | | CO5 | | R | 3 |
| 16. | Differentiate network based intrusion detection system and host based intrusion detection system. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Summarize the security services, mechanisms provided for the network security. | CO1 | | R | 6 |
|  | b. | Narrate the different categories of security attacks. | CO1 | | U | 6 |
| 18. | a. | Demonstrate the encryption and decryption process for the given data by using ElGamal algorithm. Given p=283, q=47, g=60 and M=101. | CO2 | | A | 6 |
|  | b. | Break down the Diffie Hellman key exchange algorithm and give proof of its key transmission. | CO2 | | An | 6 |
| 19. |  | Interpret the completeness of the Rivest Shamir and Adleman algorithm and also solve for both encryption and decryption for the given values of p=7, q=11 and M=12. | CO4 | | E | 12 |
| 20. |  | Appraise the digital signature algorithm by showing the relationship between signing and verification process. | CO3 | | U | 12 |
| 21. | a. | Describe the security services involved in pretty good privacy transmission and reception. | CO3 | | An | 6 |
|  | b. | Illustrate X.509 certificates with a neat diagram. | CO4 | | A | 6 |
| 22. |  | Explain the working of Kerberos and elaborate the message transmission for Kerberos version 5 with a suitable diagram. | CO4 | | R | 12 |
| 23. |  | Portray the features of Secure Socket Layer for web security such as SSL Architecture, SSL record protocol, SSL record format and SSL handshake protocol. | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Elaborate the technical details of firewall and explain the three types of firewall with a neat diagram. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the computer security concepts and their needs. |
| CO2 | Apply the various symmetric and asymmetric key algorithms. |
| CO3 | Experiment with the various principles of cryptosystems, hashing algorithms and digital signatures. |
| CO4 | Recognize the importance of network security. |
| CO5 | Evaluate network and internet security. |
| CO6 | Explain the different types of viruses/worms & firewalls. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 7 | - | - | - | - | 17 |
| CO2 | 1 | 3 | 7 | 6 | - | - | 17 |
| CO3 | 6 | 11 | 1 | 5 | - | - | 23 |
| CO4 | 15 | - | 8 | - | 12 | - | 35 |
| CO5 | 4 | 1 | 12 | - | - | - | 17 |
| CO6 | 13 | - | 3 | - | - | - | 16 |
|  | | | | | | | **124** |

Graphical user interface, application

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| **Course Code** | **14CS2009/19CS2005** | **Duration** | **3hrs** |
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| **Course Name** | **DATA STRUCTURES AND ALGORITHMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | List out 5 elements of algorithm. | CO1 | R | 1 |
| 2. | State the functional representation of Big Omega in Asymptotic notation. | CO1 | R | 1 |
| 3. | Define stack and what are the operations of stack. | CO2 | R | 1 |
| 4. | Identify the type of data structure type for the given diagram.  Example_of_PQ | CO2 | U | 1 |
| 5. | Compare the advantages of array to the linked list data structure. | CO3 | E | 1 |
| 6. | Recall the underflow condition in stack: if stack is empty the top pointer points to \_\_\_\_\_\_\_. | CO3 | R | 1 |
| 7. | What will be the best case and Worst-case complexity in linear search? | CO4 | R | 1 |
| 8. | Compute the order of values after the first iteration of insertion sort in the following list of values?  ***42, 23, 34, 76, 12, 90.*** | CO4 | A | 1 |
| 9. | public void func(Tree root)  {  func(root.right());  func(root.left());  System.out.println(root.data());  }  Find the type of traversal. | CO5 | E | 1 |
| 10. | Differentiate Simple Path and Cycle in Graph. | CO6 | An | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Brief note on Abstract Data Type . | CO1 | R | 3 |
| 12. | Evaluate the postfix expression ***ABC+\*D-***,  where ***A = 3, B = 5, C = 1 and D = 12*** using stack. Show the contents of the stack in each step of the evaluation. | CO2 | A | 3 |
| 13. | Compare and list the differences between Doubly and Circular Linked List. | CO3 | E | 3 |
| 14. | Consider a hash table of size ***7***. Insert the values ***28, 39, 17, 45, and 49*** into the hash table using the hash function ***“value mod 7”***. Handle collisions, if any, by applying linear probing. | CO4 | A | 3 |
| 15. | List the Properties of Binary Tree. | CO5 | R | 3 |
| 16. | Summarize a note on DFS and BFS. | CO6 | U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q. No 24 is Compulsory)** | | | | | |
| 17. | a. | Define algorithm. List out and discuss the sequence of steps needed to design and analyze an algorithm. | CO1 | R | 6 |
| b. | Inspect why we need an Asymptotic notation. Explain the different Asymptotic notations with definition and example. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. |  | Demonstrate different functions of Stack data structure with code and example. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe the following operations of Doubly linked list along with the functional implementation.   1. Insertion at the beginning. 2. Insertion at the middle. 3. Deletion at the last. | CO3 | R | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain with the algorithm how the Linear search done to find ***key 98*** for the list of elements given ***12, 56, 87, 43, 23, 96, 45, and 92***. | CO4 | A | 6 |
| b. | Write the Selection sort algorithm. Apply and sort the given elements.***28,78,45,8,32,56*** | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | What is an AVL tree? Define balance factor of an AVL tree? Illustrate the four rotation types in AVL tree with examples? Construct an AVL tree for the list ***100, 70, 10, 50, 20, 60, 30, 80, 40, 90?*** | CO5 | R | 12 |
|  |  |  |  |  |  |
| 22. | a. | Write an algorithm that counts the number of nodes in a singly linked list. | CO3 | U | 5 |
|  | b. | Write an algorithm to sort the given list of integers using radix sort.  *data* = ***[682, 244, 73, 6, 535, 123]*** | CO4 | U | 7 |
|  |  |  |  |  |  |
| 23. |  | Give the algorithm to insert a value into a binary search tree and print the values in pre-order. Write the values of the below-given tree in pre-order:  Self-balancing binary search tree - Wikipedia | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain in detail the various graph traversal methods. | CO 6 | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of abstract data type and algorithm analysis. |
| CO2 | Illustrate the use of array to implement stack and queue. |
| CO3 | Apply linked list to design stack and queue data structures. |
| CO4 | Demonstrate the working of sorting and searching algorithms and application of hashing |
| CO5 | Understand the different types of tree data structures and demonstrate the methods for traversing trees. |
| CO6 | Differentiate the graph representations and traversals. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 11 | - | - | 6 | - | - | 17 |
| CO2 | 1 | 13 | 3 | - | - | - | 17 |
| CO3 | 13 | 5 | - | - | 4 | - | 22 |
| CO4 | 1 | 7 | 16 | - | - | - | 24 |
| CO5 | 27 | - | - | - | 1 | - | 28 |
| CO6 | 12 | 3 | - | 1 | - | - | 16 |
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**Graphical user interface, application

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| **Course Code** | **14CS2011 / 17CS2008** | **Duration** | **3hrs** |
| **Course Name** | **DATABASE SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | In which format data is stored in the database management system \_\_\_\_\_\_\_\_\_. | | CO2 | U | | 1 |
| 2. | Name the three additional relational algebra operations. | | CO2 | An | | 1 |
| 3. | In SQL, which command(s) is (are) used to enable/disable a database trigger? | | CO3 | R | | 1 |
| 4. | The minimal set of super key is called \_\_\_\_\_\_\_\_\_. | | CO4 | R | | 1 |
| 5. | Define weak entity. | | CO4 | R | | 1 |
| 6. | \_\_\_\_\_\_\_\_\_ is a set of one or more attributes taken collectively to uniquely identify a record. | | CO4 | A | | 1 |
| 7. | Summarize functional dependency. | | CO5 | U | | 1 |
| 8. | The second normal eliminates \_\_\_\_\_\_\_\_\_ dependency. | | CO5 | R | | 1 |
| 9. | List the different types of Indices. | | CO6 | R | | 1 |
| 10. | Which of the following is not a schema?  a. Database schema b. Physical schema c. Critical schema. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe the properties of relation. | | CO1 | | R | 3 |
| 12. | Discuss the importance of handling Null values in a relation. | | CO2 | | U | 3 |
| 13. | Illustrate transaction properties. | | CO2 | | U | 3 |
| 14. | Explain, how to implement the atomicity and durability in database systems? | | CO5 | | A | 3 |
| 15. | Describe functional dependency. | | CO4 | | R | 3 |
| 16. | Infer conflict serializability. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Illustrate the core architecture of database system with suitable diagram. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Discuss in detail the operators SELECT, PROJECT UNION, INNER JOIN and OUTER JOIN with suitable examples. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Categorize an aggregate functions with proper example queries. | CO3 | | An | 8 |
|  | b. | Consider the following table and give an expression in SQL for each of the following queries:  User:   |  |  |  | | --- | --- | --- | | User\_id | U-name | Phone\_no |   UserHistory   |  |  |  | | --- | --- | --- | | User\_id | Date | Action |  * Write an SQL query that returns the name, Phone number and most recent date for any user that has logged in over the last 30 days.   Write an SQL query to determine which user\_ids in the user table are not contained in the User History table. | CO3 | | A | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Distinguish the DDL, DML, TCL commands with example. | CO3 | | U | 8 |
|  | b. | Explain the basic structure of a SQL query. | CO3 | | A | 4 |
|  |  |  |  | |  |  |
| 21. |  | List and discuss various ER notations used in ER model with one example application. | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain in detail about B+ tree indexes in database and how it remains stable during the insertion, deletion or updation process. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Write short notes on:  a. Variable length records b. Organization of records in Files. | CO5 | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Categorize the different types of hashing techniques. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the role of database administrator and database management systems in software applications. |
| CO2 | Convert the logical design of a database into its physical design. |
| CO3 | Use query language to retrieve data efficiently from the database. |
| CO4 | Analyse the normality of a logical data model, and correct any anomalies. |
| CO5 | Design and implement significant database objects such as file structures and index schemes. |
| CO6 | Describe techniques for transaction processing and concurrency control. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | - | - | - | - | - | 3 |
| CO2 | - | 19 | 12 | 1 | - | - | 32 |
| CO3 | 1 | 8 | 8 | 8 | - | - | 25 |
| CO4 | 17 | - | 13 | - | - |  | 30 |
| CO5 | 13 | 1 | 3 | - | - | - | 17 |
| CO6 | 1 | 4 | - | 12 | - | - | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **14CS2015** | **Duration** | **3hrs** |
| **Course Name** | **E-COMMERCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define internet. | | CO1 | R | | 1 |
| 2. | Define Electronic Data Interchange. What are the components of Electronic Data Interchange? | | CO1 | R | | 1 |
| 3. | Discuss the types of lists in html. | | CO2 | U | | 1 |
| 4. | State two examples for image formats for the web. | | CO2 | R | | 1 |
| 5. | Describe the importance of using firewall in an organization. | | CO3 | R | | 1 |
| 6. | List the requirements for security in e-commerce. | | CO3 | R | | 1 |
| 7. | Support the importance of symmetric key encryption algorithm with argument. | | CO3 | E | | 1 |
| 8. | Define encryption. | | CO2 | R | | 1 |
| 9. | Examine and write the security technique provides both authentication and encryption services to IP Packets. | | CO2 | An | | 1 |
| 10. | List out an example for a generalized e-store. | | CO1 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | State the range of IP addresses for Class B address. | | CO3 | | R | 3 |
| 12. | Explain the three-tier model with neat diagram. | | CO3 | | U | 3 |
| 13. | Discuss the layout of Homepage of the Virtual Book Store. | | CO2 | | U | 3 |
| 14. | Explain how SSL protocol is used for secure transaction. Explain the advantages of e-commerce. | | CO2 | | R | 3 |
| 15. | Discuss in brief virtual auction. Explain the differences between virtual auction and reverse auction. | | CO1 | | An | 3 |
| 16. | Develop an encryption message using Transposition Cipher.  Key: **4 3 1 2 5 6 7**  Plain Text : THE CLASS STARTS AT NINE IN THE MORNING. | | CO3 | | C | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the steps in Web Page Design and Production. | CO3 | | U | 6 |
|  | b. | List the advantages and disadvantages of e-business to buyers. | CO2 | | C | 6 |
| 18. |  | Explain the different layers and their functions in the internet model with neat diagram. | CO2 | | U | 12 |
| 19. | a. | Explain the different session tracking techniques with examples. | CO1 | | U | 6 |
|  | b. | Give short notes on Cookies. | CO1 | | U | 6 |
| 20. |  | Given p=20, q=9 and M=29, Elucidate the steps and perform encryption and decryption using the RSA algorithm. | CO2 | | R | 12 |
| 21. | a. | Explain any one type of firewall with a neat diagram. | CO2 | | U | 4 |
|  | b. | Explain the various models of e-retailing with necessary examples. | CO2 | | U | 8 |
| 22. | a. | Consider a Virtual Book Store wants to establish a secure connection with a business partner. Identify and explain the application of IPSec service formed between Virtual Book Store and business partner? | CO3 | | R | 8 |
|  | b. | Explain the internal activities in the procurement process of buy-side e-commerce. | CO2 | | U | 6 |
| 23. | a. | Explain in detail the various types of web-based marketing strategies. | CO3 | | U | 6 |
|  | b. | Describe in detail the various means of online advertisement models. | CO1 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain in detail about the various website design issues. | CO2 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the type of ecommerce and the security mechanisms for the given applications. |
| CO2 | Analyze the various advanced technologies for e-commerce. |
| CO3 | Develop various secure e-commerce applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 19 |  | 3 |  |  | 21 |
| CO2 | 18 | 46 |  | 1 |  | 3 | 61 |
| CO3 | 12 | 15 |  |  |  | 3 | 30 |
| CO4 |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **14CS2018** | **Duration** | **3hrs** |
| **Course Name** | **ETHICS IN INFORMATION TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Define morality. | | | CO1 | R | | 1 |
| 2. | What is Ethics? | | | CO1 | U | | 1 |
| 3. | State Cyberespionage. | | | CO2 | R | | 1 |
| 4. | Mention Privacy Protection. | | | CO2 | R | | 1 |
| 5. | Expand IPR. | | | CO3 | U | | 1 |
| 6. | What is copyright? | | | CO3 | R | | 1 |
| 7. | Define warranty. | | | CO4 | U | | 1 |
| 8. | Abbreviate CMMI. | | | CO4 | R | | 1 |
| 9. | What is social shopping? | | | CO5 | U | | 1 |
| 10. | Abbreviate ISMS. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Mention the common characteristics of ethics in the Business World. | | | CO1 | | R | 3 |
| 12. | Justify why computer incidents are so prevalent? | | | CO2 | | U | 3 |
| 13. | Write short notes on few applications of privacy protection and the law. | | | CO3 | | R | 3 |
| 14. | Mention the key issues in Software Development. | | | CO4 | | U | 3 |
| 15. | What is Cyberstalking? | | | CO5 | | R | 3 |
| 16. | Distinguish Structure of ISO 270012013. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Elaborate ethical consideration in decision making with neat diagram. | CO1 | | A | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Justify how IT professional malpractice with example? Describe. | CO2 | | E | 12 |
|  | |  |  |  | |  |  |
| 19. | | a. | Explain in detail about IPR Issues. | CO3 | | E | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Justify Quality Management Standards in brief. | CO4 | | An | 6 |
|  | | b. | Mention the strategies for developing quality software with examples. | CO4 | | E | 6 |
|  | |  |  |  | |  |  |
| 21. | | a. | Distinguish between cyber abuse, cyber harassment and cyber stalking. | CO5 | | An | 6 |
|  | | b. | Illustrate the concept of offshore outsourcing. | CO5 | | A | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Discuss in detail about relationships between IT workers and clients. | CO2 | | An | 12 |
|  | |  |  |  | |  |  |
| 23. | | a. | Write a detailed note on Patent Application, Publication, examination, awarding. | CO4 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Outline Policy, Standards, and Practices with suitable diagram. | CO6 | | E | 6 |
|  | | b. | Compare Security and Privacy Entities. | CO6 | | An | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | identify issues of professional conduct in information technology |
| CO2 | determine the impact of the privacy laws on information security policies |
| CO3 | identify the possible Computer crimes and the rules and regulations for protection |
| CO4 | describe the various types of IPR and the procedures for obtaining IPR |
| CO5 | explain the various types of Social Networking and issues |
| CO6 | relate to the different national and international organizational models with intellectual ability |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 1 | 12 | - |  |  | 17 |
| CO2 | 2 | 3 |  | 12 | 12 |  | 29 |
| CO3 | 4 | 1 |  | - | 12 |  | 17 |
| CO4 | 1 | 16 |  | 6 | 6 |  | 29 |
| CO5 | 3 | 1 | 6 | 6 |  |  | 16 |
| CO6 |  | 4 |  | 6 | 6 |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **14CS2020/17CS2037** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF HUMAN COMPUTER INTERACTION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | State the Gulf of Evaluation. | | CO1 | U | | 1 |
| 2. | Differentiate rods and cones. | | CO1 | R | | 1 |
| 3. | Write down the responsibilities of windowing system. | | CO1 | U | | 1 |
| 4. | Mention some of the merits and demerits of overlapping and cascading windows. | | CO3 | An | | 1 |
| 5. | Give two different types of resolutions. | | CO3 | U | | 1 |
| 6. | Which Java class can be used to tune a group of resources into a particular language? | | CO4 | A | | 1 |
| 7. | List the different states of widget. | | CO4 | U | | 1 |
| 8. | According to the physiology of an eye, which color would be more attractable? | | CO4 | R | | 1 |
| 9. | Give an example for synchronous and asynchronous collaboration. | | CO5 | U | | 1 |
| 10. | List any two advantages of Distributed Graphics Object. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define Antialiasing. | | CO1 | | U | 3 |
| 12. | Mention some of the merits and demerits of overlapping and cascading windows. | | CO3 | | U | 3 |
| 13. | A Toolbar contains the following components New, Open, Save, Print, Search, Spell Check and so on. All these items are saved into a file called ToolBar properties (using the Java convention). How would you localize this user interface into French? | | CO2 | | R | 3 |
| 14. | List the cultural dependent items and show how it can be localized? | | CO4 | | R | 3 |
| 15. | How MAC Operating System does uses struts and springs in widget placement? | | CO4 | | A | 3 |
| 16. | Write the Fitt’s equation to calculate average movement time to reach the target. | | CO5 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Construct the interactive design which can be used to control various functionalities in smart house application. | CO6 | | R | 6 |
|  | b. | For your selected graphical user interface, describe all the steps and notifications that must occur from the time an event is received until the entire screen has been correctly updated. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Explain the following event handling mechanisms:   * Window event tables * Callback event handling * Inheritance event handling | CO3 | | An | 8 |
| b. | In designing a new abstract model widget, how would you decide whether piece of information should be the widget (or) should be something to put in model? | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 19. |  | Differentiate Layout and Constraints. Discuss any two layout algorithms with example | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Write down the limitations in standard widget architecture? Draw the architecture of abstract model widget and show how it overcomes the limitations of standard widget architecture. | CO2 | | R | 8 |
|  | b. | How does force field strategy enable the mouse to move towards appropriate selection rather than interpreting gestures. | CO3 | | A | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Mention the advantages and disadvantages of  (i) Pixels distribution. (ii) Graphical interface distribution.  (iii) Programmable clients. (iv) Model semantics distribution.  (v) Data layer distribution. | CO5 | | E | 8 |
| b. | Draw and explain the form DOM tree? | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Illustrate one of the Carpendale’s fisheye techniques that is used to implement a view of a very large image. | CO6 | | An | 6 |
| b. | Explain about the state machine diagram for the following vent methods:  (i) mouseDown (), (ii) mouseMove (), (iii) mouseUp() | CO6 | | E | 6 |
|  |  |  |  | |  |  |
| 23. |  | Sketch the architecture of Model-View-Controller and mention the places where interface distribution can occur. | CO6 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain World Wide Web interaction technologies. | CO5 | | U | 6 |
| b. | Illustrate the user interface distribution that takes place in pixel/event level? | CO5 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the fundamental design and evaluation methodologies of human computer interaction. |
| CO2 | Identify the capabilities of both humans and computers from the viewpoint of human information processing. |
| CO3 | Use the information sources available, and be aware of the methodologies and technologies supporting advances in HCI. |
| CO4 | Analyze an interactive design process and universal design principles to designing HCI systems. |
| CO5 | Plan how a computer system may be modified to include human diversity. |
| CO6 | Assess the theories and concepts associated with effective work design to real-world application. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 4 | - | - | - | - | 6 |
| CO2 | 11 | - | - | - | - | - | 11 |
| CO3 | - | 12 | 4 | 9 | - | - | 25 |
| CO4 | 4 | 1 | 22 | - | - | - | 27 |
| CO5 | 3 | 13 |  | 8 | - | - | 24 |
| CO6 | 7 | - | 18 | 6 | - | - | 31 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **14CS2034/17CS2010** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED ANALYSIS AND DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the attributes and methods of a dishwasher object. | | CO1 | R | | 1 |
| 2. | Create a class hierarchy to organize the following Vehicle classes: bus, truck car, tow truck, ford, tanker, log truck, Honda, Nissan. | | CO1 | C | | 1 |
| 3. | Design a DFD diagram for online shopping. | | CO2 | C | | 1 |
| 4. | Differentiate abstract and concrete use case. | | CO3 | U | | 1 |
| 5. | Write the 80-20 rule. | | CO5 | A | | 1 |
| 6. | List out the different classes available in common class pattern approach. | | CO4 | R | | 1 |
| 7. | Write the syntax for attribute in OCL format. | | CO6 | A | | 1 |
| 8. | Identify the two major tasks in access layer. | | CO6 | R | | 1 |
| 9. | Define Axiom. | | CO4 | R | | 1 |
| 10. | Recall the different types of Attributes. | | CO2 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write four quality measures in system evaluation with suitable diagram. | | CO1 | | A | 3 |
| 12. | Differentiate pattern and framework. | | CO2 | | U | 3 |
| 13. | Identify the actors and activities involved in drawing Use-case for and online ticket booking system. | | CO3 | | R | 3 |
| 14. | List the approaches for identifying classes. | | CO4 | | R | 3 |
| 15. | Write short notes on coupling. | | CO5 | | A | 3 |
| 16. | Discuss the guidelines for Super-Sub relationship. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the Unified Approach of software development with analysis of each phase. | CO1 | | U | 8 |
|  | b. | Consider a payroll system that processes employee records. There exist three categories of workers. They are:   1. Managers – regular salary. 2. Office Workers – Hourly wagers with overtime for over 40 hours work.   (i) Interpret the structured and object-oriented approach for the employees with syntax and explain the differences.  (ii) Anticipate the problems that may occur in both the programming paradigms while there is an addition of a new worker category as,  Outsourced worker – salary as per job completion. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 18. |  | Summarize the steps involved in Macro and Micro development process in Booch methodology. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 19. | a. | A book store sells textbooks and also many other items such as college sweat shirts, computers, etc. The text purchasing department has unique characteristics including advance notice from faculty members and issues dealing with unsold copies. Purchasing the other items is as for any retail store. An extension of both areas is the checkout point. This process should include the cash registers, scanners and sales slips.  Develop an activity diagram to show the business process of the book store. | CO3 | | C | 8 |
|  | b. | Write the guidelines for identifying Super-sub class relationship and a-part-of relationship. | CO6 | | A | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Identify the different classes using Noun Phrase approach for the following problem statement.  The bank client must be able to deposit the amount to and withdraw the amount from his/her account using touch screen. Each transaction must be recorded, the client must be able to review all the transactions performed in the account. Record transactions must include date, type, amount, and account balance after the transaction. A client can have two types of account - a checking and a savings account. Access to the ATM account is provided by a PIN code of 4 integer digits from 0 to 9. | CO5 | | R | 8 |
|  | b. | Design a CRC card for the following classes:   1. Account b. User | CO5 | | C | 4 |
|  |  |  |  | |  |  |
| 21. |  | Illustrate a detail description about class visibility and refining attributes while designing classes. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss view layer design to withdraw amount from ATM banking. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain UML class diagram with examples. | CO3 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | State the 6 corollaries of Object Oriented Design. Explain all of them in detail with suitable examples. | CO4 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the various object-oriented concepts. |
| CO2 | Recognize the requirements of any real time application. |
| CO3 | Sketch the design of any application using UML diagram. |
| CO4 | Identify various prototypes to represent the application. |
| CO5 | Prepare the documentation of any real time application. |
| CO6 | Explain the application in terms of use case driven approach. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 20 | 3 | - | - | 1 | 25 |
| CO2 | 1 | 7 | - | - | - | 1 | 9 |
| CO3 | 3 | 13 | - | - | - | 8 | 24 |
| CO4 | 17 | - | - | - | - | - | 17 |
| CO5 | 8 | 12 | 4 | - | - | 4 | 28 |
| CO6 | 1 | 15 | - | - | - | 5 | 21 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| --- | --- | --- | --- |
| **Course Code** | **14CS2035 / 17CS2012** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED PROGRAMMING IN C++** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Differentiate keyword and identifier. | | CO1 | U | | 1 |
| 2. | Define Message Passing. | | CO1 | R | | 1 |
| 3. | Differentiate between break and continue statements. | | CO2 | U | | 1 |
| 4. | Define inline function. | | CO2 | R | | 1 |
| 5. | List out the benefits of copy constructor. | | CO3 | R | | 1 |
| 6. | Describe the importance of destructor. | | CO3 | R | | 1 |
| 7. | List any two operators that cannot be overloaded. | | CO3 | R | | 1 |
| 8. | Define pointer to pointer. | | CO4 | R | | 1 |
| 9. | Differentiate between the friend function and virtual function | | CO4 | U | | 1 |
| 10. | Define this pointer. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List out the applications of OOP. | | CO1 | | R | 3 |
| 12. | Write in detail about Enumeration with an example program. | | CO2 | | A | 3 |
| 13. | Discuss parameterized constructors with an example in C++. | | CO3 | | U | 3 |
| 14. | Recall new and delete operators with suitable examples. | | CO3 | | R | 3 |
| 15. | Write a C++ program to multiply two numbers using the class template. | | CO4 | | A | 3 |
| 16. | Discuss in detail about file pointer. | | CO5 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Write a C++ Program to check whether the given number is prime or not | CO1 | | A | 6 |
|  | b. | List the features of Object-oriented programming. | CO1 | | R | 6 |
| 18. | a. | Write a C++ program to calculate the area and circumference of a circle using an inline function | CO2 | | A | 6 |
|  | b. | Write a C++ program to check whether the given number is a palindrome or not. | CO2 | | A | 6 |
| 19. |  | Explain unary and binary operator overloading with the help of member functions. | CO3 | | U | 12 |
| 20. | a. | Explain Multiple inheritance in C++ with an example. | CO5 | | U | 8 |
|  | b. | Discuss the use of public, private, and protected access specifiers and their visibility in the class. | CO5 | | U | 4 |
| 21. |  | Create a C++ program to do the following operations.   1. Write the following content into a file named first.txt. “A stream is a communication channel that a program has with the outside world. It is used to transfer data items in succession”. 2. Create another file named second.txt which contains the following content. “An Input/output (I/O) Stream represents an input source or an output destination. A stream can represent many different kinds of sources and destinations, including disk files, devices, other programs, and memory arrays”. 3. Now, merge the content of the above two files and put the same into final.txt. | CO6 | | A | 12 |
| 22. | a. | Explain the role of strcmp(),strcpy() in string manipulation. | CO6 | | U | 6 |
|  | b. | Illustrate the exception handling mechanism. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Write a C++ program to demonstrate function overloading. | CO5 | | A | 6 |
|  | b. | Write a C++ program to demonstrate the friend function. | CO5 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Write a C++ program to swap two numbers by using a function template. | CO4 | | A | 6 |
|  | b. | Write a C++ program that uses function templates to sort a list of numbers in ascending order. | CO4 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the object-oriented programming concepts. |
| CO2 | Select the relevant object oriented concepts to implement a real time application. |
| CO3 | Demonstrate the application of polymorphism in various ways. |
| CO4 | Illustrate the use of advanced features of C++ such as templates, exceptions, and multiple inheritances. |
| CO5 | Create applications using inheritance in C++. |
| CO6 | Explain file management and string manipulation. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 1 | 6 | - | - | - | 17 |
| CO2 | 1 | 1 | 15 | - | - | - | 17 |
| CO3 | 6 | 21 | - | - | - | - | 27 |
| CO4 | 1 | 1 | 15 | - | - | - | 17 |
| CO5 | - | 15 | 12 | - | - | - | 27 |
| CO6 | 1 | 6 | 12 | - | - | - | 19 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| --- | --- | --- | --- |
| **Course Code** | **14CS2040/17CS2017** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING IN JAVA** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Predict the output of following code snippet?  int a=42, b=17;  int c=(~a & b);  System.out.println(c); | | CO1 | A | | 1 |
| 2. | Express the purpose of byte code for platform independent feature in Java. | | CO1 | R | | 1 |
| 3. | Predict the output of the following code  Class Bus{  intnum;  public static void main(String[] args) {  intnum=25;  Bus c1=new Bus();  System.out.println(c1.num);  System.out.println(num);  }  } | | CO2 | U | | 1 |
| 4. | Identify the access specifier used to make the super class data accessible to all classes from different package | | CO2 | R | | 1 |
| 5. | Identify the exception created by Thread.sleep() method. | | CO5 | R | | 1 |
| 6. | Discover the code to call the fun() method without creating object in the following code.  class Math{  static void fun(){ }  } | | CO3 | R | | 1 |
| 7. | Predict the output of the following code.  enum Days { MON, TUE, WED };  class TestDays {  public static void main(String[] args) {  Days[ ] d2 = Days.values();  System.out.println(d2[2]);  }  } | | CO4 | A | | 1 |
| 8. | Predict the output of the following code.  class Boxing {  public static void main(String[] args) {  Integer iob = 10;  System.out.println(iob);  }  } | | CO4 | R | | 1 |
| 9. | Indicate the Java program to get a string "Karunya university" from the user.   * Fetch the first char using the string function * convert the string to uppercase | | CO3 | U | | 1 |
| 10. | State the purpose of InetAddress in Java networking. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe the two different ways of creating arrays in java. Explain with example. | | CO1 | | U | 3 |
| 12. | Categorize the three purpose of final keyword with example for each. | | CO2 | | An | 3 |
| 13. | Discover the error(s) (if any) in following code and justify your answer.  abstract class CSE  { abstract void display(); }  public class Abs extends CSE{  public static void main(String[] args) {  System.out.println("Welcome to CSE");  } } | | CO3 | | A | 3 |
| 14. | Show sample code to sleep a thread for one minute. | | CO5 | | U | 3 |
| 15. | Compare and contrast the method overloading and overriding with example programs. | | CO2 | | An | 3 |
| 16. | Illustrate the Java code snippet to use the GridLayout to organize 10 JButtons. | | CO5 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe the buzz words which make Java the most significant object oriented programming language for application domain. | CO2 | | U | 8 |
|  | b. | Explain the various logical operators defined by Java. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. |  | Create a class called “Student” which has data members like, Name, Regno and 3 subject marks. Write a member function which compares two students’ percentage and return the student who scored high. Demonstrate the usage of above class by printing the topper among three students using array of object. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. |  | Write an application that prompts the user to enter a number to use asan array size and then attempt to declare an array using the enteredsize. If the array is created successfully, display an appropriatemessage. Java generates a Negative ArraySizeException if you attempt to create an array with a negative size, and a NumberFormatException if you attempt to create an array using anon-numeric value for the size. Use a catch block that executes if the array size is non-numeric or negative, displaying a message that indicates the array was not created. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. | a. | List the wrapper classes; also differentiate auto boxing and auto unboxing with an example. | CO4 | | An | 8 |
|  | b. | Given: String s1 = “Java”; String s2 = “Programming ”;  Explain the following library functions to operate on the given Strings.  substring(), concat(), replace(), trim() | CO1 | | A | 4 |
|  |  |  |  | |  |  |
| 21. |  | Illustrate the Java program to demonstrate TCP-IP connection oriented one way chat using java networking model. | CO6 | | An | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss about single inheritance and multilevel inheritance in Java with appropriate example and demonstrate the use of super keyword. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Create an interface called Shape which contains the function to find the area and perimeter. Create Square and Rectangle classes which implement the interface Shape. Create a Test class which calculates the area and perimeter of various shapes using dynamic method dispatch. | CO4 | | An | 7 |
|  | b. | Write a Java program to copy the content of one text file to another text file using the necessary reader and writer classes. | CO5 | | A | 5 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate the following window based Java program to add two numbers in GUI mode and also close the window when the exit button is clicked as shown below. | CO5 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the necessary attributes and methods of an object, hierarchical classification of classes, and handle necessary exceptions. |
| CO2 | Infer object-oriented programming constructs, control statements and java library. |
| CO3 | Show proficiency in debugging. |
| CO4 | Model prototype for the real time application. |
| CO5 | Develop desktop application using multi-threading, collections, IO concepts, GUI to solve real-time problems. |
| CO6 | Design distributed applications using network concepts to solve distributed collaborative problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 7 | 5 |  |  |  | 13 |
| CO2 | 1 | 21 | 12 | 6 |  |  | 40 |
| CO3 | 1 | 1 | 15 |  |  |  | 17 |
| CO4 | 1 |  | 1 | 15 |  |  | 17 |
| CO5 | 1 | 6 | 17 |  |  |  | 24 |
| CO6 |  | 1 |  | 12 |  |  | 13 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **14CS2042/18CS2018/17CS2018** | **Duration** | **3hrs** |
| **Course Name** | **SOFTWARE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the software development life cycle model that is chosen if the development team has less experience on similar projects. | | CO1 | R | | 1 |
| 2. | Identify the model which is not suitable for accommodating any change. | | CO1 | U | | 1 |
| 3. | List the elements of requirements model. | | CO2 | R | | 1 |
| 4. | Identify the first step of requirement elicitation. | | CO2 | R | | 1 |
| 5. | Define a test case. | | CO5 | R | | 1 |
| 6. | Quote the different levels of testing. | | CO5 | R | | 1 |
| 7. | Write the important steps of six-sigma methodology. | | CO6 | R | | 1 |
| 8. | Write the formula to compute the time and effort required to complete the software product. | | CO5 | R | | 1 |
| 9. | Write the formula of schedule variance in earned value analysis method. | | CO6 | R | | 1 |
| 10. | List the various components of risk management. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write the disadvantages of spiral model. | | CO1 | | R | 3 |
| 12. | Discover the golden rules to be followed by the designers while designing the interface. | | CO1 | | R | 3 |
| 13. | Sketch the sequence diagram to withdraw money using a visa card. | | CO3 | | A | 3 |
| 14. | Define white box testing. | | CO5 | | U | 3 |
| 15. | Discriminate SCM repository and SCM auditing. | | CO6 | | U | 3 |
| 16. | Define proactive and reactive risk management technique. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Analyze the waterfall model in detail and identify the reasons to why the customer requirements may change after the requirements phase is complete and the SRS document has been signed off. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Describe the step wise process in Software Development Life Cycle to develop the software. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Differentiate functional and non-functional requirements in a software project. | CO2 | | R | 6 |
|  | b. | Explain the various activities to be performed during requirement analysis. | CO2 | | R | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Analyze the following scenario and draw the Activity diagram. “The online printed T-Shirt designing project will have registration for new users and login for members. This software will have admin login which will check for new request and orders, member login in which they can create customize design using wide range of colors &design, and can even place bulk order for the same. The system first allows users to select T-shirt design. After that user may choose desired color. After user finalizes the cost of design is calculated and user may pay online for it”. | CO3 | | An | 6 |
|  | b. | Explain the steps to be performed to accomplish the interface design. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 21. |  | Explain the following architectural styles exist in the given system in detail.   1. Data centered architecture. 2. Data flow architecture. 3. Layered architecture. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Predict the importance of testing. Narrate control path testing procedure in detail with a sample code. | CO5 | | U | 6 |
|  | b. | Explain black box and white box testing. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the process of risk mitigation, monitoring and management. | CO6 | | U | 6 |
|  | b. | Distinguish between FP based and LOC based estimation techniques. | CO6 | | R | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the process of Software Project Management using COCOMO. | CO6 | | U | 6 |
|  | b. | Discuss in detail about project scheduling. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Discover an effective software engineering process to develop software-intensive systems. |
| CO2 | Translate the requirements specification into an implementable design. |
| CO3 | Construct UML diagrams along with design strategies and deign patterns. |
| CO4 | Analyze architectural design methods. |
| CO5 | Evaluate the system using various testing strategies. |
| CO6 | Develop the software system with quality measures. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO/P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 25 | - | - | - | - | 32 |
| CO2 | 14 | - | - | - | - | - | 14 |
| CO3 | - | - | 3 | 6 | - | - | 9 |
| CO4 | - | 18 | - | - | - | - | 18 |
| CO5 | 3 | 15 | - | - | - | - | 18 |
| CO6 | 9 | 24 | - | - | - | - | 33 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **14CS2045/17CS2019** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEM SOFTWARE** | **Max. Marks** | **100** |

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| **Q. No.** | | **Questions** | | **Course Outcome** | | **Bloom’s Level** | | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | | |
| 1. | Identify the addressing used in the instruction.  LDA #3. | | | | CO1 | | U | | 1 |
| 2. | List the addressing modes of SIC/XE architecture. | | | | CO1 | | R | | 1 |
| 3. | Name the two major data structures used by assembler. | | | | CO2 | | R | | 1 |
| 4. | State the function ORG assembler directive. | | | | CO2 | | R | | 1 |
| 5. | Define Relocatable program. | | | | CO4 | | R | | 1 |
| 6. | Recall the Loader features. | | | | CO3 | | R | | 1 |
| 7. | Construct the macro expansion for the macro invocation.  SUM ALPHA  The macro definition is as follows.  SUM MACRO &L  CLEAR A  LDA X&L->1  ADD X&L->2  ADD X&L->3  MEND | | | | CO5 | | A | | 1 |
| 8. | Recite the directives used in macro definition. | | | | CO5 | | R | | 1 |
| 9. | Express the function of an Interactive Editor. | | | | CO6 | | U | | 1 |
| 10. | Sketch the schema for the University database. | | | | CO6 | | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | | |
| 11. | Determine the sequence of instructions for SIC/XE to set ALPHA equal to 8 \* BETA + 2 – GAMMA. Assume ALPHA, BETA and GAMMA are defined. | | | | CO1 | | | A | 3 |
| 12. | Differentiate System Software and Application software. | | | | CO2 | | | U | 3 |
| 13. | Describe Automatic Library Search. | | | | CO3 | | | A | 3 |
| 14. | Discuss the functions required to translate source program to object program. | | | | CO4 | | | R | 3 |
| 15. | Illustrate how macro instructions can have unique symbols with example. | | | | CO5 | | | An | 3 |
| 16. | Summarize the functions and capabilities of an interactive debugging system. | | | | CO6 | | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | | | |
| 17. |  | | Explain in detail the architecture of SIC machine with example. | | CO1 | | | U | 12 |
|  |  | |  | |  | | |  |  |
| 18. |  | | Compare and contrast RISC and CISC machine architecture. | | CO1 | | | An | 12 |
|  |  | |  | |  | | |  |  |
| 19. |  | | Examine the given SIC source program and construct the SYMTAB and object code for each given statements.  PRO START 2000  FIRST LDX ONE  LDA ONE  LOOP MUL TEST, X  TIX COUNT  JLT LOOP  STA PRODUCT  RSUB  TEST RESW 5000  COUNT RESW 1  ONE WORD 1  PRODUCT RESW 1  END FIRST   |  |  | | --- | --- | | Mnemonic | Opcode | | LDX | 04 | | LDA | 00 | | MUL | 20 | | JLT | 38 | | TIX | 2C | | STA | 0C | | RSUB | 4C | | | CO3 | | | A | 12 |
|  |  | |  | |  | | |  |  |
| 20. |  | | Describe the functions of the two pass assembler for converting the assembly language code into object code. | | CO4 | | | U | 12 |
|  |  | |  | |  | | |  |  |
| 21. | a. | | Discuss the program for bootstrap loader for reading an input. | | CO3 | | | U | 6 |
|  | b. | | Write the algorithm of an absolute loader. Depict the memory contents with object code if absolute loader is used for loading.  H^ALPHA^001000^000018  T^001000^12^010003^132010^050000^6F1000^169001^0F9000E^001000 | | CO3 | | | A | 6 |
|  |  | |  | |  | | |  |  |
| 22. |  | | Explain the DEFINE, EXPAND, GETLINE procedures in macro processor algorithm with example. | | CO5 | | | U | 12 |
|  |  | |  | |  | | |  |  |
| 23. |  | | Describe the Machine Independent Assembler features  a. Literals.  b. Symbol-defining statements.  c. Expressions. | | CO2 | | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | | | | |
| 24. | a. | | Explain the Editor structure with a neat diagram. | | CO6 | | | U | 6 |
|  | b. | | Discuss the concept of database management system and its uses. | | CO6 | | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | List different system architectures like SIC, CISC and RISC. |
| CO2 | Explain algorithm and data structures for assembler. |
| CO3 | Choose different features of loader and assembler. |
| CO4 | Examine the object program. |
| CO5 | Comply macros in assembler. |
| CO6 | Select different system software for practical applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | 3 | 12 | - | - | 29 |
| CO2 | 14 | 3 | - | - | - | - | 17 |
| CO3 | 1 | 6 | 31 | - | - | - | 28 |
| CO4 | 4 | 12 | - | - | - | - | 16 |
| CO5 | 1 | 12 | 1 | 3 | - | - | 17 |
| CO6 | - | 16 | 1 | - | - | - | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **14CS2052** | **Duration** | **3hrs** |
| **Course Name** | **WEB TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Draw the basic structure of HTML. | | CO1 | R | | 1 |
| 2. | Write the syntax for CSS. | | CO1 | C | | 1 |
| 3. | Write the syntax to access object in JavaScript | | CO1 | C | | 1 |
| 4. | Define the HTML syntax to display an image of size 100 \* 150 in the webpage. | | CO1 | R | | 1 |
| 5. | Name the CSS selector that selects the HTML element by #symbol. | | CO1 | R | | 1 |
| 6. | Find the JavaScript function used to execute a function after every specific time intervals. | | CO2 | R | | 1 |
| 7. | Identify the purpose of JSON. | | CO2 | R | | 1 |
| 8. | State the syntax rules for JSON. | | CO2 | U | | 1 |
| 9. | Compare the PHP built -in fcuntions require and include. | | CO3 | U | | 1 |
| 10. | Describe the PHP code to create an array with 5 integers. | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the data exchange formats such as XML and JSON for web applications with suitable example. | | CO2 | | U | 3 |
| 12. | Write CSS code to change the background and text color of the division when the user moves the cursor over that division. | | CO1 | | Ap | 3 |
| 13. | Demonstrate the popup box functions in JavaScript with suitable examples. | | CO3 | | U | 3 |
| 14. | A student class comprises of data members such as regno and name. Initialize the data members through constructor. Use a member function display() to display the details of student. Write PHP code to create the object and print the details. | | CO3 | | Ap | 3 |
| 15. | Describe about JSON Schema. | | CO2 | | U | 3 |
| 16. | Mention the purpose of jQuery hide() and show() elements with snippet. | | CO2 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Design the following table layout using HTML5 table tags and populate the rows to display the results of four students.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | SI.No | Student details | | Subject details | | | | Reg.No | Name | Code | Name | Grade | | 1 | EC101 | Remi | 17EC1001 | Microprocessor | S | | CO1 | | Ap | 8 |
|  | b. | Elucidate the media elements in HTML5. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. | a. | Assume the webpage contains four divisions. Write CSS rules to apply the following styles.  Division 1: Set the dotted border with 5px thick, green color  Division 2: Display an image with opacity of 0.2  Division 3: Display a text in red color with font size 24px. | CO1 | | Ap | 8 |
|  | b. | Explain the CSS box model with suitable HTML and CSS code. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 19. |  | Apply timer functions and object and create different buttons to display:  i)date and time.  ii)current date not time.  iii)current time and not date.  iv)the message “Your form has been submitted” should appear after 5 seconds.  v)stop the execution of the above program before the message gets displayed.  vi)time where the seconds should get changed for every 2 seconds (similar to digital clock). | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Demonstrate the following JSON components with example.  i)data types  ii)parse  iii)stringfy  iv)objects  v)arrays | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Create a form structure where a client enters his details first name,second name,address,email id in it.  • In the top of the form place a gif image related to your form when mouse is placed over the gif its size should get increased to a particular size.  •When mouse is moved away from gif its size should become normal (original position).  •Use media element related to the theme of the form you create.  •Use the text boxes to get the user names and password.  •Make use of radio buttons to give ranking level.  •Use checkboxes to give reasons like why they liked it.  •Enter the input in smaller case in the fields and when you leave the field it should get changed to Uppercase.  •When detail is filled in first form field it should get focussed. Use necessary event and CSS property. When detail is filled in the first field and when moved to next field the first event should get blur.  •Comments if they would like to give any.  •Use buttons to submit the form and reset to clear values entered. •When you resize the form page a message should appear “your page is resized. | CO2 | | C | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Apply the AJAX technology in dynamic web application to demonstrate live search suggestion example. | CO3 | | Ap | 8 |
|  | b. | Demonstrate the three types types of lists in HTML with suitable example program. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Consider the following table ‘Shop’ in database called “Product” Apply HTML and PHP technologies to perform the following operations.   1. Add new product b)Updates the product count  |  |  |  | | --- | --- | --- | | P\_id | P\_name | P\_count | | 102 | Hoodies | 10 | | CO3 | | Ap | 8 |
|  | b. | Demonstrate the session management in PHP with $\_SESSION to preserve data across subsequent accesses. | CO3 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Create a student database using PHP with the fields:  (Name, Degree, CGPA). Also perform the below operations  a) insert 5 documents  b) display all the documents.  c) find the first document in the customers collection.  d) exclude "name" from the result.  e) display only the degree.  f) update one document from the existing collection. | CO3 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design web sites utilizing multiple tools and techniques. |
| CO2 | Utilize entry-level system analysis and design principles to solve business problems |
| CO3 | Have an understanding of Client/Server databases. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 8 | 19 | - | - | 2 | 32 |
| CO2 | 2 | 14 | - | 24 | - | 12 | 52 |
| CO3 | 1 | 8 | 19 | - | - | 12 | 40 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| --- | --- | --- | --- |
| **Course Code** | **14CS2054 / 18CS2027** | **Duration** | **3hrs** |
| **Course Name** | **C# AND .NET PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Predict the output of the following C# code:  *var i="CSharp";*  *Type t=i.GetType();*  *System.Console.WriteLine(t.ToString());* | | CO1 | U | | 1 |
| 2. | State the syntax for a class named ‘MyClass’ that intends to use an interface called ‘IFace’. | | CO1 | R | | 1 |
| 3. | Differentiate String and StringBuilder. | | CO1 | U | | 1 |
| 4. | Examine the keyword used to access members of the base class within a derived class. | | CO1 | R | | 1 |
| 5. | Visualize the memory allocation of a double value in Stack memory area. | | CO4 | R | | 1 |
| 6. | Predict the output of the following C# code.  *Class Rectangle{*  *}*  *Type rectData = typeof(Rectangle);*  *Console.WriteLine(rectData.IsClass);*  *Console.WriteLine(rectData.IsValueType);* | | CO3 | U | | 1 |
| 7. | Name the synchronization issue that can happen if two or more threads access the same objects and access to the shared state that is not synchronized. | | CO2 | R | | 1 |
| 8. | Discuss the relation between Data Set and Data Adapter in ADO.NET disconnected layer. | | CO5 | U | | 1 |
| 9. | List the three programming models in .NET Entity Framework. | | CO5 | R | | 1 |
| 10. | Name the panel that enables you to arrange the controls with rows and columns in WPF. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Illustrate method overriding with a C# code snippet. | | CO1 | | U | 3 |
| 12. | Describe the creation and accessing of jagged array with sample C# code. | | CO1 | | U | 3 |
| 13. | Differentiate generic and non-generic Stack collection with proper C# syntax. | | CO4 | | U | 3 |
| 14. | Visualize the structure of the assembly and describe its types. | | CO4 | | R | 3 |
| 15. | Describe the execute methods used for Command objects in ADO.NET. | | CO5 | | R | 3 |
| 16. | Examine the three types of action selector attributes and its usage with proper syntax in ASP.NET MVC. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Develop the BMI application using C# with the following requirements. (i) Create a class called Person with data members such as Name, Age, Height and Weight (ii) Create object and instantiate it through a constructor (iii) Calculate the BMI value and display the corresponding status through the calcBMI() method by using the following conditions.   |  |  | | --- | --- | | **Status** | **BMI value associated with** | | Underweight | < 18 | | Normal | >=18 and <25 | | Overweight | >=25 and <30 | | Obese | >=30 | | CO3 | | A | 8 |
|  | b. | Describe the various ways of passing arguments to the method with sample C# code. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. |  | Consider a Complex class with *real* and *img* as attributes which describes the members of the complex class. Write a C# program to overload the +, \* and == operators.  **Note:** The complex number should be displayed in the format of 2+3i or 2-3i. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Create a class called Shape with methods Circle(int r), Rectangle(int l, int b) and Triangle(double b, double h). Write a C# code to invoke the functions of the Shape class through single delegate. | CO5 | | A | 8 |
|  | b. | Discuss the uses of sealed keyword in C# with sample code snippet. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Explain the mechanisms to free up the managed and unmanaged resources in .NET environment. | CO4 | | U | 6 |
|  | b. | Develop an application in C# to maintain the marks of students in List collection.  1) Create a list with 5 marks such as 55, 67, 42, 89, 97  2) Add a new mark as 78  3) Insert a new mark as 85 after 42  4) Remove the mark 67  Note: Display the list after every operation and examine the elements in that list. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 21. | a. | A company conducted a recruitment process with the eligibility of “8 CGPA above with no arrear”. If the students are not acquiring the eligibility, then handle the following exceptions.   * If the CGPA is below 8, then throw a user defined exception called **“CGPA\_Shortage\_Exception”.** * If the student has arrear, then throw a user defined exception called **“Arrear\_Exception”.** * If the length of the student’s name is less than 15, then throw a user defined exception called **“Length\_Exception”.** | CO2 | | A | 8 |
|  | b. | Capture 10-digit numbers and upper-case words from a given input by illustrating regular expression with C# code snippet.  (For example - Input: 9876543563 67889654 KARUNYA Institute of Technology, Output: 9876543563 KARUNYA) | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Write a C# program to demonstrate attributes and reflection with the following conditions:   * Create a custom attribute called HelpAttribute with the error\_code as the positional parameters and error\_description is the named parameter. * The custom attribute usage is to Class with allow multiple true. * Create a class ErrorMessage and provide the functions Execute. Apply the custom attribute in the required places. * Using Reflection, obtain type information from ErrorMessage Class during runtime and display the custom attributes. | CO4 | | A | 6 |
|  | b. | Write the necessary code to validate the ASP.NET page with the validation server controls for the following constraints.   1. Name field is required 2. Password and retype password field are same 3. Age filed is between 23 to 30 | CO6 | | A | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Write a C# program that creates three threads. First thread displays “Happy” for every second, the second thread displays “C#” for every two seconds and the third thread displays “Programming” for every three seconds. Ensure only one thread execute at a time using synchronization mechanism. | CO2 | | A | 8 |
|  | b. | Discuss the role of SQLDataReader and SQLDataAdapter while retrieving the data from database. | CO6 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Develop an ASP.NET application using C# to perform the following operations with ADO.NET.   * Design a web page with relevant fields * Connect with the database named **‘Employee’** * Insert a record in the table called **‘Profile’** with fields such as EmpName (varchar), EmpId (int) and Salary (int) * Delete an employee record based on the EmpId * Display the details dynamically in the GridView control | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Describe the basics programming constructs of C# in .NET Framework. | | | | | | | |
| CO2 | Extend and debug variety of .NET applications. | | | | | | | |
| CO3 | Demonstrate the aspects of object-oriented functionalities in .NET applications. | | | | | | | |
| CO4 | Use the .NET base libraries in developing real time applications. | | | | | | | |
| CO5 | Illustrate .NET applications with relational database and variety of data sources for efficient data access. | | | | | | | |
| CO6 | Develop well designed ASP.NET applications using .NET framework. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 2 | 12 |  |  |  |  | 14 |
| CO2 | | 1 |  | 28 |  |  |  | 29 |
| CO3 | |  | 5 | 8 |  |  |  | 13 |
| CO4 | | 4 | 13 | 12 |  |  |  | 29 |
| CO5 | | 4 | 1 | 8 |  |  |  | 13 |
| CO6 | | 4 | 4 | 18 |  |  |  | 26 |
|  | | | | | | | | **124** |

Graphical user interface, application

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| **Course Code** | **14CS3055 / 17CS3046** | **Duration** | **3hrs** |
| **Course Name** | **INTERACTIVE GAME DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1 |  | Write down the detailed description of any two of your favorite games. Describe and compare the structure of those games based on the players, procedures, rules, conflicts and outcome. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 2. |  | Annotate the dynamic relationship between challenge and ability, frustration and boredom in playing a game and highlight the elements that help to achieve ‘FLOW’. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 3. |  | Describe the idea development process with neat diagram and explain the procedure for evaluating the game idea. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 4. |  | Compare and contrast the conflict in board game to the conflict in video game. Describe how each game creates conflict and fun for the players. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 5. | a. | Examine the process for creating a realistic project plan and budget. | CO5 | An | 8 |
|  | b. | Analyze the model for continual iterative process of playtesting, evaluating and revising and explain how the testing cycle gets tighter and tighter as production moves forward | CO4 | A | 8 |
|  |  |  |  |  |  |
| 6. |  | Show with an example how games with very similar objectives and related system designs provide extremely different ranges of possibilities with completely different player experiences. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | Describe the different categories of editing and refining an idea and turning those ideas into a game. | CO3 | U | 16 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Describe in detail the techniques for agile project planning to lead effective agile teams in the development of game design. | CO6 | U | 10 |
|  | b. | Outline the table of contents for game design document and show the types of information it should contain under each section. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Outline the role of game designer and game designing process. |
| CO2 | Classify the formal and dramatic elements for designing a game. |
| CO3 | Apply the conceptualization techniques and turn the ideas into game. |
| CO4 | Analyse the prototyping models using various playtesting mechanisms. |
| CO5 | Comply with the standards of game industries for developing team structures, team building and team communication. |
| CO6 | Estimate the cost of a game by preparing project plan and informative design documents. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | - | - | - | - | - | 16 |
| CO2 | 16 | - | 16 | - | - | - | 32 |
| CO3 | 32 | - | - | - | - | - | 32 |
| CO4 | - | - | - | 16 | - | - | 16 |
| CO5 | - | - | 8 | 8 | - | - | 16 |
| CO6 | - | - | 20 | - | - | - | 20 |
|  | | | | | | | **132** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **16CS2002/18CS2086/17CS2038** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF JAVA PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List the different Data Types available in java. | | | CO1 | R | | 1 |
| 2. | Name the object-oriented concept through which a single action can be performed in different ways. | | | CO1 | R | | 1 |
| 3. | State the output of the following program:  public class Main {  public static void main(String[] args) {  int x = 5;  System.out.println(x<3&&x<10);  }  } | | | CO2 | R | | 1 |
| 4. | Interpret the output for the sample code given below:  public class Main {  public static void main(String[] args) {  String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};  for (int i = 0; i < cars.length; i++) {  System.out.println(cars[i]);  }  }  } | | | CO2 | U | | 1 |
| 5. | Write the syntax for package in java. | | | CO3 | A | | 1 |
| 6. | Interpret the output for the sample code given below:  interface printable{  void print();  void print1();  }  class A6 implements printable{  public void print(){System.out.println(&quot;Welcome to Interface...&quot;);}  public void print1(){System.out.println(&quot;Welcome to Interface2...&quot;);}  public static void main(String args[]){  A6 obj = new A6();  obj.print();  }  } | | | CO3 | U | | 1 |
| 7. | Recognize the output of the below program:  public class Main extends Thread {  public static void main(String[] args) {  Main thread = new Main();  thread.start();  System.out.println(&quot;This code is outside of the thread&quot;);  }  public void run() {  System.out.println(&quot;This code is running in a thread&quot;);  }  } | | | CO4 | R | | 1 |
| 8. | Name the technique that is used to allow only one thread to access the shared resource. | | | CO4 | R | | 1 |
| 9. | Write the output of the following code:  class Testimmutablestring{  public static void main(String args[]){  String s="Sachin";  s.concat(" Tendulkar");  System.out.println(s);  }  } | | | CO5 | A | | 1 |
| 10. | Write the syntax for creating a file in java. | | | CO5 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Write a java program to find the sum of ‘n’ numbers. | | | CO1 | | A | 3 |
| 12. | Demonstrate a java program to store 5 numbers in an array and display only the odd numbers. | | | CO2 | | U | 3 |
| 13. | Illustrate a java program to illustrate the concept of Interface. | | | CO3 | | U | 3 |
| 14. | Sketch the Complete life cycle of a thread. | | | CO4 | | A | 3 |
| 15. | Write a simple java program to create 4 seasons of weather (Spring, Summer, Fall and Winter) using ENUM data type and display it. | | | CO5 | | A | 3 |
| 16. | Discuss in detail about the following:   1. Border Layout 2. Grid Layout 3. Flow Layout | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Develop a simple calculator using switch case for arithmetic Operators with a menu option. | CO1 | | A | 8 |
|  | | b. | Write a Java program to print the result of the following operations.  ***Test Data***  a. -5 + 8 \* 6 b. (55+9) % 9 c. 20 + -3\*5 / 8 d. 5 + 15 / 3 \* 2 - 8 % 3 | CO1 | | A | 4 |
|  | |  |  |  | |  |  |
| 18. | | a. | Discuss the different types of inheritance with an example program. | CO2 | | U | 8 |
|  | | b. | Write a java program to illustrate the concept of Method Overriding. | CO2 | | A | 4 |
|  | |  |  |  | |  |  |
| 19. | | a. | Develop a java program for Shape interface having methods area () and perimeter (). Create 2 subclasses, Circle and Rectangle that implement the Shape interface. Write a class Sample with main method and demonstrate the area and perimeters of both the shape classes. You need to handle the values of length, breath, and radius in respective classes to calculate their area and perimeter. | CO3 | | A | 8 |
|  | | b. | Illustrate a java program for package with package name as pack. Create a class called A inside pack with one method as msg() and display a welcome message inside msg() method. Create another class called B and invoke the package (pack) here. Write the main method in class B and display the result. | CO3 | | U | 4 |
|  | |  |  |  | |  |  |
| 20. | | a. | Describe in detail the Exception Handling with an example program. | CO4 | | U | 8 |
|  | | b. | Write a java program to illustrate the concept of Synchronization. | CO4 | | A | 4 |
|  | |  |  |  | |  |  |
| 21. | | a. | Explain in detail about the different String Operations in java with an example for each. | CO5 | | U | 8 |
|  | | b. | Write a java program to illustrate the concept of Autoboxing and Unboxing | CO5 | | A | 4 |
|  | |  |  |  | |  |  |
| 22. | | a. | Write a java program to perform matrix multiplication. | CO1 | | A | 8 |
|  | | b. | Write a java program to perform matrix addition. | CO1 | | A | 4 |
|  | |  |  |  | |  |  |
| 23. | | a. | Write java programs to illustrate the following concepts:   1. Abstract Class 2. Final Class | CO2 | | A | 8 |
|  | | b. | Illustrate a java program to represent the concept of Inner Class. | CO2 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Write a java program to stimulate the layout and working of a calculator using Swing. | CO6 | | A | 8 |
|  | | b. | Develop a java program using swing Border Layout to represent the given directions such as NORTH, SOUTH, EAST, WEST and CENTER. | CO6 | | A | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamental principles of object-oriented design. |
| CO2 | Identify the fundamental programming constructs to develop real time applications. |
| CO3 | Model applications using Java. |
| CO4 | Demonstrate the development of multitasking applications |
| CO5 | Breakdown the real time applications into small abstract entities |
| CO6 | Develop desktop-based applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | - | 27 | - | - | - | 29 |
| CO2 | 1 | 16 | 12 | - | - | - | 29 |
| CO3 | - | 8 | 9 | - | - | - | 17 |
| CO4 | 2 | 8 | 7 | - | - | - | 17 |
| CO5 | - | 8 | 9 | - | - | - | 17 |
| CO6 | - | 3 | 12 | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **17CS2024** | **Duration** | **3hrs** |
| **Course Name** | **WEB TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Draw the basic structure of HTML. | | CO1 | R | | 1 |
| 2. | Write the syntax for CSS. | | CO1 | C | | 1 |
| 3. | Write the syntax to access object in JavaScript. | | CO1 | C | | 1 |
| 4. | Define the HTML syntax to display an image of size 100 \* 150 in the webpage. | | CO1 | R | | 1 |
| 5. | Name the CSS selector that selects the HTML element by #symbol. | | CO1 | R | | 1 |
| 6. | Find the JavaScript function used to execute a function after every specific time intervals. | | CO2 | R | | 1 |
| 7. | Identify the purpose of JSON. | | CO2 | R | | 1 |
| 8. | State the syntax rules for JSON. | | CO2 | U | | 1 |
| 9. | Compare the PHP built -in fcuntions require and include. | | CO3 | U | | 1 |
| 10. | Describe the PHP code to create an array with 5 integers. | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the data exchange formats such as XML and JSON for web applications with suitable example. | | CO2 | | U | 3 |
| 12. | Write CSS code to change the background and text color of the division when the user moves the cursor over that division. | | CO1 | | Ap | 3 |
| 13. | Demonstrate the popup box functions in JavaScript with suitable examples. | | CO3 | | U | 3 |
| 14. | A student class comprises of data members such as regno and name. Initialize the data members through constructor. Use a member function display() to display the details of student. Write PHP code to create the object and print the details. | | CO3 | | Ap | 3 |
| 15. | Describe about JSON Schema. | | CO2 | | U | 3 |
| 16. | Mention the purpose of jQuery hide() and show() elements with snippet. | | CO2 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Design the following table layout using HTML5 table tags and populate the rows to display the results of four students.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | SI.No | Student details | | Subject details | | | | Reg.No | Name | Code | Name | Grade | | 1 | EC101 | Remi | 17EC1001 | Microprocessor | S | | CO1 | | Ap | 8 |
|  | b. | Elucidate the media elements in HTML5. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. | a. | Assume the webpage contains four divisions. Write CSS rules to apply the following styles.  Division 1: Set the dotted border with 5px thick, green color  Division 2: Display an image with opacity of 0.2  Division 3: Display a text in red color with font size 24px. | CO1 | | Ap | 8 |
|  | b. | Explain the CSS box model with suitable HTML and CSS code. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 19. |  | Apply timer functions and object and create different buttons to display:  a)date and time.  b)current date not time.  c)current time and not date.  d)the message “Your form has been submitted” should appear after 5 seconds.  e)stop the execution of the above program before the message gets displayed.  f)time where the seconds should get changed for every 2 seconds (similar to digital clock). | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Demonstrate the following JSON components with example.  a. data types b) parse c) c)stringfy d) d)objects e) e)arrays. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Create a form structure where a client enters his details first name,second name,address,email id in it.  • In the top of the form place a gif image related to your form when mouse is placed over the gif its size should get increased to a particular size.  •When mouse is moved away from gif its size should become normal (original position).  •Use media element related to the theme of the form you create.  •Use the text boxes to get the user names and password.  •Make use of radio buttons to give ranking level.  •Use checkboxes to give reasons like why they liked it.  •Enter the input in smaller case in the fields and when you leave the field it should get changed to Uppercase.  •When detail is filled in first form field it should get focussed. Use necessary event and CSS property. When detail is filled in the first field and when moved to next field the first event should get blur.  •Comments if they would like to give any.  •Use buttons to submit the form and reset to clear values entered. •When you resize the form page a message should appear “your page is resized. | CO2 | | C | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Apply the AJAX technology in dynamic web application to demonstrate live search suggestion example. | CO3 | | Ap | 8 |
|  | b. | Demonstrate the three types types of lists in HTML with suitable example program. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 23. |  | Consider the following table ‘Shop’ in database called “Product” Apply HTML and PHP technologies to perform the following operations.   1. Add new product b)Updates the product count  |  |  |  | | --- | --- | --- | | P\_id | P\_name | P\_count | | 102 | Hoodies | 10 | | CO3 | | Ap | 8 |
|  | b. | Demonstrate the session management in PHP with $\_SESSION to preserve data across subsequent accesses. | CO3 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Create a student database using PHP with the fields:  (Name, Degree, CGPA). Also perform the below operations  a)insert 5 documents  b)display all the documents.  c)find the first document in the customers collection.  d)exclude "name" from the result.  e)display only the degree.  f)update one document from the existing collection. | CO3 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design web sites utilizing multiple tools and techniques. |
| CO2 | Utilize entry-level system analysis and design principles to solve business problems |
| CO3 | Have an understanding of Client/Server databases. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 8 | 19 | - | - | 2 | 32 |
| CO2 | 2 | 14 | - | 24 | - | 12 | 52 |
| CO3 | 1 | 8 | 19 | - | - | 12 | 40 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **17CS2068** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the standard datatypes in python. | | CO1 | R | 1 |
| 2. | Define global variable. | | CO1 | R | 1 |
| 3. | Define Boolean expression. | | CO2 | R | 1 |
| 4. | Which Python module is appropriate for the following code?  import\_\_\_\_\_\_\_\_\_  x=math.sqrt(64)  print(x) | | CO2 | U | 1 |
| 5. | What is the output for the following code?  myString="Karunya" stringList=["Deemed", "Karunya", "University"]  print(stringList[1] ==myString)  print(stringList[1] is myString) | | CO4 | A | 1 |
| 6. | Write a statement in Python to perform the following operations   1. To open a text file “SAMPLE.TXT” in write mode 2. To open a text file“SAMPLE.TXT” in read mode | | CO5 | A | 1 |
| 7. | Let list = [’a’, ’b’, ’c’, ’d’, ’e’, ’f’]. Find a) list[1:3] b) list[:4] c) list[3:] | | CO6 | A | 1 |
| 8. | What will be the output of the following Python code? class A: def one(self): return self.two() def two(self): return 'A'  class B(A): def two(self): return 'B' obj1=A() obj2=B() print(obj1.two(),obj2.two()) | | CO7 | A | 1 |
| 9. | Name the inheritance used in the following code snippet.  class A(): pass class B(): pass class C(A,B): pass | | CO3 | A | 1 |
| 10. | What is the output of the following?  a. float(42) b. float("3.7459") | | CO1 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe Python String with example. | | CO1 | U | 3 |
| 12. | Explain while loop with example. | | CO2 | U | 3 |
| 13. | List out some different modes to open a file. | | CO5 | R | 3 |
| 14. | Define cloning in list with example. | | CO6 | R | 3 |
| 15. | List out any two i**nheritance type with example.** | | CO3 | R | 3 |
| 16. | Define Function Call. | | CO7 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Describe Arithmetic Operators, Assignment Operators, Comparison Operators, Logical Operators and Bitwise Operators in detail with examples. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain the Identifiers, Keywords, Statements, Expressions, and Variables in Python programming language with examples | CO1 | U | 6 |
|  | b. | Explain the basic data types available in Python with examples. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Write a python program to find the square root of a number. | CO2 | A | 6 |
|  | b. | Write a detail note on Recursion. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain String slices and string immutability with example | CO5 | U | 6 |
|  | b. | **Write a function in Python that counts the number of “Me” or “My” (in smaller case also) words present in a text file “BOOK.TXT”. If the “BOOK.TXT” contents are as follows:**  **My first book was Me and My Family. It gave me chance to be Known to the world. It also made me know more about my people.** | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Discuss the difference between List, Tuple and Dictionary. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Write a Python function to find the Max of three numbers. | CO7 | C | 3 |
|  | b. | Write a Python function to multiply all the numbers in a list. | CO7 | C | 3 |
|  | c. | Explain the role of function call and function definition with example. | CO7 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Write a python program to print the maximum among ‘n’ randomly generate ‘d’ numbers by storing them in a list | CO6 | C | 6 |
|  | b. | Write a Python program to convert Celsius to Fahrenheit. | CO2 | C | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain in detail about creating a class and object with example. | CO7 | U | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Outline the structure and components of a Python program. | | | | | | | |
| CO2 | Explain loops and decision statements in Python. | | | | | | | |
| CO3 | Illustrate class inheritance in Python for reusability. | | | | | | | |
| CO4 | Experiment read and write files in Python. | | | | | | | |
| CO5 | Design, code, and test small Python programs that meet requirements expressed in English. | | | | | | | |
| CO6 | Choose lists, tuples, and dictionaries in Python programs. | | | | | | | |
| CO7 | Assess object oriented programs with Python classes. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 2 | 15 | 13 | - | - | - | 30 |
| CO2 | | 1 | 10 | 6 | - | - | 12 | 29 |
| CO3 | | 3 | - | 1 | - | - | - | 4 |
| CO4 | | - | - | 7 | - | - | - | 7 |
| CO5 | | 3 | 6 | 1 | - | - | - | 10 |
| CO6 | | 3 | 12 | 1 | - | - | - | 16 |
| CO7 | | 3 | 18 | 1 | - | - | 6 | 28 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS1001** | **Duration** | **3hrs** |
| **Course Name** | **INFORMATION AND COMMUNICATION TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (20 X 1 = 20 MARKS)** | | | | | | |
| 1. | Recall an example for application software. | | CO3 | R | | 1 |
| 2. | Name an input device used for images. | | CO1 | R | | 1 |
| 3. | Name the type of data used by Google maps. | | CO1 | R | | 1 |
| 4. | Recall an application of video data. | | CO1 | R | | 1 |
| 5. | Name the type of data used in flight recorders. | | CO1 | R | | 1 |
| 6. | Recall the full form of MICR. | | CO2 | R | | 1 |
| 7. | Recall the symbol that is used for decision-making in a flowchart. | | CO3 | R | | 1 |
| 8. | Name the type of storage cell used in compact disks. | | CO3 | R | | 1 |
| 9. | Recall the part of the computer that is referred to as its brain. | | CO3 | R | | 1 |
| 10. | Recall the memory that stores frequently accessed data for quick access. | | CO3 | R | | 1 |
| 11. | Name the markup language used to design web pages. | | CO1 | R | | 1 |
| 12. | Recall the base of a decimal number system. | | CO2 | R | | 1 |
| 13. | Name an input device used to acquire cheque numbers. | | CO2 | R | | 1 |
| 14. | Find the number of bits that constitute 1 byte. | | CO1 | R | | 1 |
| 15. | Name the process in which a message is sent to all users connected in a network. | | CO4 | R | | 1 |
| 16. | Recall the full form of ROM. | | CO4 | R | | 1 |
| 17. | Identify the type of display used in ‘Amazon Kindle’. | | CO5 | R | | 1 |
| 18. | Name a field in a database table that uniquely identifies a record. | | CO4 | R | | 1 |
| 19. | Recall the alternate name given to supercomputers. | | CO4 | R | | 1 |
| 20. | Recall the full form of HTML. | | CO5 | R | | 1 |
| **PART – B (10 X 5 = 50 MARKS)**  **(Answer any 10 from the following)** | | | | | | |
| 21. | Outline the process of acquisition and representation of image data. | | CO2 | | U | 5 |
| 22. | Classify the different types of data that are processed by a computer and explain any two of their applications. | | CO1 | | U | 5 |
| 23. | Summarize any two techniques used for image compression. | | CO2 | | U | 5 |
| 24. | Explain the acquisition and representation of line drawings. | | CO3 | | U | 5 |
| 25. | Illustrate the types of graphs that can be plotted in Microsoft Excel. | | CO3 | | U | 5 |
| 26. | Convert the following:   1. 25810 to binary. 2. 1101010012 into decimal. | | CO1 | | A | 5 |
| 27. | One kg of apple costs Rs. 125/-. Estimate the binary equivalent of this value when it is stored in the computer. | | CO1 | | A | 5 |
| 28. | Construct the ROM table for seven-segment display. | | CO2 | | U | 5 |
| 29. | Model the types of communication in local area networks. | | CO3 | | A | 5 |
| 30. | Explain the applications of ROM. | | CO2 | | U | 5 |
| 31. | Illustrate the role of databases in storing data. | | CO4 | | U | 5 |
| 32. | Demonstrate any two applications of the Internet. | | CO5 | | U | 5 |
| **PART – C (2 X 15 = 30 MARKS)**  **(Answer any 2 from the following)** | | | | | | |
| 33. | a. | Identify the parts of a desktop computer. | CO1 | | A | 8 |
|  | b. | Illustrate the working of a washing machine. | CO1 | | A | 7 |
| 34. | a. | Categorize the types of data used in computers and highlight their applications. | CO1 | | An | 8 |
|  | b. | Categorize the memory of the computer and explain the working of any one type in detail. | CO3 | | U | 7 |
| 35. |  | Demonstrate the use of Excel in various real life applications. | CO2 | | A | 15 |

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|  | **COURSE OUTCOMES** |
| CO1 | Classify different forms of data. |
| CO2 | Acquire different forms of data. |
| CO3 | Analyze the working of hardware and software. |
| CO4 | Organize the data. |
| CO5 | Work on technologies related to Multimedia and Internet. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 | 5 | 25 | 8 | - | - | 44 |
| CO2 | 3 | 20 | 20 | - | - | - | 43 |
| CO3 | 5 | 17 | - | - | - | - | 22 |
| CO4 | 4 | 5 | - | - | - | - | 9 |
| CO5 | 2 | 5 | - | - | - | - | 7 |
|  | 20 | 52 | 45 | 8 | - | - | **125** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18CS1004** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List the four basic data types. | | | CO1 | R | | 1 |
| 2. | Name the input and output functions used in the C programs. | | | CO1 | R | | 1 |
| 3. | Define identifiers. | | | CO2 | R | | 1 |
| 4. | State some examples of the three integer constants listed below.   * decimal * octal and * hexadecimal. | | | CO2 | R | | 1 |
| 5. | Identify the unconditional branching statement that skips the current iteration and initiates the next iteration of a loop. | | | CO3 | U | | 1 |
| 6. | List all conditional control statements used in C. | | | CO3 | R | | 1 |
| 7. | Indicate the purpose of the return statement. | | | CO4 | U | | 1 |
| 8. | Differentiate while and do-while control statements. | | | CO4 | U | | 1 |
| 9. | Relate recursion in C. | | | CO5 | U | | 1 |
| 10. | Predict the output for the following code.  int a=10;  int \*ptr=&a;  printf(“%d”,\*ptr);  printf(“%d”, ++(\*ptr)); | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | List the various types of hardware and software with examples. | | | CO1 | | U | 3 |
| 12. | Predict the output of the program.  #include<stdio.h>  int main()  {  float s=10, u=30, t=2, a;  a = 2\*(s-u\*t);  printf("Result = %f", a);  return 0;  } | | | CO2 | | U | 3 |
| 13. | Write a simple program to find odd or even using a while loop. | | | CO3 | | A | 3 |
| 14. | Explain the Linear search algorithm with an example. | | | CO4 | | U | 3 |
| 15. | Describe a function. Explain the difference between user-defined and library functions. | | | CO5 | | U | 3 |
| 16. | Develop an application in C to find the mean of all elements in an array using a pointer. | | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain the error diagnostic and debugging techniques. | CO1 | | U | 5 |
|  | | b. | Draw a flowchart to find the area of a rectangle. Convert the flowchart into the algorithm and respective C program to find the area of a rectangle. | CO1 | | U | 7 |
|  | |  |  |  | |  |  |
| 18. | | a. | Explain any four relational operators with sample code. | CO2 | | U | 5 |
|  | | b. | Write a C program to find the smallest and largest of the given three numbers. | CO2 | | A | 7 |
|  | |  |  |  | |  |  |
| 19. | | a. | Explain different aspects of function calling with an example. | CO5 | | A | 9 |
|  | | b. | List the differences between a while loop and a do-while loop. | CO3 | | U | 3 |
|  | |  |  |  | |  |  |
| 20. | | a. | Definean array and explain the declaration and initialization of one-dimensional and two-dimensional arrays with an example. | CO4 | | U | 6 |
|  | | b. | Write a C program to find the sum of elements in an integer array. | CO4 | | A | 6 |
|  | |  |  |  | |  |  |
| 21. | | a. | Describe a pointer. Explain how the pointer variable is declared and initialized. | CO6 | | U | 6 |
|  | | b. | Write a C program to generate the Fibonacci series using function. | CO5 | | A | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Write a program in C to add two matrices of MXN order. | CO4 | | A | 8 |
|  | | b. | List and explain the various string-handling functions in C. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 23. | | a. | Develop an application in C using structures to maintain and display the records with the name, register number, place and percentage of marks of n students. | CO6 | | A | 8 |
|  | | b. | Compare and contrast Structures with Arrays. | CO6 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Write a recursive function to return the factorial of all the numbers in a one-dimensional array. | CO5 | | A | 6 |
|  | | b. | Write the C program for bubble sorting. Illustrate the various steps to sort the following data in ascending order.  10, 30, 5, 20, 9, 8 | CO3 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of computer and software development process. |
| CO2 | Identify the data type to represent the real time data representation and operators for computation. |
| CO3 | Prepare innovative solutions for the problem using branching and looping statements. |
| CO4 | Decompose a problem into functions and synthesize a complete program using divide and conquer approach. |
| CO5 | Formulate algorithms and programs using arrays, pointers, and structures. |
| CO6 | Create a new application software to solve real-world problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 2 | 8 | 7 | - | - | - | 17 |
| CO3 | 1 | 4 | 9 | - | - | - | 14 |
| CO4 | - | 15 | 14 | - | - | - | 29 |
| CO5 | - | 4 | 21 | - | - | - | 25 |
| CO6 | - | 11 | 11 | - | - | - | 22 |
|  | | | | | | | 124 |

**Graphical user interface, application

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| **Course Code** | **18CS2001/16CS2003/CS245/CS101** | **Duration** | **3hrs** |
| **Course Name** | **BASICS OF COMPUTER PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (20 X 1 = 20 MARKS)** | | | | | | |
| 1. | List the use of utility software. | | CO1 | R | | 1 |
| 2. | Define sizeof operator for int, float and char. | | CO1 | R | | 1 |
| 3. | Identify the keyword which is used to come out of a loop only for that iteration. | | CO1 | R | | 1 |
| 4. | List the different types of constants supported by C. | | CO2 | R | | 1 |
| 5. | Define the use of scanf and cout in programming. | | CO2 | R | | 1 |
| 6. | Interpret the output of the following program?  #include <stdio.h>  main()  { int a, b, c=3;  a=3\*c/2;  b=3\*(c/2);  printf(“a=%d, b=%d”, a, b);} | | CO2 | U | | 1 |
| 7. | Illustrate the types of looping statements in C. | | CO3 | U | | 1 |
| 8. | Illustrate the various conditional statements in C. | | CO3 | U | | 1 |
| 9. | Express the syntax of strcmp() function and its use. | | CO3 | U | | 1 |
| 10. | Define the syntax for declaring a pointer variable. | | CO4 | R | | 1 |
| 11. | Define the syntax of the structure. | | CO4 | R | | 1 |
| 12. | List the merits of using bitwise operators. | | CO4 | R | | 1 |
| 13. | Illustrate the types of access specifiers in structures. | | CO5 | U | | 1 |
| 14. | Differentiate between strcat() and strcpy() functions. | | CO5 | U | | 1 |
| 15. | Illustrate the number of nested loop iteration used in C. | | CO6 | U | | 1 |
| 16. | Illustrate the keywords to declare a structure and union. | | CO6 | R | | 1 |
| 17. | Define the syntax of the union with an example. | | CO6 | U | | 1 |
| 18. | Illustrate the different data types available in ‘C’ programming language. | | CO1 | U | | 1 |
| 19. | Define recursive function. | | CO2 | U | | 1 |
| 20. | Write an application program to copy the content of one file into another file. | | CO3 | R | | 1 |
| **PART – B (10 X 5 = 50 MARKS)**  **(Answer any 10 from the following)** | | | | | | |
| 21. | Outline and explain the working functionalities of application software and system software. | | CO1 | | U | 5 |
| 22. | Write an application program for arithmetic calculation using do while loop. | | CO2 | | R | 5 |
| 23. | Write an application program for student grade system using switch case. | | CO3 | | R | 5 |
| 24. | Write an application program to calculate the area of a circle using function. | | CO4 | | R | 5 |
| 25. | Write an application program to display all the leap years from 1900 to 2100. | | CO6 | | R | 5 |
| 26. | Write an application program and flow chart to merge two integer arrays and display the merged array in reverse order. | | CO1 | | R | 5 |
| 27. | Illustrate the swap program using call by value and call by reference. | | CO2 | | U | 5 |
| 28. | Explain the concept of matrix multiplication using two-dimensional arrays along with drawbacks. | | CO4 | | U | 5 |
| 29. | Explain the working concept of Dynamic Memory Allocation using Malloc() and Calloc(). | | CO5 | | U | 5 |
| 30. | [Write an application program to find the factorial of a number using recursion](https://www.programiz.com/c-programming/examples/factorial-recursion) function. | | CO3 | | R | 5 |
| 31. | Write an application program to [Add two complex numbers by passing structures to a function](https://www.programiz.com/c-programming/examples/complex-number-add). | | CO6 | | R | 5 |
| 32. | Demonstrate the concept of employee playable system using structures. Mention the types of access specifiers involved in accessing the data. | | CO6 | | A | 5 |
| **PART – C (2 X 15 = 30 MARKS)**  **(Answer any 2 from the following)** | | | | | | |
| 33. |  | Explain the evolutionary stages of programming languages. | CO1 | | U | 15 |
| 34. |  | Write an application program and flow chart to develop to find the largest of three numbers using ternary operator. | CO2 | | R | 15 |
| 35. |  | Write an application program and flow chart to perform the area of a circle, the area of a square, and the area of the sphere using menu driven. | CO3 | | R | 15 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamental principles of programming. |
| CO2 | Gain knowledge on the concepts of structured programming. |
| CO3 | Understand logics of solving problems. |
| CO4 | Solve problems using basic programming techniques. |
| CO5 | Apply programming to solve real world problems. |
| CO6 | Illustrate the role of programming in real life scenarios. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 26 |  |  |  |  | 34 |
| CO2 | 22 | 2 |  |  |  |  | 24 |
| CO3 | 26 | 3 |  |  |  |  | 29 |
| CO4 | 8 | 5 |  |  |  |  | 13 |
| CO5 |  | 7 |  |  |  |  | 7 |
| CO6 | 11 | 2 | 5 |  |  |  | 18 |
|  | | | | | | | **125** |

**Graphical user interface, application

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| **Course Code** | **18CS2005** | **Duration** | **3hrs** |
| **Course Name** | **CRYPTOGRAPHY AND NETWORK SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | What is Symmetric Cyber? | | CO1 | R | | 1 |
| 2. | State the meaning of security services. | | CO1 | U | | 1 |
| 3. | How authentication is achieved using public key cryptography? | | CO2 | U | | 1 |
| 4. | Give the meaning of ‘relative prime number’. | | CO2 | A | | 1 |
| 5. | Differentiate hashing from encryption. | | CO3 | U | | 1 |
| 6. | How many registers are used in SHA-512 logic? | | CO3 | R | | 1 |
| 7. | What is the limitation of Kerberos V 4? | | CO4 | R | | 1 |
| 8. | Expand PGP. | | CO5 | R | | 1 |
| 9. | Who is an intruder? | | CO5 | U | | 1 |
| 10. | List the types of firewalls. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the security attacks on computer networks. | | CO1 | | R | 3 |
| 12. | Discuss the strengths of DES. | | CO2 | | R | 3 |
| 13. | Whether the Diffie Hellman key exchange protocol is vulnerable to any primitive attack? Justify. | | CO3 | | A | 3 |
| 14. | Give two applications of cryptographic hash functions. | | CO4 | | U | 3 |
| 15. | Describe the techniques used for the distribution of public keys. | | CO5 | | R | 3 |
| 16. | Explain various types of firewalls. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the various kinds of security attacks on systems and networks; also discuss the possible countermeasures. | CO1 | | R | 8 |
| b. | Encrypt the message “Computer viruses are harmful” using Caesar cipher. | CO1 | | A | 4 |
|  |  |  |  | |  |  |
| 18. |  | Explain the operation of S-Box operation in DES with suitable example. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Perform encryption and decryption using the RSA algorithm for the following:  p = 5; q = 11, e = 3;M = 9 | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. | a. | User A & B exchange the key using Diffie Hellman  Algorithm. Assume α=7 q=71, XA=5 XB=12. Find YA, YB, K. | CO4 | | A | 8 |
| b. | Recall the scope of key management. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 21. |  | Refer to the exhibit. Bob selects q=19, alpha=10. He computes his public key and publically announces the tuple (q, α , YA). Now Alice wants to send the message M=17 to Bob and she selects the random integer =6. Compute C1 and C2. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 22. | a. | With necessary sketch, explain CMAC algorithm. | CO5 | | R | 8 |
|  | b. | Explain the process of Message Digest Generation Using SHA-512. | CO5 | | U | 4 |
|  |  |  |  | |  |  |
| 23. |  | Explain with adequate diagram the transmission and reception of PGP messages. | CO5 | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain Kerberos v5 authentication dialogue. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the computer security concepts and their needs. |
| CO2 | Apply the various symmetric and asymmetric key algorithms. |
| CO3 | Experiment with the various principles of cryptosystems, hashing algorithms and digital signatures. |
| CO4 | Recognize the importance of network security. |
| CO5 | Evaluate network and internet security. |
| CO6 | Explain the different types of virus/worms & firewalls. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 12 | 1 | 4 |  |  |  | 17 |
| CO2 | 3 | 13 | 1 |  |  |  | 17 |
| CO3 | 1 | 1 | 15 |  |  |  | 17 |
| CO4 | 2 | 7 | 20 |  |  |  | 29 |
| CO5 | 23 | 5 |  |  |  |  | 28 |
| CO6 | 4 | 12 |  |  |  |  | 16 |
|  | | | | | | | 124 |

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| **Course Code** | **18CS2008** | **Duration** | **3hrs** |
| **Course Name** | **DATABASE MANAGEMENT SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | What do you mean by Database? | | | | CO1 | U | | 1 |
| 2. | List the basic constraints that can be specified when a database table is created. | | | | CO1 | R | | 1 |
| 3. | Define Materialized views. | | | | CO2 | R | | 1 |
| 4. | Which key corresponds to the minimal set of attributes that uniquely identifies any row of a table. | | | | CO2 | R | | 1 |
| 5. | Define the number of entity sets participating in a relationship set. | | | | CO3 | U | | 1 |
| 6. | What kind of participation does the double solid line represent in the given diagram?  https://lh5.googleusercontent.com/JrDRRJWMvxJUThXcmyeTvlIYml9i8od9FapFbW9mTyYN-wLJY35wlKxgEiitcqGwrUl1dXBg2UxF5CJzIqdxVuSyWbsNiDxwoUPWfEW_a6-ayaOMBhE_ELCNIyD5wOlnoBNy80mYuDTxChcRE-NLmbcUzwkEWgTChsMM_nZuBBPxZCUtTeQ-1-KV9AoV | | | | CO3 | R | | 1 |
| 7. | Which term is used to denote a unit of storage that can store one or more records? | | | | CO4 | U | | 1 |
| 8. | Which mechanism allocates next free bucket when a data is already stored in generated address? | | | | CO4 | R | | 1 |
| 9. | Which is also Known as ‘All or Nothing Rule’? | | | | CO5 | U | | 1 |
| 10. | In which type of access control, the model of access control is determined by the owner of the resource? | | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Explain Object based and Semi structured database with example. | | | | CO1 | | An | 3 |
| 12. | Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.(Note: Create your own employee table). | | | | CO2 | | U | 3 |
| 13. | Explain Weak entity with example. | | | | CO3 | | An | 3 |
| 14. | Define B+ Tree Index Files with example. | | | | CO4 | | U | 3 |
| 15. | Explain Concurrent Execution with example. | | | | CO5 | | An | 3 |
| 16. | Write about Role based access control. | | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | | |
| 17. | |  | | Illustrate the core architecture of database system with suitable diagram. | CO1 | | R | 12 |
| 18. | |  | | Consider the following database and answer the following: Employee(Employee\_id,Employee\_Name,Department\_Id,Date\_of\_joining, Salary)  Department(Department\_Id,Department\_name,Head\_of\_Department)   * + 1. Write a query to display the name of the employee who has got lowest salary.     2. Find all employees who earns more than the average salary in their department using correlated subquery.     3. Write a query to display the Employee\_Name, Department\_Name and the Head of the Department.     4. Write a query to display the name of the employees who joined after '01-AUG-22'.     5. Write a query to display the name of the employee which starts with 'S'. | CO2 | | C | 12 |
|  | |  | |  |  | |  |  |
| 19. | |  | | Define normalization and denormalization. What is the significance of normalization of database? What are the different normal forms? Which normal form is considered adequate for normal relational database design? Explain the 1NF, 2NF and 3 NF with proper examples. | CO3 | | A | 12 |
|  | |  | |  |  | |  |  |
| 20. | | a. | | Illustrate the various method of file organization with suitable example. | CO4 | | R | 8 |
|  | | b. | | List out the difference between static hashing and dynamic hashing. | C04 | | R | 4 |
|  | |  | |  |  | |  |  |
| 21. | | a. | | Create a trigger that prints ''salary updated" whenever there is a modification in salary column of the employees table. | CO5 | | An | 6 |
|  | | b. | | Create a trigger that prints ''salary incremented' whenever there is an increase in salary and  "salary decremented” whenever there is decrease in salary of employees table. | CO5 | | An | 6 |
|  | |  | |  |  | |  |  |
| 22. | |  | | Construct clear and concise ER model for University Database   * Draw an E-R diagram for University Database. * Identity the Primary key for each entity * Identify the relation between entities * Identify the composite, multi-valued attributes and derived   Attributes | CO3 | | C | 12 |
|  | |  | |  |  | |  |  |
| 23. | |  | | Consider set F of functional dependencies:  F={  A → B  AB→C  D→ AC  D →E  }  Find out the canonical cover (Fc) for the given set of functional dependency F. | CO3 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | |  | Write about Object oriented database, object relational databases, Logical databases, Web databases and Distributed databases. | | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the role of database administrator and database management systems in software  applications and other advanced concepts. |
| CO2 | Use query language to retrieve data efficiently from the database. |
| CO3 | Design the database for given specification of the requirement design the databases using ER  method and normalization. |
| CO4 | Design and implement significant database objects such as file structures and index schemes |
| CO5 | Describe techniques for transaction processing and concurrency control. |
| CO6 | Implement security in database. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 1 |  | 3 |  |  | 17 |
| CO2 | 2 | 3 |  |  |  | 12 | 17 |
| CO3 | 1 | 1 | 12 | 3 | 12 | 12 | 41 |
| CO4 | 13 | 4 |  |  |  |  | 17 |
| CO5 |  | 1 |  | 15 |  |  | 16 |
| CO6 | 12 | 4 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2013** | **Duration** | **3hrs** |
| **Course Name** | **MACHINE LEARNING TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the commonly used feature transformation methods. | | | CO1 | R | 1 |
| 2. | Suggest a suitable classification algorithm to identify whether the cyclone is high or low. | | | CO1 | U | 1 |
| 3. | Mention the purpose of AUC and ROC. | | | CO2 | U | 1 |
| 4. | Highlight the significance of support vectors. | | | CO3 | U | 1 |
| 5. | Name the distance-based classification and clustering algorithms. | | | CO2 | R | 1 |
| 6. | Compute the Euclidean distance between the two data point A1(8, 4) and A2(5, 8). | | | CO3 | An | 1 |
| 7. | In the given SOM architecture, if the output of nodes Y1 = 3, Yi = 5, Ym = 5 during the training period, which output node is the winner? | | | CO4 | A | 1 |
| 8. | Identify the meaning of 'K' in K-means clustering algorithm. | | | CO4 | U | 1 |
| 9 | Why do we use weak learners in ensemble model? | | | CO6 | An | 1 |
| 10. | Relate the given diagram to the reinforcement learning mechanism. What does “a couple of steps” represent? | | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11 | Distinguish supervised and unsupervised machine learning techniques and provide corresponding algorithms. | | | CO1 | U | 3 |
| 12. | Define generalization. Compare underfitting and overfitting issues. | | | CO2 | U | 3 |
| 13. | Calculate all the statistical measures of dispersion for the following dataset  4 11 8 1 7 19 5 12 10 | | | CO3 | A | 3 |
| 14. | Describe the various linkage functions used in Hierarchical clustering algorithms. | | | CO4 | U | 3 |
| 15. | Consider the following frequent 3-itemset, {Humidity = Normal, Windy = False, Play = Yes}. Write down the potential association rules that can be generated from this set. | | | CO5 | An | 3 |
| 16. | List the popular methods used for constructing ensembles. | | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | |  | Models form the central concept in machine learning as they are what is being learned from the data, in order to solve a given task; in this scenario demonstrate the Geometric and Logical models with suitable examples. | CO1 | U | 12 |
|  | |  |  |  |  |  |
| 18. | | a. | Illustrate the importance of the confusion matrix in measuring the performance of a classification model. Calculate precision, recall, f1-score, accuracy for the given confusion matrix. | CO2 | An | 6 |
| 18. | | b. | Differentiate simple linear and multiple linear regression techniques. Elucidate the concept of simple linear regression with an example. | CO3 | A | 6 |
|  | |  |  |  |  |  |
| 19. | | a. | Explain the working principle of a perceptron in neural networks with an illustration of weight updation. | CO3 | A | 6 |
|  | | b. | Define SVM. Explain linear and non-linear SVM. | CO4 | U | 6 |
| 20. | |  | Construct a dendrogram for the below-given distance matrix using single linkage clustering approaches. | CO4 | E | 12 |
|  | |  |  |  |  |  |
| 21. | | a. | Identify association rules for the following dataset using the Apriori algorithm for the support and confidence measure of 50% each. | CO3 | An | 6 |
|  | | b. | Consider a database of four transactions. The minimum support is 60% and the minimum confidence is 80%. List the 2-itemsets that satisfies the given support and confidence. | CO3 | An | 6 |
|  | |  |  |  |  |  |
| 22. | |  | Formulate the outcome when the {outlook -Sunny, Temperature-Cool, Humidity- Normal and Wind = false} using Bayes theorem by applying Naive Bayes classifier to the following dataset. | CO4 | C | 12 |
|  | |  |  |  |  |  |
| 23. | | a. | Explain the steps of Linear Vector Quantization (LVQ) algorithm. | CO5 | U | 6 |
|  | | b. | Calculate the covariance between the two variables X and Y of the following sample dataset of an IT company.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | X | 4 | 8 | 13 | 7 | | Y | 11 | 4 | 5 | 14 | | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | |  | Distinguish Random Forest and AdaBoost ensemble methods. Explain the steps of the Adaboost algorithm. | CO6 | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the concepts, mathematical background, applicability, limitations of existing machine learning techniques. |
| CO2 | Identify the performance evaluation criteria of the model developed. |
| CO3 | Analyze and design various machine learning based applications with a modern outlook focusing on recent advances. |
| CO4 | Build the learning model for a given task. |
| CO5 | Apply some state-of-the-art development frameworks and software libraries for implementation. |
| CO6 | Evaluate the performance of machine learning algorithms using suitable metrics. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 | - | - | - | - | 17 |
| CO2 | 1 | 4 | - | 6 | - | - | 11 |
| CO3 | - | 1 | 15 | 13 | - | - | 29 |
| CO4 | - | 10 | 1 | - | 12 | 12 | 35 |
| CO5 | - | 7 | 6 | 3 | - | - | 16 |
| CO6 | - | 15 | - | 1 |  | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2014** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Give the syntax of inline function. | | CO1 | U | | 1 |
| 2. | Write down the methods to pass the arguments to the functions. | | CO1 | R | | 1 |
| 3. | Mention the principles of object oriented programming. | | CO1 | R | | 1 |
| 4. | Write down the syntax to create an object in JAVA. | | CO2 | R | | 1 |
| 5. | Mention the use of garbage collection in JAVA. | | CO2 | R | | 1 |
| 6. | List the access specifiers available in JAVA. | | CO3 | R | | 1 |
| 7. | Define abstract class. | | CO3 | U | | 1 |
| 8. | The classes that directly inherit the throwable class except Runtime exception and Error are known as \_\_\_\_\_\_\_\_\_\_\_ exceptions. | | CO4 | R | | 1 |
| 9. | State different ways of creating threads. | | CO5 | U | | 1 |
| 10. | The \_\_\_\_\_\_\_\_\_\_ pattern is also known as Cursor. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the control statements available in C++ with syntax. | | CO1 | | U | 3 |
| 12. | With neat diagram, write short notes on JVM, JDK and JRE. | | CO2 | | U | 3 |
| 13. | Explain the concept of dynamic method dispatch. | | CO3 | | U | 3 |
| 14. | With example, explain user defined exception. | | CO4 | | U | 3 |
| 15. | Write down the procedure to create a generic method. | | CO5 | | U | 3 |
| 16. | Describe the various phases software development process. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the following operators with sample C++ code,   1. Relational operators 2. Logical operators 3. Arithmetic assignment operators. | CO1 | | A | 9 |
|  | b. | Write a C++ program which reads three numbers and display the largest number. | CO1 | | A | 3 |
|  |  |  |  | |  |  |
| 18. | a. | Write down the JAVA program to   1. Create a class containing only data members. 2. Modify the class so that it now contain some methods that operate on these data members 3. Add methods to read values and display values. 4. Declare objects of this class type to perform operations. | CO2 | | U | 8 |
|  | b. | List down the string handling functions available in JAVA. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 19. | a. | Write a JAVA program to find the average of 3 numbers and 2 numbers using method overloading. | CO3 | | U | 6 |
|  | b. | Explain the concept of interface and implement with an example. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. |  | Explain about the following concept using sample JAVA code,   1. Throws and throw 2. Boxing and Unboxing 3. Lambda expressions | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Develop a multithreaded Java program to create two threads. One thread must display odd numbers between 1 and 100 and another thread must display even numbers between 1 and 100. | CO4 | | A | 8 |
|  | b. | Write short notes on states of thread. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 22. |  | Explain about reading console input and writing console output using JAVA stream class. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Write a JAVA program for the following,  a. Create a folder b. Create a file c. File reading  d. File writing | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Outline the use of setSize(), getSize( ), setVisible() and setTitle() methods when working with frame windows with their signature. | CO6 | | U | 8 |
|  | b. | Write short notes on GUI in JAVA. | CO6 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the object-oriented programming concepts. |
| CO2 | Select the relevant object-oriented concepts to implement a real time application with design patterns. |
| CO3 | Demonstrate the application of polymorphism in various ways. |
| CO4 | Illustrate the use of inheritance, exceptions, generics and collection. |
| CO5 | Develop applications with event-driven graphical user interface and file management. |
| CO6 | Describe software development process. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 4 | 12 |  |  |  | 18 |
| CO2 | 2 | 15 |  |  |  |  | 17 |
| CO3 | 1 | 16 |  |  |  |  | 17 |
| CO4 | 1 | 19 | 8 |  |  |  | 28 |
| CO5 |  | 16 | 12 |  |  |  | 28 |
| CO6 |  | 16 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2019** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEM SOFTWARE AND COMPILER DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Differentiate system software from application software. | | CO1 | U | 1 |
| 2. | Identify the addressing used in instruction LDA #3. | | CO1 | R | 1 |
| 3. | State the three types of codes generated by the compiler. | | CO2 | R | 1 |
| 4. | Mention the two major tasks performed by the compiler. | | CO2 | R | 1 |
| 5. | List the possible conflicts occur during shift-reduce parsing | | CO3 | U | 1 |
| 6. | Identify the type of conflict that occurs if an itemset contains the following items | | CO3 | U | 1 |
| 7. | What is the restriction in L-Attributed SDD? | | CO4 | U | 1 |
| 8. | When can a syntax directed definition be said to be an S-attributed definition? | | CO4 | R | 1 |
| 9. | Construct DAG for the expression c+d+(c+d) | | CO5 | A | 1 |
| 10. | Define constant folding. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List the additional functions of linkage editor. | | CO1 | R | 3 |
| 12. | Differentiate syntax analysis and semantic analysis. | | CO2 | U | 3 |
| 13. | Find the “FOLLOW” of ‘A’ and ‘B’ for the following grammar  S🡪aABe  A🡪Abc  A🡪b  B🡪d | | CO3 | A | 3 |
| 14. | Write a brief note on lifetime of an activation of a procedure | | CO4 | U | 3 |
| 15. | Draw the dependency graph for the declaration statements. | | CO5 | R | 3 |
| 16. | Paraphrase dead code elimination in basic-block optimization. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Illustrate the working principle of absolute loader with the given object program.  H^COPY^001000^000012  T^ 001000^ 12^141033^ 482039^ 001036^ 281030^ 301015^ 482061  E^ 001000  How this program would be loaded in memory? | CO1 | A | 6 |
|  | b. | Illustrate the working concept of pass macro processor with algorithms and suitable example. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Describe the various phases of a compiler in detail. Trace the output of each phase for the program segment a: = b + c \*60 where c is real data type. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Construct SLR parsing Table for the grammar and parse “011”.  S ->FF  F -> 0F | 1 | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Discuss in detail the S-attributed and L-attributed definition. | CO4 | U | 6 |
|  | b. | Recall type checking. Elucidate on type systems. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 21. |  | Convert a= a\*(b\*-c)+(b\*-c)/d into three address code, quadruples, triples, indirect triples, syntax tree and DAG. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Mention the various loader design options. Illustrate in detail about linkage editors and dynamic linking | CO1 | U | 6 |
|  | b. | Define system software. List the functions of system software. Mention the types of system software with a brief note on each type. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 23. | a. | Write a YACC program for performing the basic arithmetic operations on any given numbers. | CO3 | A | 6 |
|  | b. | Write a Lex Program to count all the even numbers. | CO2 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss on Storage Organization Strategies in detail. | CO6 | U | 6 |
|  | b. | Explain peephole optimization with proper examples. | CO6 | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | explain algorithm and data structures for assembler |
| CO2 | develop algorithms for macros and loaders |
| CO3 | list and define various stages of compiler. |
| CO4 | select and use standard tools and techniques in different stages of compiler design |
| CO5 | compare and contrast various methods for implementing the phases of a compiler |
| CO6 | design and construct different phases of the compiler |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 13 | 6 | - | - | - | 29 |
| CO2 | 2 | 3 | 18 | - | - | - | 23 |
| CO3 | 2 | 21 | - | - | - | - | 23 |
| CO4 | 7 | 10 | - | - | - | - | 17 |
| CO5 | 3 | - | 13 | - | - | - | 16 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2022** | **Duration** | **3hrs** |
| **Course Name** | **WEB TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | | **Bloom’s Level** | | | **Marks** | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | | |
| 1. | Define the HTML snippet to embed an image in the center of the webpage without using CSS. | | CO1 | | R | | | 1 | |
| 2. | List out at least two inline-level elements in HTML. | | CO1 | | R | | | 1 | |
| 3. | Name the CSS property that is used to remove the underline from an anchor tag. | | CO6 | | R | | | 1 | |
| 4. | Recognize the CSS selector that selects the HTML element by .(dot) symbol. | | CO6 | | R | | | 1 | |
| 5. | Define the HTML syntax used to attach the external JavaScript file in an HTML document. | | CO2 | | R | | | 1 | |
| 6. | Find the JavaScript function used to expire a function after a specific time. | | CO3 | | R | | | 1 | |
| 7. | Define the syntax to perform the page redirection in PHP. | | CO3 | | R | | | 1 | |
| 8. | Differentiate PHP sessions and cookies. | | CO3 | | U | | | 1 | |
| 9. | Describe the PHP code to create an associative array. | | CO3 | | R | | | 1 | |
| 10. | Mention the web technology used to achieve asynchronous server-side interaction. | | CO2 | | R | | | 1 | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | | |
| 11. | List any three multimedia elements in HTML with their syntax. | | CO1 | | | | U | 3 | |
| 12. | Discuss absolute and relative positioning in CSS with example code. | | CO2 | | | | Ap | 3 | |
| 13. | Write an HTML program with JavaScript code to display a popup message box when the page loads. | | CO3 | | | | U | 3 | |
| 14. | An employee class comprises data members such as empid and name. Initialize the data members through the constructor. Use a member function display() to display the details of the employee Write PHP code to create the object and print the details. | | CO3 | | | | Ap | 3 | |
| 15. | Illustrate the structure of the angular js module and controller code in  HTML. | | CO4 | | | | U | 3 | |
| 16. | Describe the HTML code with the necessary bootstrap class to display the following images. | | CO5 | | | | U | 3 | |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | | | |
| 17. | a. | Design the following table layout using the HTML5 table tags and populate the rows to display the results of 3 students. Every student is registered with 3 subjects.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Student details** | | | | | | | **Sl.No** | **Personal details** | | **Subject details** | | | | **Reg.No** | **Name** | **Code** | **Name** | **Grade** | | 1 | CS1001 | Johny | 18CS1001 | Web Design | S | | 18CS1002 | Java | S | | 18CS1003 | C++ | O | | | CO1 | | Ap | | | 6 |
|  | b. | Elucidate the various types of List elements in HTML5. | | CO1 | | U | | | 6 |
|  |  |  | |  | |  | | |  |
| 18. |  | Explain any 6 CSS Selectors with suitable program illustrations. | | CO6 | | Ap | | | 12 |
|  |  |  | |  | |  | | |  |
| 19. |  | Develop an HTML program with JavaScript code to perform the Electricity Bill (EB) calculation as given below   * Get user details including name, previous unit and current unit through input fields. * Calculate the consumed units and perform EB calculation with the following constraints       0-100 units = Free     101-400 units = Rs. 4.50 per unit     401- 500 units = Rs. 6 per unit     501 and above units= Rs. 8 per unit   * Display the customer name, total units consumed and bill amount using the DIV element | | CO3 | | Ap | | | 12 |
|  |  |  | |  | |  | | |  |
| 20. |  | Explain the selection and looping statements in JavaScript with suitable examples. | | CO3 | | U | | | 12 |
|  |  |  | |  | |  | | |  |
| 21. |  | Consider the following table ‘CSE’ in a database called “KITS”.   |  |  |  | | --- | --- | --- | | **Regno** | **Name** | **Batch** | | URK19CS1001 | Student1 | 5 |   Apply HTML and PHP technologies to perform the following operations.   1. Add new student in to the table CSE. 2. View the content of the table CSE. 3. Update a batch detail of a student. 4. Delete a student from the table. | | CO3 | | Ap | | | 12 |
|  |  |  | |  | |  | | |  |
| 22. |  | Design an online registration form using HTML as given below with the necessary attributes to make all fields mandatory. | | CO1 | | Ap | | | 12 |
|  |  |  | |  | |  | | |  |
| 23. |  | Apply the AJAX technology to check if a username already exists in the database. | | CO2 | | Ap | | | 12 |
| **COMPULSORY QUESTION** | | | | | | | | | |
| 24. |  | Construct an HTML program with AngularJS actions to calculate and display the BMI value and Status for the given weight and height.  BMI = weight(kg)/[height(m)]2  Check the status using the following conditions.  • Underweight: BMI < 18  • Normal: BMI between 18 – 25  • Overweight: BMI between 25 – 30  • Obese: BM > 30 | | CO6 | | Ap | | | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the relevant properties and methods which facilitate dynamic application development. |
| CO2 | Explain the development of fully functional web applications that incorporates planning, designing, coding, testing, and publishing to a web server. |
| CO3 | Apply the latest client and server-side technologies for creating interactive data-driven websites. |
| CO4 | Model dynamic web applications using suitable latest server-side technologies integrated with the database. |
| CO5 | Formulate and build extensible web applications using the Model View Controller design pattern. |
| CO6 | Select appropriate design standards for designing attractive web pages. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 9 | 18 | - | - | - | 29 |
| CO2 | 2 | 3 | 15 | - | - | - | 20 |
| CO3 | 3 | 13 | 27 | - | - | - | 43 |
| CO4 | - | 3 | - | - | - | - | 3 |
| CO5 | - | 3 | - | - | - | - | 3 |
| CO6 | 2 | - | 24 | - | - | - | 26 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2025** | **Duration** | **3hrs** |
| **Course Name** | **BIG DATA PLATFORMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the computing technique that works together with management and parallel processing principle, allows to acquire and analyze intelligence from Big Data making Big Data Analytics a reality. | | CO1 | R | | 1 |
| 2. | Identify the type of data that is generated from all the daily transactions that take place both online and offline. | | CO1 | U | | 1 |
| 3. | List the two decimal types of data supported by Hive. | | CO2 | R | | 1 |
| 4. | Name the Hive service that acts as a shell where we can execute Hive queries and commands. | | CO2 | R | | 1 |
| 5. | Recall the programming model that is a combination of map() and reduce() functions used in the Lisp(LiSt Processing) programming language. | | CO3 | R | | 1 |
| 6. | State whether the given statement is True/False?  Combiners do the rearrangement of the key and values whereas partitioner partitions the values on the basis of keys. | | CO3 | R | | 1 |
| 7. | State the acronym for YARN. | | CO4 | R | | 1 |
| 8. | Identify the high-level data flow platform for executing Map Reduce programs of Hadoop. | | CO4 | U | | 1 |
| 9. | Recall the umbrella term used to describe any alternative system to traditional SQL databases. | | CO5 | R | | 1 |
| 10. | State the command-line interface application used in MongoDB for transferring data between relational databases and Hadoop. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Define Big Data Analytics and explain with an example. | | CO1 | | R | 3 |
| 12. | Discuss the features of Hadoop Distributed File System. | | CO2 | | U | 3 |
| 13. | Recall some of the aggregate functions used in Hive. | | CO3 | | R | 3 |
| 14. | List the features of Oozie SLA. | | CO4 | | R | 3 |
| 15. | Discuss in detail about Flume and Sqoop in MongoDB. | | CO5 | | U | 3 |
| 16. | Write a short note on data visualization with Tableau. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe in detail the different sources of big data and its applications. | CO1 | | U | 6 |
|  | b. | Discuss the following:   1. Evolution and History of Big Data. 2. Characteristics of Big Data. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Describe in detail the HBase and its architecture. | CO2 | | U | 6 |
|  | b. | List the key features of Pig. | CO2 | | R | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Discuss in detail the analysis of big data and data warehouse. | CO3 | | U | 6 |
|  | b. | Illustrate the different types of Map Reduce input formats with an example. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Discuss in detail the different types of schedulers in YARN. | CO4 | | U | 6 |
|  | b. | List out some of the Built-in Functions used in Hive. | CO4 | | R | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Discuss the following with an example:   1. Document database. 2. Key-value database. 3. Column-Oriented database. 4. Graph database. | CO5 | | U | 6 |
|  | b. | Describe in detail the clustering and classification in Hadoop. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Illustrate the working flow of Map Reduce with a suitable diagram. | CO3 | | U | 6 |
|  | b. | Describe in detail on controlling Map Reduce execution with Input Format class. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Write a short note on different DDL commands used in Hive. | CO4 | | A | 6 |
|  | b. | Discuss in detail the different platforms on which YARN containers gets executed. | CO4 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain in detail the different categorizations of social media platforms. | CO6 | | U | 6 |
|  | b. | List some of the important features of Tableau Software. | CO6 | | R | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the big data concepts, data analytics life cycle and applications. |
| CO2 | Illustrate the different eco system components of Hadoop. |
| CO3 | Develop MapReduce programs for real world problems. |
| CO4 | Justify the need of YARN Hadoop2 framework for big data analytics. |
| CO5 | Classify various NoSQL databases. |
| CO6 | Use big data analytics and data visualization techniques to analyze data and to provide business insights. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 13 | - | - | - | - | 17 |
| CO2 | 8 | 9 | - | - | - | - | 17 |
| CO3 | 5 | 24 | - | - | - | - | 29 |
| CO4 | 10 | 13 | 6 | - | - | - | 29 |
| CO5 | 1 | 15 | - | - | - | - | 16 |
| CO6 | 7 | 6 | 3 | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **18CS2057** | **Duration** | **3hrs** |
| **Course Name** | **MOBILE APPLICATION DEVELOPMENT USING ANDROID** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the class that provides information about the telephony services such as subscriber id, sim serial number, phone network type. | | CO1 | R | | 1 |
| 2. | What are the hardware-based sensors available in android? | | CO1 | R | | 1 |
| 3. | List the two ways of registering the Broadcast Receiver. | | CO2 | R | | 1 |
| 4. | Identify the appropriate components:  public class MyBroadcast Receiver extends\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_{         @Override         public void\_\_\_\_\_\_\_\_\_(Context context, Intent intent){  //code         }     } | | CO2 | R | | 1 |
| 5. | Identify the type of the layout:  Android Linear Layout Example | Java Tutorial Network | | CO3 | U | | 1 |
| 6. | Mention the function used to handle the button event in android. | | CO3 | R | | 1 |
| 7. | Write a simple syntax to send e-mail using intent with ACTION\_SEND action. | | CO5 | U | | 1 |
| 8. | What is Toast in Android? | | CO4 | R | | 1 |
| 9. | List two ways to get a user location from your android application. | | CO6 | R | | 1 |
| 10. | Mention the two major tasks that you need to perform when you publish your application. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Illustrate the general steps required for creating a custom camera interface for your application. | | CO1 | | U | 3 |
| 12. | Design a simple application to notify Battery low. | | CO2 | | R | 3 |
| 13. | Explain SMS Manager class. | | CO3 | | R | 3 |
| 14. | Describe the code for passing and retrieving data using Intent in an android application. | | CO4 | | U | 3 |
| 15. | Write the code snippet to design option menu. | | CO5 | | U | 3 |
| 16. | Mention the callback methods and its purpose of the Location Manager class. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Discuss the lifecycle of android activity with suitable code. | CO1 | | U | 6 |
|  | b. | Explain the layered architecture of android system with necessary diagram. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Create an android application to download file using Asyn Task. | CO2 | | A | 6 |
|  | b. | Discuss the callback methods associated with the started services. | CO2 | | U | 6 |
|  |  |  |  | |  |  |
| 19. |  | Develop an android application which can display a dialog box containing a progress bar showing the status of downloading a mp3 file. The duration of the file download is 1min 20 secs. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | How do you create P2P connections using Wi-Fi direct? Explain with suitable code snippet. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Create an android application for the following:  The Beginner's Guide to Notifications in Android N | CO5 | | A | 6 |
|  | b. | Write the code to pick your date of birth from the calendar. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 22. |  | Demonstrate scanning, pairing and connecting with devices within 30 feet with suitable android application. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Describe fragment lifecycle with necessary code snippet. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Develop the following Entertainment application with the layouts as shown in the figure and illustrate how to deploy as .apk file.  reactjs - How to create an Android swipe view using React Native? - Stack  Overflow | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify a significant programming component, involving the sensors and hardware features of mobile device. |
| CO2 | Use the power of background tasks. |
| CO3 | Model mobile applications with appropriate, layouts and user interface. |
| CO4 | Demonstrate applications with network connectivity, messaging and persistent storage. |
| CO5 | Design and develop android applications for real time problems. |
| CO6 | Build, sign and publish mobile application. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | 12 |  |  |  | 29 |
| CO2 | 5 | 4 | 8 |  |  |  | 17 |
| CO3 | 4 | 7 | 12 |  |  |  | 23 |
| CO4 | 1 | 15 |  |  |  |  | 16 |
| CO5 |  | 16 | 6 |  |  |  | 22 |
| CO6 | 5 |  | 12 |  |  |  | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2068** | **Duration** | **3hrs** |
| **Course Name** | **PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Predict the output of the following code:  String1 = "HaiForHello"  print(String1[0]) | | CO1 | U | 1 |
| 2. | Give the index operator used to access an item in a tuple. | | CO1 | U | 1 |
| 3. | For the string a=“hai”, give the output for the expression a\*2. | | CO2 | U | 1 |
| 4. | Write Python code to create a list using different values. | | CO2 | A | 1 |
| 5. | State the method used for object initialization. | | CO3 | R | 1 |
| 6. | List the types of name spaces. | | CO3 | R | 1 |
| 7. | Describe the different image file formats. | | CO4 | R | 1 |
| 8. | State the method used to make the turtle arrow head invisible. | | CO4 | R | 1 |
| 9. | Give the method used to provide the single-line text-box to the user. | | CO5 | R | 1 |
| 10. | Give the method that allows the main thread to wait for new threads. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write a Python program to demonstrate the access of elements in a set. | | CO1 | A | 3 |
| 12. | Write a Python program to access values in a list. | | CO2 | A | 3 |
| 13. | Define Method Overriding. | | CO3 | R | 3 |
| 14. | Discuss the use of the method convert(‘LA’). | | CO4 | U | 3 |
| 15. | State the use of sticky attribute. | | CO5 | R | 3 |
| 16. | Write a Python program to create a thread. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Describe in detail the various control structures that allow the execution of complicated paths with suitable examples. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. | a. | Write a Python program to find the factorial of a number using a loop. | CO2 | A | 6 |
|  | b. | Write a python program for the multiplication table (from 1 to 10). | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Illustrate the design using recursive functions with a suitable program. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Develop a python program to draw the circle using Turtle:  a. using for loop b. using RGB values  c. fill the shape using red color. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Develop a GUI application based on a Python program for the triangle area calculator as shown below: | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Develop a Python program to implement inter-thread communication. | CO6 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Write a python program that implements the following image  processing operations:   1. Crop an image. 2. Transpose and image from left to right. 3. Transpose and image from upside down. 4. Resizing the image. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Write a Python program to implement a TCP socket program for sending data from server to client. | CO6 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand and apply the basic programming constructs of Python suitably. |
| CO2 | Infer the concepts of string processing, file I/O, lists and dictionary. |
| CO3 | Apply modules for reusability and the object-oriented principles for modelling and developing software system. |
| CO4 | Make use of graphics for processing images. |
| CO5 | Construct applications with graphical user interface. |
| CO6 | Develop software solutions using multi-threading, networking and client-server concepts. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 12 | 2 | 3 |  |  |  | 17 |
| CO2 |  | 1 | 16 |  |  |  | 17 |
| CO3 | 5 | 12 |  |  |  |  | 17 |
| CO4 | 2 | 3 | 24 |  |  |  | 29 |
| CO5 | 4 |  | 12 |  |  |  | 16 |
| CO6 | 1 |  | 27 |  |  |  | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2072** | **Duration** | **3hrs** |
| **Course Name** | **SOCIAL NETWORK ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Sketch actors in a network node. | | | CO1 | A | | 1 |
| 2. | Examine any two dyadic phenomena that is commonly used. | | | CO1 | R | | 1 |
| 3. | Discuss snow ball sampling. | | | CO2 | U | | 1 |
| 4. | List the tool used to simulate the networking nodes in Social Network. | | | CO2 | R | | 1 |
| 5. | State the term homophily. | | | CO3 | R | | 1 |
| 6. | Examine the purpose of Multidimensional Scaling. | | | CO4 | R | | 1 |
| 7. | Calculate the sum of differences from the given star graph. | | | CO4 | A | | 1 |
| 8. | Define affiliation network. | | | CO5 | R | | 1 |
| 9. | Discuss the scenario of faction in Social Networks. | | | CO5 | U | | 1 |
| 10. | Write the formula to find network density. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | List the characteristics of hypothesis. | | | CO1 | | R | 3 |
| 12. | Discuss Random Sampling. | | | CO2 | | U | 3 |
| 13. | Describe cleaning network data. | | | CO3 | | R | 3 |
| 14. | State how you would generalize “ego networks”. | | | CO4 | | R | 3 |
| 15. | Recall the value for in degree of vertex 0,1,2,3 from the given architecture diagram. | | | CO5 | | R | 3 |
| 16. | Analyze the concept of combinatorial optimization. | | | CO4 | | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain Dyad and Node in Social Networks. | CO1 | | U | 4 |
|  | | b. | Classify Linear Regression and Logistic Regression. Demonstrate which model can solve a multi-class classification problem. | CO1 | | U | 8 |
|  | |  |  |  | |  |  |
| 18. | | a. | Illustrate different components in a network with its types. | CO1 | | U | 7 |
|  | | b. | Explain ways and modes in a network. | CO2 | | U | 5 |
|  | |  |  |  | |  |  |
| 19. | |  | Describe Archival Data collection. Show how you will retrieve data from electronic sources. | CO2 | | R | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Explain ideas to validate different Affiliation network matrix and Co-Membership Matrix in Large Networks. | CO3 | | U | 8 |
|  | | b. | Classify different ways in permutation tests that can be used to test a variety of network hypotheses. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 21. | | a. | Discuss dyadic hypotheses with the relation based on equality. | CO4 | | U | 8 |
|  | | b. | Discuss different aspects of Exponential random graph models. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 22. | | a. | Explain Co-membership matrix and overlap matrix. | CO4 | | U | 8 |
|  | | b. | Discuss Bow-Tie Networks. | CO5 | | U | 4 |
|  | |  |  |  | |  |  |
| 23. | | a. | Explain Structural Equivalence and Auto morphic Equivalence in a Social Network. | CO5 | | U | 8 |
|  | | b. | Define cohesion. Lists the importance of cohesion related to the real time networks. | CO5 | | R | 4 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Explain Profile similarity with real time analysis of collecting data. | CO6 | | U | 4 |
|  | | b. | Describe Girvan-Newman algorithm with its different steps. | CO6 | | R | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the core concepts of social network analysis and the underlying mathematics. |
| CO2 | Summarize the research design methods and different options for collection and management of network data. |
| CO3 | Distinguish between the whole network and egocentric research designs. |
| CO4 | Apply suitable multivariate and statistical techniques for testing hypotheses with network data. |
| CO5 | Analyze the node’s position and structural similarities of network using suitable measures. |
| CO6 | Interpret various social networks using suitable tools. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 19 | 1 | - | - | - | 24 |
| CO2 | 13 | 9 | - | - | - | - | 22 |
| CO3 | 4 | 8 | - | - | - | - | 12 |
| CO4 | 4 | 24 | 1 | 3 | - | - | 32 |
| CO5 | 8 | 13 | - | - | - | - | 21 |
| CO6 | 8 | 4 | 1 | - | - | - | 13 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2080** | **Duration** | **3hrs** |
| **Course Name** | **VIRTUAL REALITY TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Differentiate passive auto-stereoscopic display and active auto-stereoscopic display. | | CO2 | U | | 1 |
| 2. | List the advantages of magnetic tracker device. | | CO1 | R | | 1 |
| 3. | Differentiate outside-looking in and inside-looking out optical tracker arrangement. | | CO2 | R | | 1 |
| 4. | Design the pictorial representation of virtual binoculars. | | CO2 | R | | 1 |
| 5. | Define VR engine. | | CO3 | R | | 1 |
| 6. | List the different types of modeling techniques. | | CO3 | U | | 1 |
| 7. | Point out the importance of using scene graph in processing 3D object. | | CO4 | An | | 1 |
| 8. | Formulate the syntax used to generate new sphere and new cone using world tool kit. | | CO5 | R | | 1 |
| 9. | List the technological growth in commercial VR technologies. | | CO6 | U | | 1 |
| 10. | Differentiate case study and control study. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare and contrast Augmented Reality(AR) with Virtual Reality(VR). | | CO1 | | U | 3 |
| 12. | Define graphics display device. | | CO2 | | R | 3 |
| 13. | Describe the type of modeling that focuses on the study of motion without regard to the force that cause it. | | CO3 | | An | 3 |
| 14. | Classify the different types of tool kits available to process the VR objects. | | CO4 | | U | 3 |
| 15. | Compare and contrast the performance of WTK and Java 3D. | | CO5 | | R | 3 |
| 16. | List the requirements to be satisfied for conducting safe VR training. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe the working principle of bird-of-flock optical tracker. | CO1 | | U | 8 |
|  | b. | Compare and contrast between AC and DC magnetic tracker. | CO1 | | U | 4 |
| 18. | a. | Explain the working methodology of the Head-Mounted Display (HMD) integration in a VR system. | CO2 | | U | 4 |
|  | b. | Discuss the working of pinch data glove. | CO2 | | U | 8 |
| 19. | a. | Define rendering. Summarize the functionalities of the various stages of the graphics rendering pipeline with neat diagram. | CO3 | | U | 6 |
|  | b. | Describe the various measures taken for the synchronization of displays when multiple displays are placed side-by-side. | CO3 | | U | 6 |
| 20. | a. | Summarize the functionalities of Java 3D for object creation and processing using scene graph. | CO4 | | U | 6 |
|  | b. | Explain the working architecture of the integration of GHOST pipeline | CO4 | | R | 6 |
| 21. | a. | Describe the importance of modeling the physical characteristics such as mass, roughness, intertia using examples. | CO3 | | U | 8 |
|  | b. | Explain the various stages of usability engineering methodology. | CO4 | | U | 4 |
| 22. |  | Explain how temperature feedback glove allows users to detect the thermal characteristics that can help identify an object material. | CO3 | | U | 12 |
| 23. | a. | Describe the importance of model management technique used in rendering complex virtual environments. | CO1 | | U | 8 |
|  | b. | Explain the various stages of usability engineering methodology. | CO1 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe the overview of VR applications in the field of education, medicine and science. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the virtual technology and usage of input devices. |
| CO2 | Identify the essential output devices, sound displays, graphics and feedback. |
| CO3 | Demonstrate workstation-based architecture for modelling. |
| CO4 | Analyze the programming tool kits in engineering the virtual reality methods. |
| CO5 | Relate the user performance and multimodality feedbacks. |
| CO6 | Understand the effect of virtual reality simulation on users. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 27 | - | - | - | - | 28 |
| CO2 | 5 | 13 | - | - | - | - | 18 |
| CO3 | 1 | 33 | - | 3 | - | - | 37 |
| CO4 | 6 | 13 | - | 1 | - | - | 20 |
| CO5 | 2 | - | - | 2 | - | - | 4 |
| CO6 | 1 | 16 | - | - | - | - | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18CS2087** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Predict the output of the following program:  a=10  b="Hi Python"  c = 10.5  print(type(a))  print(type(b))  print(type(c)) | | CO1 | U | | 1 |
| 2. | List the any four escape sequences in python. | | CO1 | R | | 1 |
| 3. | Recall the Syntax of Function definition. | | CO2 | R | | 1 |
| 4. | Define module. | | CO2 | R | | 1 |
| 5. | Predict the output of the following program:  str1 = 'hello Mech'  str2 = “how are you”  print (str1[0:2])  print (str1[4])  print (str1\*2)  print (str1 + str2) | | CO3 | U | | 1 |
| 6. | Recall the Syntax of String Split Methods. | | CO3 | R | | 1 |
| 7. | Identify the list method used for Removes the element at the specified value. | | CO4 | U | | 1 |
| 8. | Define Mutator Method. | | CO4 | R | | 1 |
| 9. | Identify the object-oriented programming concept which converts multiple forms or more than one form. | | CO5 | U | | 1 |
| 10. | Recognize the abbreviation for GUI. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Develop a python program for String Concatenation. | | CO1 | | A | 3 |
| 12. | Summarize *for* loop with an example. | | CO2 | | U | 3 |
| 13. | Prepare a python program for generating 500 random integers between 1 and 500that are written to a text file named integers.txt. | | CO3 | | A | 3 |
| 14. | Describe List Methods for inserting and removing elements in list. | | CO4 | | U | 3 |
| 15. | Write a Python program for any two Inheritance types with examples. | | CO5 | | A | 3 |
| 16. | Discuss about behavior of terminal based programs. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe Arithmetic Operators in detail with examples. | CO1 | | U | 6 |
|  | b. | Explain in detail about Numeric Data Types and String Literals. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Discuss the various ways of import module in python with examples. | CO2 | | U | 6 |
|  | b. | Develop a program to check if the number is prime or not using *for* loop. | CO2 | | A | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Describe the Data Encryption Standard. | CO3 | | U | 6 |
|  | b. | Discuss about various types of String Methods with examples. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Differentiate between List and Tuples. | CO4 | | U | 6 |
|  | b. | Explain the working principles of Dictionary with an example program. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Prepare a python program to generate reports of students with the following specifications. Create a class called Student with attributes regno, name, cgpa. Create two Student objects and display their reports. | CO5 | | A | 6 |
|  | b. | Write in detail about Structuring Classes with Polymorphism. | CO5 | | A | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Prepare a python function to find the Max of three numbers. | CO2 | | A | 6 |
|  | b. | Explain the role of function call and function definition with examples. | CO2 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Prepare a program to get a single string from two given strings, separated by a space and swap the first two characters of each string.  ***Input***  s1=”welcome”  s2=”good”  ***Expected Output***  “gelcome wood” | CO3 | | A | 6 |
|  | b. | Write a function in python that counts the number of “Me” or “My” (in smaller case also) words present in a text file “STORY.TXT”. If the “STORY.TXT” contents are as follows:  My first book was Me and My Family. It gave me chance to be Known to the world. | CO3 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Discuss about the following GUI Resources:  i. Accessing Database.  ii. Storing and Retrieving data. | CO6 | | U | 6 |
|  | b. | Explain in detail about GUI based ATM. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the data types, expressions and type conversions in Python. |
| CO2 | Use functions, control statements, strings, lists and dictionaries in python programming. |
| CO3 | Demonstrate the concept of object, class inheritance and polymorphism in Python. |
| CO4 | Write user defined functions, classes in python. |
| CO5 | Develop GUI based Python program and to read and write files using python programming. |
| CO6 | Create python program for real world applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 01 | 13 | 03 |  |  |  | 17 |
| CO2 | 02 | 21 | 12 |  |  |  | 35 |
| CO3 | 01 | 13 | 09 |  |  |  | 23 |
| CO4 | 01 | 16 |  |  |  |  | 17 |
| CO5 |  | 01 | 15 |  |  |  | 16 |
| CO6 | 01 | 15 |  |  |  |  | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **18CS3004** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED CRYPTOGRAPHY AND NETWORK SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss any four Substitution Techniques and list their merits and demerits. | CO1 | R | 10 |
|  | b. | Draw the general structure of DES and explain the encryption and decryption process. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the algorithm for generating keys in RSA algorithm. Perform encryption and decryption using RSA algorithm for the following. P=7; q=11; e=13; M=8. | CO2 | A | 10 |
|  | b. | Briefly explain the Diffie Hellman Key Exchange algorithm. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the process of creating a digital signature with an example. | CO3 | U | 10 |
|  | b. | Give the structure of HMAC. Explain the applications of HMAC. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain in detail about the x.509 certificate in detail. | CO4 | R | 10 |
|  | b. | Explain Kerberos authentication mechanism with a suitable diagram. | CO4 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the operations involved in pretty good privacy and explain it. | CO5 | U | 10 |
|  | b. | Explain in detail about the Transport Layer Security protocol stack. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Elaborate on the advanced encryption standard algorithm and explain its round functions. | CO1 | R | 12 |
|  | b. | Differentiate passive attacks and active attacks. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | List the categories of cloud Security as a Service and explain them with an example. | CO6 | R | 12 |
|  | b. | Differentiate Transport mode encryption and Tunnel mode Encryption. | CO6 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Draw the architecture of IP Security and explain the security policy database and security association database | CO5 | R | 10 |
|  | b. | Explain in detail about Elgamal Cryptosystem. | CO2 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain Intrusion Detection System with a suitable diagram. | CO6 | R | 10 |
|  | b. | List the types of firewalls and explain them. | CO6 | R | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of cryptography. |
| CO2 | Distinguish different kinds of attacks and design new security features. |
| CO3 | Apply key management using various symmetric and asymmetric key algorithms. |
| CO4 | Categorize cryptographic data integrity algorithms. |
| CO5 | Explain the different types of firewalls. |
| CO6 | Evaluate wireless network and cloud security. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 32 | 8 | - | - | - | - | 40 |
| CO2 | 10 | 10 | 10 | - | - | - | 30 |
| CO3 | 10 | 10 | - | - | - | - | 20 |
| CO4 | 20 | - | - | - | - | - | 20 |
| CO5 | 20 | 10 | - | - | - | - | 30 |
| CO6 | 32 | 8 | - | - | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **18CS3005** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED DATA STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Write the pseudo code to insert a node in a binary search tree. Construct a binary search tree by inserting the values 38, 13, 51, 10, 12, 40, 84, 25, 89, 37, 66 and 95. | CO1 | An | 8 |
|  | b. | List the keys in the following binary tree in in-order, pre-order, post-order and level order traversals. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. |  | Demonstrate how the following directed acyclic graph can be used to solve topological sorting. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 3. | a. | Consider the following directed weighted graph-.    Using Floyd Warshall Algorithm, find the shortest path distance between every pair of vertices | CO3 | A | 12 |
|  | b. | Articulate the terms Level, Sibling, Degree with respect to trees. | CO3 | R | 4 |
|  |  |  |  |  |  |
| 4. | a. | Given the jobs, their deadlines and associated profits as shown below   1. Write the optimal schedule that gives maximum profit. 2. Are all the jobs completed in the optimal schedule? 3. What is the maximum earned profit? | CO4 | U | 12 |
|  | b. | Explain the concept of a Huffman coding tree. | CO4 | R | 4 |
|  |  |  |  |  |  |
| 5. | a. | State AVL Tree Rotations and build the tree for the following sequence of numbers 50, 20, 60, 10, 8, 15, 32, 46, 11, 48.You are required to show every insertion and rotation performed during tree formation process. | CO5 | An | 10 |
|  | b. | Give an example of the adjacency matrix representation of the directed graph. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 6. |  | Explain, with an algorithm, how Depth First Traversal (DFS) and Breadth First Traversal (BFS) are performed on an undirected graph with the following example: | CO2 | R | 16 |
|  |  |  |  |  |  |
| 7. | a. | Find the optimal solution for the fractional knapsack problem making use of greedy approach. Consider- n = 5 and w = 60 kg. | CO4 | An | 10 |
|  | b. | Construct a B-tree of order 3 from the list of items: Z, Y, W, V, U, T, S, R, Q, P, O, N, M, L, K, J, I, H, G, F, E, D, C, B, A. | CO4 | A | 6 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Solve the sum of subset problems using backtracking algorithmic strategy for the following data: n = 4, W = (w1, w2, w3, w4) = (11, 13, 24, and 7) and M = 31. | CO6 | E | 12 |
|  | b. | Illustrate how to solve the N Queens problem using the backtracking method. | CO6 | R | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | Select an appropriate design technique for finding solution to a problem. |
| CO2 | Design algorithms using greedy and dynamic programming techniques. |
| CO3 | Propose solutions using backtracking and branch and bound technique |
| CO4 | Analyze the efficiency of various algorithms and express its complexity in asymptotic notation |
| CO5 | Solve problems using fundamental graph algorithms. |
| CO6 | Identify the problems belonging to the class of P, NP, NP-complete or NP-hard |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 8 | 8 |  |  | 16 |
| CO2 | 16 |  | 16 |  |  |  | 32 |
| CO3 | 4 |  | 12 |  |  |  | 16 |
| CO4 | 4 | 12 | 6 | 10 |  |  | 32 |
| CO5 | 6 |  |  | 10 |  |  | 16 |
| CO6 | 8 |  |  |  | 12 |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CS3007 / 14CS3005** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED DATABASE MANAGEMENT SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Illustrate indexed nested loops join and sort merge join. Assume that you need to join two relations R1 and R2 and the system catalog contains appropriate statistics about R1 and R2. Write the formulas for the cost estimates of the index nested loops join and sort merge loops join using the appropriate variables. For index nested loop join, consider both a B+ tree index and hash index. | CO1 | U | 8 |
|  | b. | List the transaction characteristics that a programmer can control in SQL. Discuss the different access modes and isolation levels in particular. What issues should be considered in selecting an access mode and an isolation level for a transaction? | CO1 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Assume that there are two transactions X1 and X2. Transaction X1 reads objects M and N and then writes object M. Transaction X2 reads objects M and N and then writes objects M and N   1. Give an example schedule with actions of transactions X1 and X2 on objects A and B that results in a read-write conflict. 2. Give an example schedule with actions of transactions X1 and X2 on objects A and B that results in a write-write conflict. 3. For the above two schedules, show that strict 2PL disallows the schedule. | CO2 | U | 8 |
|  | b | Consider the execution shown in the following figure.     1. Extend the figure to show preLSN and undonextLSN values 2. Describe the actions taken to rollback transaction T2 3. Show the log after T2 is rolled back. | CO2 | An | 8 |
|  |  |  |  |  |  |
| 3. | a. | Consider the following BCNF relational schema for a portion of a University schema  Prof(pid, office, age, gender, specialization, did)  Dept(did, dname, budget, no\_courses, head\_id)  The following are the most common queries in the workload for this University   * List all the department information for departments with professors in a user specified * List the lowest budget for a department in the university  1. Discuss on the indexes that should be built to speed up these queries 2. Decide which attribute should be indexed 3. Whether each index should be a clustered or unclustered index   Justify your decision. | CO3 | A | 8 |
|  | b. | Mention the various choices in tuning the conceptual schema. Explain with appropriate examples. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Discuss how each of the following operators can be parallelized using data partitioning.   * + - Scanning     - Sorting     - Join | CO4 | R | 8 |
|  | b. | State the difference between synchronous and asynchronous replication. Describe in detail about the voting and read-any-write-all approaches to synchronous replication. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | What is an R tree? What is the structure of data entries in R trees? How can we minimize the overlap between bounding boxes when splitting the nodes? | CO5 | U | 8 |
|  | b. | What data structures are maintained for grid file index? How do insertion and deletion in a grid file work? For what types of queries and data are grid files especially suitable and why? | CO5 | R | 8 |
|  |  |  |  |  |  |
| 6. |  | Elucidate the three-concurrency control mechanism without locking. | CO3 | R | 16 |
|  |  |  |  |  |  |
| 7. |  | Describe the three main architectures for parallel DBMSs. Explain why the shared-memory and shared-disk approaches suffer from interference. What can you say about the speed-up and scale-up of the shared nothing architecture? | CO4 | U | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | You are the DBA of a company and create a relation called “Customer” with fields Cname, CID, age, location, phone\_no and amount. For authorization reasons you also define two views CusNames (Cname)and OrderInfo(O\_id , item)   1. What privileges should be granted to a user who needs to know only average age of the customers who are from CBE and Chennai? 2. You want to give your secretary the authority to allow other people to read the CusNames view. Write the appropriate command. 3. Your secretary allows “John” to read the CusNames and later quits. You then revoke the secretary’s privileges. What happens to John’s privileges? | CO6 | A | 10 |
|  | b. | Discuss the Bell-Lapadula restrictions in terms of these concepts. Specifically define the simple security property and the \*- property.  What are objects, subjects, security classes and clearances in Mandatory access control? | CO6 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify alternative designs for implementation of database systems, including data models, file structures, index schemes, and query evaluation. |
| CO2 | Recognizes appropriate techniques for transaction processing, concurrency control, backup and recovery that maintain data integrity in database systems. |
| CO3 | Applies locks and isolation levels to the concurrent transactions. |
| CO4 | Analyzes the operation of parallel and distributed database. |
| CO5 | Design and implement significant database objects such as file structures and index schemes. |
| CO6 | Explains the concepts of information retrieval and spatial data management. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 8 | - | - | - | - | 16 |
| CO2 | - | 8 | 8 | - | - | - | 16 |
| CO3 | 16 | 8 | 8 | - | - | - | 32 |
| CO4 | 8 | 24 | - | - | - | - | 32 |
| CO5 | 8 | 8 | - | - | - | - | 16 |
| CO6 | - | - | 10 | 10 | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CS3009** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED MACHINE LEARNING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | What does Random refer to in Random Forest? Give some real time examples of how you would use a random forest model. | CO1 | U | 10 |
|  | b. | Differentiate between Bagging and Boosting in ensemble learning. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Consider the given data set and calculate the following   1. Entropy of the class variable 2. Average weighted entropy 3. Information gain   Also, apply Decision tree algorithm to predict the final decision on playing cricket.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Day** | **Outlook** | **Temperature** | **Humidity** | **Wind** | **Play Cricket** | | D1 | Sunny | Hot | High | Weak | No | | D2 | Sunny | Hot | High | Strong | No | | D3 | Overcast | Hot | High | Weak | Yes | | D4 | Rain | Mild | High | Weak | Yes | | D5 | Rain | Cool | Normal | Weak | Yes | | D6 | Rain | Cool | Normal | Strong | No | | D7 | Overcast | Cool | Normal | Strong | Yes | | D8 | Sunny | Mild | High | Weak | No | | D9 | Sunny | Cool | Normal | Weak | Yes | | D10 | Rain | Mild | Normal | Weak | Yes | | D11 | Sunny | Mild | Normal | Strong | Yes | | D12 | Overcast | Mild | High | Strong | Yes | | D13 | Overcast | Hot | Normal | Weak | Yes | | D14 | Rain | Mild | High | Strong | No | | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | Describe the expectation step in the EM Algorithm with the help of a flow diagram. Analyze the importance of convergence in the same. | CO3 | An | 10 |
|  | b. | Discuss in detail about various methods to determine the optimal number of clusters to use in a data set. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Examine Laplacian, Exponential and Polynomial Kernel along with its equation. | CO4 | A | 10 |
|  | b. | Analyze the similarities and dissimilarities in support vector machine and relevance vector machine. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. |  | Describe the casual component and actual numbers in Bayesian networks along with an example. | CO5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Classify the given set of data into two clusters by using K-means algorithm.  Data = { 2, 3, 4, 7, 8, 10, 11, 12, 13, 15, 17, 18, 22, 25, 27 } | CO3 | A | 10 |
|  | b. | Discuss the Hierarchical method in a machine learning and explain the steps involved in hierarchical agglomerative clustering. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Evaluate the performance of Kernel Methods for non-linear data in Machine learning. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Categorize the functionalities of the given graphical models:   * Learning Undirected GaussianGraphical Models and * Learning Undirected Discrete Graphical Models. | CO5 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Analyze the difference between Boltzmann and restricted Boltzmann machine and outline the architecture and training algorithm for Boltzmann machine. | CO6 | An | 10 |
|  | b. | Discuss on Deep Belief Network with neat architecture and relate its Realtime applications. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | The student will be able to summarize the theoretical and practical aspects of advanced machine learning techniques. |
| CO2 | The student will be able to compare the strengths and limitations of selected machine learning techniques and where they can be applied for different applications. |
| CO3 | The student will be able to identify the relevant tool for different machine learning techniques. |
| CO4 | The student will be able to analyze the problem thoroughly and identify the advanced machine learning approaches and paradigms. |
| CO5 | The student will be able to design and implement suitable machine learning technique to a given task. |
| CO6 | The student will be able to evaluate and compare the performance of the selected approaches for a given problem. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | - | - | 20 | - | - | - | 20 |
| CO3 | - | 20 | 10 | 10 | - | - | 40 |
| CO4 | - | - | 10 | 10 | - | - | 20 |
| CO5 | - | 20 | - | 20 | 20 | - | 60 |
| CO6 | - | - | 10 | 10 | - |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **18CS3015** | **Duration** | **3hrs** |
| **Course Name** | **CLOUD COMPUTING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Categorize the type of virtualization techniques anddifferent design principles in virtualization also explain KVM architecture. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Elaborate various cloud deployment models and cloud service model with the case study of NOVA open stack. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Analyze how Frequent are your Service Outages and how long do they last on average in Amazon Elastic Compute2 (EC2) service providers. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Analyze, how Hadoop MapReduce works. Examine the application of MapReduce | CO4 | An | 10 |
|  | b. | **Explain the basic concept of Infrastructure as a code with Open Stack (IaC).** | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. |  | Justify, how IAM security best practices implemented in IaaS, PaaS, SaaS cloud services. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Examine the case study for Microsoft conversion tools and Open Source p2v conversion tools. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain Amazon CloudFront service single tenant and multi tenant architecture with neat diagram. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Examine network, host and application level aspects of data security in cloud. | CO5 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Demonstrate the case study for dynamic configuration management using salt stack. | CO6 | A | 10 |
|  | b. | Implement the code and step to Deploy a web server and database server using Ansible playbook. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Infer the concept of virtualization in the cloud computing. |
| CO2 | Use the concepts of cloud storage, cloud networks and its management. |
| CO3 | Identify the architecture, infrastructure and delivery models of cloud computing. |
| CO4 | Categorize the services using Cloud computing. |
| CO5 | Apply the security models in the cloud environment. |
| CO6 | Develop an automation solution for the cloud. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | 20 | - | - | 40 |
| CO2 | - | 20 | - | - | - | - | 20 |
| CO3 | - | 20 | 20 | - | - | - | 40 |
| CO4 | - | 10 | - | 10 | - | - | 20 |
| CO5 | - | - | - | 20 | 20 | - | 40 |
| CO6 | - | - | 20 | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **18CS3016** | **Duration** | **3hrs** |
| **Course Name** | **CLOUD COMPUTING AND IOT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Examine the six pillars of M2M and four pillars of IoT with relevance to distinct networking technologies. | CO1 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Enumerate the need and development of IoT technology and elaborate on the real time challenges that are faced by IOT applications. | CO1 | R | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss on the capabilities and types of middleware. Appraise on the communication middleware and surveillance middleware for IoT with suitable examples. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the technological aspects of the DCM layers of the IoT value chain. Provide a comprehensive list of sensors and related technologies for few applications of IoT. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Illustrate the working process of WoT portals for business intelligence and list out the various security challenges that is enforced on IoT information security. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Discuss unified data standards and the issues involved in the unified identification of objects in a smart vehicle parking system. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain the evolution of cloud computing with the services and middleware that impacts the synergy with IoT. Justify the outcome of mobile cloud computing to deliver applications to mobile devices. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Examine the IoT based Cloud deployment models and specify its essential features and the required technologies for its successful deployment. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the taxonomy of security threats in the IoT and classify the possible vulnerabilities and their mitigation techniques. | CO6 | A | 10 |
|  | b. | Discuss on the following  i)Security issues in Trust Management Systems .  ii)Security Analysis of IoT Standard Protocols. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Examine IoT Architecture and various protocols. |
| CO2 | Classify the IoT value chain structure (device, data cloud), application areas and technologies involved. |
| CO3 | Design, develop and implement smart systems. |
| CO4 | Infer the advantages of Cloud Services. |
| CO5 | Learn about optimization of cloud storage. |
| CO6 | Apply various kinds of security mechanisms. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 20 | - | - | - | - | 40 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | - | 40 | - | - | - | - | 40 |
| CO4 | - | - | 20 | - | - | - | 20 |
| CO5 | - | - | 20 | - | - | - | 20 |
| CO6 | - | 10 | 10 | - | - | - | 20 |
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| **Course Code** | **18CS3017** | **Duration** | **3hrs** |
| **Course Name** | **CLOUD SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Reproduce the various stages in the evolution of Cloud Computing. | CO1 | R | 5 |
|  | b. | Paraphrase the acronym ‘SPI’ in terms of Cloud Computing Services. | CO2 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare and contrast the Traditional Software model and the Cloud Services Model. | CO1 | An | 10 |
|  | b. | Evaluate the impact of Cloud Computing on the different types of users. | CO6 | E | 10 |
|  |  |  |  |  |  |
| 3. |  | Demonstrate the application of Infrastructure Security at various levels in the Cloud environment. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Enumerate the various means of maintaining Confidentiality, Integrity, and data availability in the Cloud environment. | CO4 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the IAM functional architecture for ensuring enterprise-level security. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the various phases of the Data Life Cycle. | CO1 | U | 10 |
|  | b. | Examine the critical privacy concerns in the Cloud. | CO3 | R | 10 |
|  |  |  |  |  |  |
| 7. |  | Explain the features of Information Security Management Systems (ISMS) - ISO27001/ISO27002. How do you apply this in Cloud Environment? | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Define the various aspects on cloud compliances. Infer the laws and regulations implemented in the international forums. | CO6 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain the various cloud deployment models- Public, Private, and Hybrid. Illustrate with suitable applications. | CO5 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify security aspects of each cloud model. |
| CO2 | Know the standards and protocols for cloud services. |
| CO3 | Develop a risk-management strategy for moving to the Cloud. |
| CO4 | Implement a public cloud instance using a public cloud service provider. |
| CO5 | Apply audit and compliance rules in the cloud environment. |
| CO6 | Summarize the recent technologies in cloud security. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 10 | - | 10 | - | - | 25 |
| CO2 | - | 35 | 20 | - | - | - | 55 |
| CO3 | 10 | - | 20 | - | - | - | 30 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | - | - | 20 | 10 | - | 30 |
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| **Course Code** | **18CS3023** | **Duration :** | **3hrs** |
| **Course Name** | **COMPUTER VISION** | **Max. Marks:** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
|  | **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | Elucidate Monocular and Binocular imaging systems with suitable example for each system. | | | CO1 | U | 20 |
|  | **(OR)** | | | | | |
| 2. | Explain Reflectance Map with its mechanisms, white-out, brightness, gradient space, and surface and body reflection with its mathematical model. | | | CO2 | An | 20 |
|  |  |  |  | |  |  |
| 3. | Illustrate mean‐shift with its algorithm, mean‐shift segmentation and real modality analysis. | | | CO3 | A | 20 |
|  | **(OR)** | | | | | |
| 4. | Demonstrate about tracking a single point, tracking bounding boxes, tracking object contours, multiple fixed and overlapping cameras tracking using Kanade‐Lucas‐Tomasi (KLT) tracking method. | | | CO4 | A | 20 |
|  |  | | |  |  |  |
| 5. | Evaluate shape correspondence and shape matching with it types, error analysis shape-based recognition, intensity values, geometric transformations and its biological shape. | | | CO5 | E | 20 |
|  | **(OR)** | | | | | |
| 6. | Explain RANSAC for estimating homography and discuss the rounds, rotational mosaics and its computing homography with suitable example to fit a line. | | | CO1 | U | 20 |
|  |  | | |  |  |  |
| 7. | Describe the main steps in edge detection using image derivatives, effect of illumination, edge descriptors and image intensity edges. | | | CO2 | R | 20 |
|  | **(OR)** | | | | | |
| 8. | Explain fourier and wavelet descriptors with its goals, shape versus fourier, the 8 Shape features, and equal arc length sampling with example. | | | CO3 | A | 20 |
|  | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | Illustrate activity recognition using Silhouette Posture, Space-Time Occupancy Patterns, Random Occupancy Patterns, Depth Motion Maps, Eigen Joints, Relational Pose Features, Depth and Joints. | | | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define image formation models and light effects in computer vision. |
| CO2 | Identify the feature extraction methodology suitable for computer vision applications. |
| CO3 | Apply the segmentation approaches in image analysis. |
| CO4 | Analyze the motion detection and estimation techniques. |
| CO5 | Construct image analysis models for object recognition. |
| CO6 | Explain the computer vision techniques used for real time applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 40 |  |  |  |  | 40 |
| CO2 | 20 |  |  | 20 |  |  | 40 |
| CO3 |  |  | 40 |  |  |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  |  |  |  | 20 |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
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| **Course Code** | **18CS3026** | **Duration** | **3hrs** |
| **Course Name** | **CYBER FORENSICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the history around the growth of cybercrime and its related laws. | CO1 | R | 8 |
|  | b. | Elaborate few incidents of cyber-attacks with clear analysis. | CO1 | R | 8 |
| 2. |  | Discuss the threats and attacks possible in mobile and wireless technologies with case studies of digital evidence taken from mobile devices to embrace an attacker. | CO2 | U | 16 |
| 3. |  | Categorize the forensics investigation, collection and examination methods for any known cybercrime case study. | CO2 | U | 16 |
| 4. | a. | Examine the various techniques for hacking and the mechanisms to prevent hacking. | CO3 | A | 8 |
|  | b. | List five real life examples of cybercrimes in the world. | CO1 | R | 8 |
| 5. | a. | Summarize mobile threats and attacks with efficient counter measures. | CO3 | U | 8 |
|  | b. | Explain the national and international efforts to fight cybercrime. | CO4 | U | 8 |
| 6. | a. | Examine the process related to private sector & public sector workplace searches while performing computer forensic analysis. | CO5 | A | 8 |
|  | b. | Explain the future of trends in improving the security features in cyber forensics. | CO5 | U | 8 |
| 7. | a. | Elaborate five open source and commercial forensic tools available in the market to analyze information with relevant examples. | CO3 | R | 8 |
|  | b. | Paraphrase the evolution of hacking with real time case studies in history. | CO1 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Identify the need for Service Level Agreement with clear example of each phase, its metrics and the checklist for the service level agreement. | CO6 | U | 10 |
|  | b. | Associate the security issues with outsourcing security contracts and the typical outsourcing process. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the effect of cybercrime in forensic computing. |
| CO2 | Infer digital forensic evidences and investigate the contents. |
| CO3 | Choose and apply current computer forensics tools. |
| CO4 | Analyze the nature of cyber terrorism and its effects . |
| CO5 | Devise basic computer and network forensic analysis. |
| CO6 | Summarize the technical and legal aspects related to cyber crime. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 24 | 8 |  |  |  |  | 32 |
| CO2 |  | 32 |  |  |  |  | 32 |
| CO3 | 16 |  | 8 |  |  |  | 24 |
| CO4 |  | 8 |  |  |  |  | 8 |
| CO5 |  | 8 | 8 |  |  |  | 16 |
| CO6 |  | 10 | 10 |  |  |  | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CS3030** | **Duration** | **3hrs** |
| **Course Name** | **DATA PREPARATION AND ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the process of making sense of data, Observations and variables in detail. | CO1 | U | 15 |
|  | b. | List the types of variables in making sense of data. | CO1 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate the different methods used in centraltendency with all possible distribution of the data. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Enumerate the various methods used for removing Observations and Variables during the cleaning the data | CO2 | R | 10 |
|  | b. | Compare and contrast the methods of generating consistent scales across variables | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give examples of new frequency distribution and converting text to numbers. | CO3 | U | 15 |
|  | b. | Summarize the methods used in preparing unstructured data | CO3 | U | 5 |
|  |  |  |  |  |  |
| 5. |  | Survey on visualizing relationships between variables in detail. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Analyze the Linear Regression and Logistic Regression with suitable parameters. | CO5 | An | 15 |
|  | b. | Tabulate the classification and regression trees with suitable example. | CO5 | R | 5 |
|  |  |  |  |  |  |
| 7. | a. | Explain the Jenkins method and ARIMA model in detail. | CO4 | U | 15 |
|  | b. | Differentiate ARMA and ARIMA models. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Recall the following in detail:   1. Autocorrelation models. 2. Autoregressivemodels. 3. Moving average models. | CO5 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Write short notes on:   1. Term Frequency and Inverse Document Frequency. 2. Common representation methods. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe and understand the nature of data. |
| CO2 | Prepare the data into the required format. |
| CO3 | Identify the relationships and group the data. |
| CO4 | Build models from the data. |
| CO5 | Gain insight from the data. |
| CO6 | Deliver the insights through appropriate visualization technique. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 40 | - | - | - | - | 40 |
| CO2 | 10 | - | - | 10 | - | - | 20 |
| CO3 | - | 20 | - | - | - | - | 20 |
| CO4 | - | 20 | - | 20 | - | - | 40 |
| CO5 | 25 | - | - | 15 | - | - | 40 |
| CO6 | 20 | - | - | - | - | - | 20 |
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| **Course Code** | **18CS3031** | **Duration** | **3hrs** |
| **Course Name** | **DATA SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Distinguish the 3V’s of data and analyze the best tool for processing Tera bytes of data. | CO1 | A | 16 |
|  |  |  |  |  |  |
| 2. | a. | Define data wrangling and list the necessary steps required to prepare data for Business Intelligence (BI). | CO2 | R | 8 |
|  | b. | Evaluate, how EDA can be helpful for processing a dataset. | CO2 | E | 8 |
|  |  |  |  |  |  |
| 3. |  | Differentiate classification and regression. Find the Ypredicted data points and sum of squared error for the below mentioned dataset by applying linear regression.   |  |  | | --- | --- | | X | Y | | 1 | 22 | | 2 | 25 | | 3 | 27 | | 4 | 32 | | 5 | 35 | | 6 | 40 | | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. | a. | Explain visualization tools and analyze how the outliers are identified using visualization tool. | CO4 | U | 8 |
|  | b. | Illustrate the inputs, types and variables used for representing visual encoding model. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 5. | a. | Identify the techniques used for the process of reducing the number of attributes in a dataset. | CO5 | R | 8 |
|  | b. | Categorize the Geolocated data visualization tools with example. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 6. |  | Create a Python code to perform basic data set processing and plotting bar chart, heat map by assuming your own data set to analyze the correlation coefficient. | CO1 | C | 16 |
|  |  |  |  |  |  |
| 7. |  | Illustrate the concept of Support Vector Machine Classification in detail and analyze the various scenarios of plotting hyper-plane. Apply the concept of SVM in real time example. | CO3 | U | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Interpret the concept of movie and songs suggestion Apps. Mention the type of recommendation system applied on each model. | CO6 | U | 10 |
|  | b. | Examine the tips to minimize data leakage problem while building a data model. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the key concepts in data science, its applications and the tool kit used by data scientists. |
| CO2 | Explain how data is collected managed and stored for data science. |
| CO3 | Apply various machine learning techniques in real-world applications. |
| CO4 | Implement data collection and management. |
| CO5 | Use visualization tools for data visualization. |
| CO6 | Possess the required knowledge and expertise to become a proficient data scientist. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 16 | - | - | 16 | 32 |
| CO2 | 16 | - | - | - | - | - | 16 |
| CO3 | - | 16 | 16 | - | - | - | 32 |
| CO4 | - | 8 | 8 | - | - | - | 16 |
| CO5 | 8 | 8 | - | - | - | - | 16 |
| CO6 | - | 10 | 10 | - | - | - | 20 |
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| **Course Code** | **18CS3040** | **Duration** | **3hrs** |
| **Course Name** | **DISTRIBUTED SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Reproduce external data representation concept of distributed system with example. | CO1 | R | 8 |
|  | b. | Argue - Interprocess communications of distributed system in detail. |  | E | 8 |
|  |  |  |  |  |  |
| 2. |  | Summarize Sun NFS of distributed file systems. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 3. |  | Discuss the potential advantages and drawbacks of the use of an X.500 directory service in place of the DNS and the Internet mail delivery programs. Sketch the design of a mail delivery system for an internetwork in which all mail users and mail hosts are registered in an X.500 database. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 4. |  | In multiversion timestamp ordering, read operations can access tentative versions of objects. Give an example to show how cascading aborts can happen if all read operations are allowed to proceed immediately. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 5. |  | A router separating process p from two others, q and r, fails immediately after p initiates the multicasting of message m. If the group communication system is view synchronous, explain what happens to p next. | CO5 | C | 16 |
|  |  |  |  |  |  |
| 6. |  | Explain applications of P2P with examples. | CO3 | E | 16 |
|  |  |  |  |  |  |
| 7. |  | In a gossip system, a front end has the vector timestamp (3, 5, 7) representing the data it has received from members of a group of three replica managers. The three replica managers have vector timestamps (5, 2, 8), (4, 5, 6) and (4, 5, 8), respectively. Which replica manager(s) could immediately satisfy a query from the front end, and what would the resultant timestamp of the front end be? Which could incorporate an update from the front end immediately? | CO5 | E | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Explain the distinctions between the three forms of synchronization (synchronous distributed state, media synchronization and external synchronization) that may be required in distributed multimedia applications. Suggest mechanisms, by which each of them could be achieved, for example in a video conferencing application. | CO6 | An | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the distributed system models. |
| CO2 | Distinguish inter-process communication mechanisms and their application scenarios. |
| CO3 | Illustrate a transaction and concurrency control scheme for a real time application. |
| CO4 | Compare the various file system architectures used in distributed systems. |
| CO5 | Construct a real time distributed system with suitable IPC, event coordination, file management, name service, transaction and concurrency control mechanisms. |
| CO6 | Evaluate an efficient distributed system and its qualities. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 |  |  |  | 8 |  | 16 |
| CO2 |  | 16 |  |  |  |  | 16 |
| CO3 |  | 16 |  |  | 16 |  | 32 |
| CO4 |  |  | 16 |  |  |  | 16 |
| CO5 |  |  |  |  | 16 | 16 | 32 |
| CO6 |  |  |  | 20 |  |  | 20 |
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| **Course Code** | **18CS3042** | **Duration** | **3hrs** |
| **Course Name** | **ETHICAL HACKING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Brief the necessity for understanding the attacks by analyzing the security compromises and trends. | CO1 | R | 10 |
|  | b. | List the Computer Fraud and Abuse Act Laws with examples and punishment details. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 2. | a. | Discuss Physical Penetration Testing and methods in the testing. | CO2 | U | 10 |
|  | b. | Brief Passive Analysis and its techniques. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 3. | a. | Explain the tools used in Advanced Reverse Engineering. | CO3 | An | 10 |
|  | b. | Elaborate Fuzzing and discuss about the tools used in fuzzing. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 4. | a. | A University was targeted for ransomware attack, as Security Analyst you were to recommend security controls to the institution. During initial scanning it has been observed that the browsers used in the institution is not updated, elaborate any three-client exploitation that is possible to attack. | CO4 | E | 10 |
|  | b. | Summarize the four key foundational components involved in Windows access control. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | An ex-employee of a Company intruded into a protected system of Company’s System Cloud infrastructure hosted in Cloud Platform and deleted 456 virtual machines. This apparently led to $1,250,000 equivalent in employee time to restore the damage to the application and refund over $7,000,000 to the affected customers. Mention the applicable Cyber-Laws and their sections in detail for this case. | CO5 | A | 10 |
|  | b. | Discuss the 18 USC 1029 Access Device Statute with an example. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 6. | a. | In a case scenario, assume the user is the network and using Nmap. A host 192.168.23.220 is discovered with port 4646 running in a Linux server. Create a payload to Shut down the server using Metasploit | CO6 | C | 10 |
|  | b. | Discuss the limitations of Passive Analysis. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 7. |  | Discuss the steps and procedures involved in partial and full disclosure in detail. | CO5 | U | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Explain the Malware defensive techniques used in Malware Analysis. | CO6 | U | 10 |
|  | b. | Identify the tools used in Malware Analysis and describe their functionalities in real-time. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Learn how to apply knowledge of engineering to society evaluations and design. |
| CO2 | Understand the impact of security practices in a global and societal context. |
| CO3 | Defend a computer against different types of security attacks. |
| CO4 | Practice and use safe techniques on the World Wide Web. |
| CO5 | Appreciate the Cyber Laws and impact of hacking. |
| CO6 | Exploit the vulnerabilities related to conquer system and networks using state of the art tools and technologies. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 6 | - | - | - | - | 16 |
| CO2 | - | 22 | - | - | - | - | 22 |
| CO3 | - | 6 | - | 10 | - | - | 16 |
| CO4 | - | 6 | - | - | 10 | - | 16 |
| CO5 | - | 22 | 10 | - | - | - | 32 |
| CO6 | - | 20 | - | - | - | 10 | 30 |
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| **Course Code** | **18CS3052** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF THINGS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Identity the required protocols in application layer. | CO1 | R | 10 |
|  | b. | Compare and contrast any two application layer protocols. |  | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | List out the design principles for connected devices and discuss the applications with proper block diagram. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | While designing a smart IoT application, the designer need not give attention to prototyping. Analyse the above statement and defend your recommendation. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | List out the recommendations for sketching process in a IoT application design with the proper example. | CO4 | R | 20 |
|  |  |  |  |  |  |
| 5. |  | Reflect the requirement of Raspberry Pi in a IoT application design with the proper block diagram. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Analyse the need for Arduino in a smart agriculture application with the required functional block diagram. | CO5 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Assess any two designs for IoT device iteration with your recommendations. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | List out the various APIs required for an real-time IoT application. Also compare any two APIs with required examples. | CO6 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Identify the Popular IOT/M2M applications. | CO2 | R | 10 |
|  | b. | Discuss some advancements that are being expected from the revolutionary and raging IoT concept for smart city. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the working principles of internet of things. |
| CO2 | Convert the principles into to a working prototype. |
| CO3 | Interpret the prototype into real life working models. |
| CO4 | Illustrate IOT business models. |
| CO5 | Design IOT based smart applications. |
| CO6 | Relate IOT applications to solve problems of humanity. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 |  |  |  |  |  | 20 |
| CO2 | 10 | 20 |  |  |  |  | 30 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 | 20 |  |  | 20 |  |  | 40 |
| CO5 |  |  | 20 | 20 |  |  | 40 |
| CO6 | 20 |  | 10 |  |  |  | 30 |
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Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **18CS3053** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF THINGS SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Describe the process of data management that manages the data flow from the moment data is created to the moment it reaches the back-end system. | CO1 | R | 16 |
| 2. |  | The IoT enables information gathering, transmitting, and storing to be available for devices which creates or accelerates many applications such as industrial control systems, the retailing industry, healthcare, etc. Explain the security concerns and countermeasures in IoT applications. | CO4 | U | 16 |
| 3. |  | Classify the threats to Access Control, Privacy, and Availability. Analyze the potential security threats and security vulnerabilities at the IoT end-node and sensing layer. | CO2 | An | 16 |
| 4. |  | Elaborate on the role, types, and uses of Cryptography in securing the IoT. | CO3 | A | 16 |
| 5. |  | Explain the Public Key Infrastructures (PKI) and their utility in securing IAM deployments for the IoT. | CO2 | U | 16 |
| 6. |  | Elucidate the functional layers and capabilities of an IoT architecture with relevant examples and diagrams. | CO1 | R | 16 |
| 7. |  | Illustrate the process of Authentication/Authorization for smart devices in a health care IoT system. | CO4 | A | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Explain the enterprise IoT cloud security architecture with a relevant diagram and point out the new directions in cloud-enabled IoT computing. | CO5 | An | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate knowledge and understanding of the security and ethical issues of the internet of things. |
| CO2 | Conceptually identify vulnerabilities, including recent attacks, involving the internet of things. |
| CO3 | Describe countermeasures for the internet of things devices and security threats. |
| CO4 | Analyze the societal impact of IoT security events. |
| CO5 | Develop critical thinking skills. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 32 | - | - | - | - | - | 32 |
| CO2 | - | 16 | - | 16 | - | - | 32 |
| CO3 | - | - | 16 | - | - | - | 16 |
| CO4 | - | 16 | 16 | - | - | - | 32 |
| CO5 | - | - | - | 20 | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CS3055** | **Duration** | **3hrs** |
| **Course Name** | **IOT AND SMART CITIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | | |
| 1. | |  | Describe and report the strategies involved in city transformation. | CO1 | U | 16 |
| 2. | | a. | Discuss in detail the evolution of mobile wireless technologies. | CO2 | U | 10 |
|  | | b. | Tabulate any four cross-OS platforms available in the market. | CO2 | R | 6 |
| 3. | |  | Enumerate the smarter home building services available in the cloud. | CO3 | R | 16 |
| 4. | |  | Summarize the main use cases of cloud computing in the healthcare sector. | CO4 | U | 16 |
| 5. | | a. | Explain the two categories of vulnerabilities that affect smart  phones. | CO5 | R | 8 |
|  | | b. | Discuss the different types of security threats that are possible in an intelligent transportation system. | CO5 | R | 8 |
| 6. | |  | Review all the components of the IoT reference architecture with  suitable illustrations. | CO3 | U | 16 |
| 7. | |  | Review with necessary illustrations, the components of CIDAP along with its subscription mechanisms. | CO4 | U | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | |
| 8. | | a. | Discuss a plethora of existing services that are being transitioned to be smart and more city-specific applications. | CO6 | U | 12 |
|  | | b. | Illustrate the reference architecture for sensing-as-service model that works in the waste management domain. | CO6 | A | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the necessity for smart cities. |
| CO2 | Describe the factors influencing the smart cities. |
| CO3 | Apply the IoT technologies in healthcare and security areas. |
| CO4 | Analyze data in smart buildings, including data stemming from sensors and IoT devices. |
| CO5 | Evaluate the devices and technologies deeded for smart cities. |
| CO6 | Design and plan the architecture for smart cities. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 16 | - | - | - | - | 16 |
| CO2 | 6 | 10 | - | - | - | - | 16 |
| CO3 | 16 | 16 | - | - | - | - | 32 |
| CO4 | - | 32 | - | - | - | - | 32 |
| CO5 | 16 | - | - | - | - | - | 16 |
| CO6 | - | 12 | 8 | - | - | - | 20 |
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| **Course Code** | **18CS3060** | **Duration** | **3hrs** |
| **Course Name** | **MALWARE ANALYSIS AND REVERSE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | | |
| 1. | |  | Describe the process of static and dynamic malware analysis to overcome the demerits of admitting random packets into the system. | CO1 | R | 16 |
| 2. | | a. | Elucidate the steps to perform advanced static analysis over x86 assembly. | CO1 | U | 6 |
|  | | b. | Narrate the process of debugging the kernel when malicious packets are traced using WinDbg. | CO2 | U | 10 |
| 3. | |  | Deploy the procedure to analyze the behavior of malware into the system and narrate the merits of focused network signature in it. | CO2 | An | 16 |
| 4. | |  | Summarize the categories of covert malware launching methodologies with examples. | CO3 | R | 16 |
| 5. | |  | Describe how anti reverse engineering will assist in malware detection and prevention process. | CO4 | U | 16 |
| 6. | |  | Discuss the procedure for examining the existing ClamAV signatures. | CO5 | U | 16 |
| 7. | |  | Describe the process of detecting malware capabilities with YARA file in detail. | CO5 | R | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | | |
| 8. | | a. | Elaborate the usage of Dionaea and Nepenthes to observe, detect and prevent malware into a network. | CO6 | R | 10 |
|  | | b. | Compare and contrast binaries with IDA and BinDiff in malware analysis. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the static and dynamic analysis procedures with relevant debugging methods. |
| CO2 | Describe the malware behavior and recognize the anti-reverse engineering techniques which prevent  the identification of malware. |
| CO3 | Use the malware analysis tools like ClamAV, Yara, PEiD, IDA and BinDiff to identify the malware  attacks. |
| CO4 | Analyze the self-modifying binary malwares. |
| CO5 | Synthesize the malware samples by using Honeypots and Sandboxes. |
| CO6 | Explain the various malware attacks by using the malware forensic tools. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 6 | - | - | - | - | 22 |
| CO2 | - | 10 | - | 16 | - | - | 26 |
| CO3 | 16 | - | - | - | - | - | 16 |
| CO4 | - | 16 | - | - | - | - | 16 |
| CO5 | 16 | 16 | - | - | - | - | 32 |
| CO6 | 10 | 10 | - | - | - | - | 20 |
|  | | | | | | | **132** |

Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **18CS3070** | **Duration** | **3hrs** |
| **Course Name** | **OPTIMIZATION TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and the daily capacity of the three machines are given in the table below:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Machine | Time per unit (minutes) | | | Machines Capacity (minutes/day) | | Product 1 | Product 2 | Product 3 | | M1 | 2 | 3 | 2 | 440 | | M2 | 4 | - | 3 | 470 | | M2 | 2 | 5 | - | 430 |   It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs.3 and Rs.6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical (L.P.) model that will maximize the daily profit | CO2 | U | 6 |
|  | b. | Describe the steps of formulation of Linear Programming Problem. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 2. | a. | Compute the following using simplex method.  max z=x+2y  Sub to x+4y≤8  x+y≤12  x,y ≥0 | CO2 | A | 12 |
|  | b. | Convert the following problem into the slack form of LPP  min -3x+6y  sub to x+4y≥8  5x+4y≥ -10  x, y>0 | CO1 | U | 4 |
|  |  |  |  |  |  |
| 3. | a. | Compute the following using revised simplex method.  max z=2x+3y  sub to x+2y ≤10  3x+y≤15  y≤4  x,y≥=0 | CO2 | A | 12 |
|  | b. | Convert the given problem into its dual.  Obtain the dual of the following Linear Programming Problem: min. z = 2x1 + 3x2 + 4x3  sub to, 2x1 + 3x2 + 5x3 ≥ 2  3x1 + x2 + 7x3 = 3  x1 + 4x2 + 6x3 ≤ 5  x1 , x2 ≥ 0, x3 is unrestricted | CO1 | U | 4 |
|  |  |  |  |  |  |
| 4. | a. | Solve the given assignment problem using Hungarian algorithm.  Solution of assignment problems (Hungarian Method) - Procedure, Example  Solved Problem | Operations Research | CO3 | A | 6 |
|  | b. | Solve the given transportation problem using   1. Least Cost Cell Method. 2. North West Corner Method 3. Vogel’s Approximation Method  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | **D1** | **D2** | **D3** | **D4** | **D5** | **Supply** | | **S1** | 10 | 2 | 3 | 15 | 9 | 35 | | **S2** | 5 | 10 | 15 | 2 | 4 | 40 | | **S3** | 15 | 5 | 14 | 7 | 15 | 20 | | **S4** | 20 | 15 | 13 | 25 | 8 | 30 | | **Demand** | 20 | 20 | 40 | 10 | 35 |  | | CO3 | A | 10 |
|  |  |  |  |  |  |
| 5. |  | Explain quadratic programming with an example. | CO4 | R | 16 |
|  |  |  |  |  |  |
| 6. |  | Design solution using genetic algorithm to solve the maximization problem f(x) = 4x2-15 where 0 <x<15. | CO5 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | Design ant colony optimization algorithm to solve assignment problem of 10 jobs to a single processor. The overall objective is to minimize the waiting time. | CO5 | A | 16 |
| **,PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Explain the working principle of Particle Swarm Optimization. | CO6 | R | 10 |
|  | b. | Illustrate the application of Particle Swarm Optimization technique to solve the travelling salesman problem. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define and use optimization terminology and concepts. |
| CO2 | Formulate optimization problems. |
| CO3 | Understand and apply the concept of optimality criteria for various types of optimization problems. |
| CO4 | Solve various constrained and unconstrained problems in single variable as well as multivariable. |
| CO5 | Apply the methods of optimization in real life situation |
| CO6 | Implement basic optimization algorithms in a computational setting and apply existing optimization software packages to solve engineering problems. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 8 | - | - | - | - | 18 |
| CO2 | - | 6 | 24 | - | - | - | 30 |
| CO3 | - | - | 16 | - | - | - | 16 |
| CO4 | 16 | - | - | - | - | - | 16 |
| CO5 | - | - | 32 | - | - | - | 32 |
| CO6 | 10 | 10 | - | - | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18CS3081** | **Duration** | **3hrs** |
| **Course Name** | **SECURITY IN COMPUTING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the Reliability and Integrity measures in database security with elaboration on the database disclosure. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate Unintentional (Non-malicious) Programming Oversights with examples and provide the countermeasures for the malicious attacks created due to such oversights. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Explain the methods for obtaining user and website data without the user’s knowledge with examples. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Appraise the procedures in identifying the security parameters in the design of operating systems. | CO2 | E | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the intrusion detection and prevention systems with its types and analysis of the state model of operation. | CO5 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Examine Wireless Network Security with clear representation of the IEEE802.11 protocol. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain Information Security Policy, Standards and Practices with clear case studies for each standard. | CO5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Describe the components of information security and elaborate the various approaches to information security during implementation process. | CO2 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the ethical issues related to computer security with a case study | CO6 | U | 10 |
|  | b. | Analyze the rights of employees and employers in prevention of computer crimes. | C06 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the factors driving the need for security. |
| CO2 | Discuss security issues in operating systems. |
| CO3 | Apply computer security in data and databases. |
| CO4 | Analyze the possibilities in securing the network. |
| CO5 | Categorize information security techniques. |
| CO6 | Assess legal and ethical issues in security. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  |  | 20 |  |  | 20 |
| CO2 | 20 |  |  |  | 20 |  | 40 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 |  |  | 40 |  |  |  | 40 |
| CO5 | 20 | 20 |  |  |  |  | 40 |
| CO6 |  | 10 |  | 10 |  |  | 20 |
|  | | | | | | | **180** |

Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **18CS3082** | **Duration** | **3hrs** |
| **Course Name** | **SENSOR NETWORKS AND INTERNET OF THINGS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Discuss the role of the coordinator in wireless sensor networks. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 2. | a. | List the difference between SDN and NFV. | CO2 | R | 8 |
|  | b. | Determine the IoT levels for designing home automation IoT systems using home automation and intrusion detection. | CO2 | A | 8 |
|  |  |  |  |  |  |
| 3. |  | Design an IoT based system for smart water management. Explain the following modules in detail:  a. Sensor module.  b. Actuator module.  c. Communication module (LAN and WAN). | CO6 | C | 16 |
|  |  |  |  |  |  |
| 4. |  | Determine the various communication models that can be used for the weather monitoring system. Justify the more appropriate model for this system. | CO1 | A | 16 |
|  |  |  |  |  |  |
| 5. | a. | Differentiate machines in M2M and Things in IoT? | CO1 | U | 6 |
|  | b. | Describe the architecture of Raspberry Pi with neat sketch. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 6. | a. | Explain the schedulers in Hadoop YARN. | CO5 | An | 8 |
|  | b. | Compare and contrast CoAP and MQTT protocols. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Sketch and explain the Map-reduce Job execution workflow. | CO5 | A | 8 |
|  | b. | Discuss various modes of attacks in IoT environments. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Describe the puppet framework with a suitable example. | CO3 | R | 10 |
|  | b. | Discuss various cloud storage models and communication APIs for IoT applications. | CO3 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the important aspects of IoT and its benefits. |
| CO2 | Illustrate the working principles of a IoT sensors and devices. |
| CO3 | Demonstrate the working of various tools available for IoT. |
| CO4 | Compare and contrast different technologies of IoT. |
| CO5 | Evaluate the performance of IoT technologies. |
| CO6 | Develop new IoT based projects. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 22 | 16 | - | - | - | 38 |
| CO2 | 18 | - | 8 | - | - | - | 26 |
| CO3 | 10 | 10 | - | - | - | - | 20 |
| CO4 | - | - | - | - | - | - | - |
| CO5 | - | 16 | 8 | 8 | - | - | 32 |
| CO6 | - | - | - | - | - | 16 | 16 |
|  | | | | | | | **132** |

Graphical user interface, application

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| **Course Code** | **18CS3093** | **Duration** | **3hrs** |
| **Course Name** | **WEB SEARCH AND INFORMATION RETRIEVAL** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Write the algorithm for blocked sort-based indexing. | CO1 | R | 4 |
|  | b. | Discuss dynamic indexing with suitable algorithm. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 2. |  | Your task is to classify words as English or not English. Describe the probabilistic learning method for the text classification with suitable example. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 3. | a. | Demonstrate dictionary compression with suitable example. | CO2 | U | 8 |
|  | b. | How the system effectiveness is measured? Discuss the two main measures for information retrieval effectiveness. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 4. |  | Explain computing scores in a complete search system. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 5. |  | Describe the solution to matrix problem using singular-value decompositions and latent semantic indexing. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 6. | a. | Justify why web search engines require connectivity servers. | CO5 | U | 8 |
|  | b. | Web page consists of multiple copies of the same content. Explain the method used by web search engines to avoid multiple copies. | CO5 | R | 8 |
|  |  |  |  |  |  |
| 7. | a. | Explain the challenges that make structured information retrieval more difficult than unstructured. | CO3 | U | 8 |
|  | b. | Demonstrate the algorithm for used for document score. | CO3 | R | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Discuss the process of finding and downloading the web pages for the content “Crawling of the web”. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Interpret the basics of information models. |
| CO2 | Illustrate the different techniques like tokenizing and indexing used in information retrieval systems. |
| CO3 | Evaluate the concept of query operations and languages. |
| CO4 | Simulate the various text classification and clustering techniques. |
| CO5 | Experiment the various concepts of web search. |
| CO6 | Appraise the different tools of search engines. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 12 |  |  |  |  | 16 |
| CO2 | 8 | 24 |  |  |  |  | 32 |
| CO3 | 8 | 24 |  |  |  |  | 32 |
| CO4 |  |  | 16 |  |  |  | 16 |
| CO5 | 8 | 8 |  |  |  |  | 16 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **132** |

**Graphical user interface, application

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| **Course Code** | **19CS1001** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING IN PYTHON** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the standard data types in python. | | CO1 | R | | 1 |
| 2. | State the features of python. | | CO1 | R | | 1 |
| 3. | Name the operators supported by python. | | CO2 | R | | 1 |
| 4. | Define recursive function with an example. | | CO2 | R | | 1 |
| 5. | Explain the need for Unicode. | | CO1 | U | | 1 |
| 6. | Enumerate five benefits of using python. | | CO1 | R | | 1 |
| 7. | List a few common types of exceptions. | | CO4 | R | | 1 |
| 8. | Write notes on format specifiers and escape sequences. | | CO3 | A | | 1 |
| 9. | Infer on module and package in python. | | CO6 | An | | 1 |
| 10. | Write a python script to display the current date and time. | | CO5 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe *is* and *is not* operators and type () function. | | CO2 | | U | 3 |
| 12. | Illustrate call by value and call by reference. | | CO1 | | An | 3 |
| 13. | Summarize the precedence of mathematical operators in python. | | CO3 | | E | 3 |
| 14. | Explain how to create a dictionary in python | | CO5 | | A | 3 |
| 15. | Describe the characteristics of the CSV format. | | CO4 | | U | 3 |
| 16. | Design a python code to count the number of words in a file. | | CO6 | | C | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the concept of scope and lifetime of variables in Python with code examples. | CO1 | | U | 6 |
|  | b. | Explain in detail identifiers, keywords, statements, expressions, and variables in python with examples. | CO1 | | An | 6 |
| 18. | a. | Describe arithmetic operators, assignment operators, comparison operators, logical operators and bitwise operators in detail with examples. | CO2 | | U | 6 |
|  | b. | Compile a python code to calculate BMI. | CO5 | | C | 6 |
| 19. |  | Illustrate the following types of control flow statements available in Python: if, if-else, nested if-else, for, while, nested loops, break, continue and pass. | CO2 | | An | 12 |
| 20. | a. | Express stack operations in data structures using python code. | CO5 | | C | 4 |
|  | b. | Discuss the following list functions a) len() b) sum() c) any() d) all() e) sorted(). | CO3 | | U | 4 |
|  | c. | Discuss the different options to traverse a list. | CO6 | | U | 4 |
| 21. | a. | Write a python code to perform matrix multiplication using nested loops and also perform transpose of the resultant matrix. | CO5 | | C | 6 |
|  | b. | Write a python program to replace comma-separated words with hyphens and print hyphen-separated words in ascending order. | CO5 | | C | 6 |
| 22. | a. | Determine whether the given string is a palindrome or not using the string slicing concept in python. | CO2 | | A | 4 |
|  | b. | Discuss the relation between tuples and lists, tuples and dictionaries in detail. | CO6 | | U | 4 |
|  | c. | Explain the different string formats available in python with examples. | CO4 | | An | 4 |
| 23. | a. | Explain the following list of methods with an example.  a) append() b) extend() c) insert() d) index() e) sort() | CO3 | | A | 6 |
|  | b. | Discuss the types of inheritance in python. | CO3 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Write a python program to delete all the files and subdirectories from the *Extinct\_Animals* directory by using the following file structure. | CO4 | | C | 6 |
|  | b. | Describe the different access modes of files with examples. | CO4 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Outline the structure and components of a Python program. |
| CO2 | Explain loops and decision statements in Python. |
| CO3 | Illustrate class inheritance in Python for reusability. |
| CO4 | Experiment read and write files in Python. |
| CO5 | Design, code, and test small Python programs that meet requirements expressed in English. |
| CO6 | Choose lists, tuples, and dictionaries in Python programs. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 7 | - | 9 | - | - | 19 |
| CO2 | 2 | 9 | 4 | 12 | - | - | 27 |
| CO3 | - | 10 | 7 | - | 3 | - | 20 |
| CO4 | 1 | 9 | - | 4 | - | 6 | 20 |
| CO5 | - | - | 4 | - | - | 22 | 26 |
| CO6 | - | 8 | - | 1 | - | 3 | 12 |
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**Graphical user interface, application

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| **Course Code** | **19CS2002** | **Duration** | **3hrs** |
| **Course Name** | **INTRODUCTION TO DATA SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Identify the most appropriate graph to display the categorical variables. | | | CO1 | A | | 1 |
| 2. | List any two basic python libraries for data science. | | | CO1 | R | | 1 |
| 3. | \_\_\_\_\_\_\_\_\_\_ is the middle value for a dataset that has been arranged in order of magnitude. | | | CO2 | U | | 1 |
| 4. | Elucidate the information found in the following distributions. | | | CO2 | A | | 1 |
| 5. | Write the mathematical expression of linear regression. | | | CO3 | R | | 1 |
| 6. | Decision tree algorithm falls under the category of supervised learning. [True/False] | | | CO3 | U | | 1 |
| 7. | Why is the odd value of “K” preferred over even values in the KNN Algorithm? | | | CO4 | A | | 1 |
| 8. | Suggest a best programming language for machine learning. | | | CO4 | A | | 1 |
| 9. | Can SVM algorithm be used for both classification and regression? | | | CO5 | U | | 1 |
| 10. | Give some examples of recommender systems. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Write the significant advantages of using data analytics technology. | | | CO1 | | R | 3 |
| 12. | Interpret the statistical information found in the following visualizations which describes the goodness of fit. | | | CO2 | | An | 3 |
| 13. | Compare agglomerative and divisive algorithm. | | | CO3 | | U | 3 |
| 14. | Describe the machine learning algorithm which is most suitable for classification task. | | | CO4 | | R | 3 |
| 15. | Produce a decision tree that performs Boolean AND operation. | | | CO5 | | A | 3 |
| 16. | Is a hybrid approach more beneficial in recommender system? Justify your answer. | | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain the different steps in the data science process. | CO1 | | R | 8 |
|  | | b. | Write in detail about the 5V’s of big data. | CO1 | | R | 4 |
|  | |  |  |  | |  |  |
| 18. | | a. | You are given a data set consisting of variables with missing values. Identify the methods for filling in missing values and list the best practices for data cleaning. | CO2 | | A | 8 |
|  | | b. | Determine the mean, median mode and range for the given temperature data in degrees Celsius?  {13, 13, 14, 13, 19, 17, 23} | CO2 | | A | 4 |
|  | |  |  |  | |  |  |
| 19. | | a. | Discuss in detail the KNN classifier algorithm with a neat flow diagram. Also write the advantages and disadvantages. | CO3 | | U | 6 |
|  | | b. | Compare linear and logistic regression with suitable examples. | CO3 | | U | 6 |
|  | |  |  |  | |  |  |
| 20. | | a. | Differentiate supervised and unsupervised machine learning algorithms with some real time practical applications. | CO4 | | U | 8 |
|  | | b. | Is SVM an example of large marge margin classifier? Justify your answer. | CO4 | | A | 4 |
|  | |  |  |  | |  |  |
| 21. | |  | Explain the working process of random forest algorithm with a neat diagram. Also discuss the advantages, disadvantages and applications of the algorithm. | CO5 | | R | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Construct a whisker’s plot using the five number summary for the given data.  18, 27, 34, 52, 54, 59, 61, 68, 78, 82, 85, 87, 91, 93, 100 | CO6 | | A | 4 |
|  | | b. | With a neat flow diagram, write the main steps involved ink-means clustering. | CO3 | | R | 8 |
|  | |  |  |  | |  |  |
| 23. | |  | Describe structured and unstructured data with examples. Also list some of the common plots used for exploratory data analysis? | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Distinguish content-based filtering and collaborative filtering. | CO6 | | U | 6 |
|  | | b. | Calculate the cosine similarity between the users for the given utility matrix. | CO6 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Remember the key concepts of data science, data characteristics, its applications and the toolkit used by data scientists. |
| CO2 | Recall the mathematical concepts for descriptive and statistical analysis of the given dataset. |
| CO3 | Discuss on the principle of operation of various data preparation and machine learning techniques. |
| CO4 | Select appropriate mathematical and machine learning techniques for designing simple applications. |
| CO5 | Apply the relevant techniques for implementing simple applications. |
| CO6 | Interpret the results of data preparation and machine learning techniques. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 12 | 1 | - | - | - | 29 |
| CO2 | - | 1 | 13 | 3 | - | - | 17 |
| CO3 | 9 | 16 | - | - | - | - | 25 |
| CO4 | 3 | 8 | 6 | - | - | - | 17 |
| CO5 | 12 | 1 | 3 | - | - | - | 16 |
| CO6 | 1 | 6 | 13 | - | - | - | 20 |
|  | | | | | | | **124** |

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| **Course Code** | **19CS2012** | **Duration** | **3hrs** |
| **Course Name** | **ARTIFICIAL INTELLIGENCE FOR BIOTECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | List any two examples for recoverable problems. | CO1 | R | 1 |
| 2. | Identify the name of the problem in hill climbing approach.  It is a state that is better than all its neighbors but is not better than sum other states farther away. | CO1 | R | 1 |
| 3. | What is the name of the test if the interrogator cannot distinguish the machine from the human, then the machine may be assumed to be intelligent. | CO2 | U | 1 |
| 4. | \_\_\_\_\_\_\_\_\_ is the ability to manipulate the representational structures to derive new structures corresponding to new knowledge inferred from old. | CO2 | U | 1 |
| 5. | Cross the fittest two individuals using one–point crossover at the middle point and produce the answer.  x2 = 8 6 1 2 | 3 1 2 4  x1 = 3 7 5 8 | 3 7 4 4 | CO3 | R | 1 |
| 6. | List any functions used in Convolutional Neural Network. | CO3 | U | 1 |
| 7. | State the algorithm reads [MRI scans](https://www.nibib.nih.gov/science-education/science-topics/magnetic-resonance-imaging-mri) or [Biopsy stissue samples](http://mhpl.facilities.northwestern.edu/files/2013/10/The-Science-and-Application-of-Hematoxylin-and-Eosin-Staining-6-5-2012.pdf) as an input. | CO4 | R | 1 |
| 8. | Abbreviate ‘SWARA’. | CO5 | R | 1 |
| 9. | Recall the instrument used for the analysis of dissolved metals. | CO6 | R | 1 |
| 10. | Express the major disadvantage of using AI. | CO6 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Express artificial intelligence in four different view points. | CO1 | U | 3 |
| 12. | ConnectFOPL with propositional logic with examples. | CO2 | An | 3 |
| 13. | Enumerate the features of Genetic Algorithm. | CO3 | R | 3 |
| 14. | Distinguish protein coding and protein non-coding genes. | CO4 | An | 3 |
| 15. | Write a note on Imperialist competitive algorithm (ICA) for the prediction of water quality. | CO5 | A | 3 |
| 16. | Predict the performance of SVM using capacity parameter C in heavy metal prediction. | CO6 | A | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Consider the water jug problem: You are given two jugs, a 4-gallon one and 3-gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water from the 4-gallon jug?  **Explicit Assumptions:**  A jug can be filled from the pump, water can be poured out of a jug on to the ground, water can be poured from one jug to another and that there are no other measuring devices available. Apply suitable production rules to solve this problem. | CO1 | An | 8 |
| b. | Choose any one of the uninformed sessarch techniques and explain. | CO1 | A | 4 |
| 18. |  | Examine the following problem characteristics with example.   * Is the problem Decomposable? * Can solution steps be ignored or undone? * Is the universe predictable? * Is a good solution Absolute or relative. * Is the solution a state or path? * What is the Role of Knowledge. * Does the task require interaction with a person? | CO2 | A | 12 |
| 19. |  | Represent the below sentences as well-formed formulas (wff) in predicate logic and solve the question “was John loyal to Ramanan” ?  1. John was a man.  2. John was a Dancer.  3. All Dancers were Artists.  4. Ramanan was an instructor.  5. All Artists were either loyal to Ramanan or hated him.  6. Everyone is loyal to someone.  7. People only try to disobey instructors they are not loyal to.  8. John tried to disobey Ramanan. | CO2 | A | 12 |
| 20. | a. | Examineproblem reduction technique with example. | CO3 | R | 6 |
| b. | Of the students in the college, 60% of the students reside in the hostel and 40% of the students are day scholars. Previous year results report that 30% of all students who stay in the hostel scored A Grade and 20% of day scholars scored A grade. At the end of the year, one student is chosen at random and found that he/she has an A grade. Estimate the probability that the student is a hosteler. Apply Naïve Bayes to solve the problem. | CO3 | A | 6 |
| 21. |  | Interpret the application of Artificial Intelligence in pharmaceutical industry for the development of genomic medicine. | CO4 | An | 12 |
| 22. | a. | Illustrate the steps required to implement Artificial Neural Network (ANN) for water quality analysis. | CO4 | U | 6 |
| 22. | b. | Assess the machine learning (ML) techniques contribute for modeling, optimizing and handling of biofuel production. | CO4 | E | 6 |
| 23. | a. | Differentiate Artificial Neural Network andconvolution Neural Network. | CO5 | An | 4 |
| 23. | b. | Construct the feature map by applying convolution operation and Max pooling operation on the data given below:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Input Image** | | | | | | | **1** | **0** | **0** | **1** | **0** | **0** | | **0** | **1** | **0** | **0** | **1** | **0** | | **0** | **0** | **1** | **0** | **0** | **1** | | **1** | **0** | **0** | **1** | **0** | **0** | | **0** | **1** | **0** | **0** | **1** | **0** | | **0** | **0** | **1** | **0** | **0** | **1** |      |  |  |  | | --- | --- | --- | | **Filter** | | | | **1** | **0** | **0** | | **1** | **1** | **-1** | | **0** | **-1** | **1** | | CO5 | E | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the implementation techniques of Artificial NeuralNetwork (ANN) for diabetes prediction. | CO6 | U | 8 |
| b. | Predict the machine learning algorithms for pest control in plants. | CO6 | R | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define AI based problems and select appropriate search method for different search spaces. |
| CO2 | Express knowledge representation techniques and problem-solving strategies to common AI applications. |
| CO3 | Develop prediction models and extend for healthcare applications. |
| CO4 | Analyze energy and environmental issues and discover AI based solutions. |
| CO5 | Inspect the challenges on agriculture and suggest solutions for plant disease identification and discrimination. |
| CO6 | Propose AI based solutions for industrial applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 3 | 4 | 8 |  |  | 17 |
| CO2 |  | 2 | 24 | 3 |  |  | 29 |
| CO3 | 10 | 1 | 6 |  |  |  | 17 |
| CO4 | 1 | 6 |  | 15 | 6 |  | 28 |
| CO5 | 1 |  | 3 | 4 | 8 |  | 16 |
| CO6 | 5 | 9 | 3 |  |  |  | 17 |
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| **Course Code** | **19CS2013** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF THINGS FOR FOOD TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the four fundamental components of IoT. | | CO1 | R | | 1 |
| 2. | Identify the component of IoT that does not do any processing. | | CO1 | Ap | | 1 |
| 3. | Represent Partial mesh and Full mesh network connectivity with a node diagram. | | CO2 | U | | 1 |
| 4. | Mention any two IoT sensors used in Food Industries. | | CO2 | U | | 1 |
| 5. | Name any two tools used for Diagnostic Analytics. | | CO3 | R | | 1 |
| 6. | Define QoS and DoS. | | CO3 | R | | 1 |
| 7. | Mention the functionality of PWM pins in an Arduino board. | | CO4 | U | | 1 |
| 8. | Recall the salient features of Django. | | CO4 | R | | 1 |
| 9. | \_\_\_\_\_\_\_\_\_\_ is an AWS service that is five times faster than MySQL Database. | | CO5 | Ap | | 1 |
| 10. | Give any two examples of Perishable Food Products. | | CO6 | Ap | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Fog networking is not a separate architecture and it doesn’t replace cloud computing but rather complements it. – Justify. | | CO1 | | An | 3 |
| 12. | Differentiate IOT and M2M with an application. | | CO2 | | An | 3 |
| 13. | List the benefits of prescriptive analytics. | | CO3 | | U | 3 |
| 14. | Represent the block diagram of Embedded system. | | CO4 | | U | 3 |
| 15. | Differentiate Arduino and Raspberry Pi based on CPU speed, RAM, Storage and OS. | | CO5 | | An | 3 |
| 16. | Trace the top 10 privacy risks on the IoT paradigm. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explicate the 3 types of cloud computing service models with an example each. | CO1 | | An | 12 |
|  |  |  |  | |  |  |
| 18. |  | Draw the necessary diagrams to elucidate the 6 levels of IoT with one example each. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Interpret the various Data aggregation mechanism on IoT with node diagrams. | CO4 | | U | 12 |
| 20. | a. | Provide the details of IoT based Food spoilage detection system with an example. | CO3 | | Ap | 8 |
|  | b. | Identify the disadvantages of physical server over cloud servers. | CO3 | | An | 4 |
|  |  |  |  | |  |  |
| 21. |  | Criticize the four objectives of SMARTIE approach with an application. | CO4 | | Ap | 12 |
|  |  |  |  | |  |  |
| 22. |  | Interpret the details of any 4 services provided by Amazon Web Services. | CO5 | | Ap | 12 |
|  |  |  |  | |  |  |
| 23. |  | Summarize any 6 technologies available to secure a computer from virus and threat. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Elucidate the importance of food quality and paraphrase the safety regulations in food industries. | CO6 | | U | 6 |
|  | b. | Identify the energy efficient raw food processing methods used in food industries. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Present a survey on building blocks of IOT. |
| CO2 | Analyze the deployment models of IOT. |
| CO3 | Compare the connectivity technologies and protocols in IOT. |
| CO4 | Select IOT platform for an application. |
| CO5 | Infer security issues in IOT. |
| CO6 | Develop architectural approach for IOT applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 |  | 1 | 15 |  |  | 17 |
| CO2 |  | 14 |  | 3 |  |  | 17 |
| CO3 | 2 | 3 | 8 | 4 |  |  | 17 |
| CO4 | 1 | 16 | 12 |  |  |  | 29 |
| CO5 |  | 12 | 13 | 3 |  |  | 28 |
| CO6 |  | 15 | 1 |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **20CS1001** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Outline the rules that should be followed in pseudocode. | | CO1 | U | 1 |
| 2. | List any two examples for preprocessor directives. | | CO1 | R | 1 |
| 3. | Which bitwise operator is suitable for turning off a particular bit in a number? | | CO2 | A | 1 |
| 4. | Predict the output of the following c code.  #include <stdio.h>  int main()  {  const int var;  printf("%d ", var);  return 0;  } | | CO2 | A | 1 |
| 5. | Interpret the below C code and find out the output.  #include<stdio.h>  int main()  { int i = 5, j = 6, k = 7;  if(i == --j)  printf("%d", --k);  else  printf("%d %d %d", i, j, k);  return 0;} | | CO3 | A | 1 |
| 6. | The C code “for (;;)” represents an infinite loop. Point out the best way to end an infinite loop. | | CO3 | U | 1 |
| 7. | Enumerate the memory address of the element ARRAY[5], if the starting address of a float array ARRAY[10] is 2000. | | CO5 | A | 1 |
| 8. | Identify the format specifier which is used to print a String or Character array in C Printf function. | | CO5 | U | 1 |
| 9. | Which keyword is used to pass back the control from called function to calling function? | | CO4 | R | 1 |
| 10. | Deduce the output of this following C code.  #include<stdio.h>  int main()  {  printf("C PROGRAMMING");  main();  return 0;  } | | CO4 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | “C is a structured language”. Justify the statement. | | CO1 | U | 3 |
| 12. | Illustrate the operation of conditional operator with a C program. | | CO2 | A | 3 |
| 13. | Construct a program in C to display the first 10 natural numbers. | | CO3 | A | 3 |
| 14. | Demonstrate the approach to implement a linear search. On what factor does the time taken to search an element depend? | | CO5 | A | 3 |
| 15. | Discriminate between call by value and call by reference. | | CO4 | U | 3 |
| 16. | Interpret the output of this following C code.  #include <stdio.h>  struct temp  {  int a;  int b;  int c;  } p[] = {0};  main()  {  printf("%d", sizeof(p));  } | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. |  | Describe the purpose of using Console I/O functions with examples. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. |  | Demonstrate different types of expression using a c program. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Compare and contrast between “for” and “while ” loop statements with example. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Develop a C application to demonstrate the following operations   1. Read a sentence from the user 2. Print the frequency of each vowels and the total count of consonants. | CO6 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Distinguish between Library functions and User defined functions in C and Explain with examples. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Exemplify any six format specifiers in C language. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Assume two integers 100 and 200 are stored in the memory. Create a C program to swap these numbers by passing their referenceas arguments to the swap function. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the concept of Dynamic Memory Allocation (DMA)? What is the difference between malloc() and calloc(). Demonstrate with the syntax and examples. | CO5 | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of computer and software development process. |
| CO2 | Identify the data type to represent the real time data representation and operators for computation. |
| CO3 | Prepare innovative solutions for the problem using branching and looping statements. |
| CO4 | Decompose a problem into functions and synthesize a complete program using divide and conquer approach. |
| CO5 | Formulate algorithms and programs using arrays, pointers and structures. |
| CO6 | Create a new application software to solve real world problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 4 | 12 | - | - | - | - |
| CO2 | - | 12 | 5 | - | - | - | - |
| CO3 | - | 1 | 16 | - | - | - | - |
| CO4 | 1 | 15 | 13 | - | - | - | - |
| CO5 | 12 | 1 | 7 | - | - | - | - |
| CO6 | - | - | 12 | - | - | - | - |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS1002** | **Duration** | **3hrs** |
| **Course Name** | **PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the type of function. | | CO1 | U | | 1 |
| 2. | List the standard data types in Python. | | CO1 | R | | 1 |
| 3. | Label the string method in Python to convert given string into title case. | | CO2 | R | | 1 |
| 4. | Enumerate the dictionary methods. | | CO2 | R | | 1 |
| 5. | Explain recursive function. | | CO3 | U | | 1 |
| 6. | State the function of a constructor class. | | CO3 | R | | 1 |
| 7. | Represent the use of Turtle in Python Programming. | | CO4 | U | | 1 |
| 8. | Name the python command to change the background color of the Turtle screen. | | CO4 | R | | 1 |
| 9. | Identify the various types of layout managers in Python GUI. | | CO5 | U | | 1 |
| 10. | Express the type of widget that uses a text box to enter multiple lines of text. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Illustrate the syntax and semantics of any two loop structures provided by Python. | | CO1 | | An | 3 |
| 12. | Indicate the features of lists in python with example. | | CO2 | | U | 3 |
| 13. | Illustrate the try and except statements in Python. | | CO3 | | An | 3 |
| 14. | Describe the Python code to load an image and display its width and height. | | CO4 | | U | 3 |
| 15. | Explain a Python GUI program of window size 100\*200 that displays a button at x = 20 and y = 100 labeled as “Click Here”. Also add a function on that button that will create a message box having message “Thank you for clicking”. | | CO5 | | An | 3 |
| 16. | Express the following socket functions:   * socket() * bind() * listen() | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Write a Python program to find the greatest among two numbers and print the result. | CO1 | | A | 6 |
|  | b. | Construct a Python program to check if a number is odd or even. | CO1 | | A | 6 |
| 18. | a. | Consider the list Lst=[9,8,7,6,5,4,3]. Write the Python program to perform the following operations.   * Insert element 10 at beginning of the list. * Delete the element at index position 5. * Print all elements in reverse order. | CO2 | | A | 6 |
|  | b. | Construct a Python program to read a text file and print the number of words and number of statements in that file. | CO2 | | A | 6 |
| 19. | a. | Develop a Python program to implement hierarchical inheritance. | CO3 | | A | 6 |
|  | b. | Construct a class Student with the following member attributes: Roll no, Name, Age and Total marks. Create suitable methods for reading and printing member variables in that Student class. | CO3 | | A | 6 |
| 20. | a. | Write a Python turtle program to draw a blue square of size 200 and the draw a green circle which touches the square on all sides from inside. | CO4 | | A | 6 |
|  | b. | Write a suitable Python code that read an image and carry out the following tasks on it   * Rotate the image by 60 degrees in clockwise direction. * Flip the image. | CO4 | | A | 6 |
| 21. | a. | Write a python GUI program to implement calculator using Tkinter library. | CO5 | | A | 6 |
|  | b. | Develop a Python code for window with size(400\*200) as dimension with a label “Have you finished?” in color as red, yes button to be fixed, on clicking the yes button a message box with a message “Your work is finished” to be displayed. | CO5 | | A | 6 |
| 22. | a. | Explain a Python program to compute the factorial of a given number. | CO3 | | U | 6 |
|  | b. | Explain the assignment operators supported in Python with example. | CO3 | | U | 6 |
| 23. | a. | Predict the output of following Python code:  myStr = ‘Karunya is the best University’  print myStr [15 : : 1]  print myStr [-10 : -1 : 2] | CO2 | | A | 6 |
|  | b. | Explain the dictionary element operations. | CO2 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Write a python program to create a TCP/IP client-server chat application. | CO6 | | A | 6 |
|  | b. | Explain multi threaded programming in Python. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Choose the basic programming constructs of Python suitably | | | | | | | |
| CO2 | Infer the concepts of string processing, file I/O, lists and dictionary | | | | | | | |
| CO3 | Apply modules for reusability and the object-oriented principles for modeling and developing software system. | | | | | | | |
| CO4 | Utilize the power of graphics for processing images. | | | | | | | |
| CO5 | Construct applications with graphical user interface. | | | | | | | |
| CO6 | Develop software solutions using multi-threading, networking and client-server concepts. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 1 | 12 | 3 | - | - | 17 |
| CO2 | | 2 | 9 | 18 | - | - | - | 29 |
| CO3 | | 1 | 13 | 12 | 3 | - | - | 29 |
| CO4 | | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | | - | 1 | 12 | 3 | - | - | 16 |
| CO6 | | - | 10 | 6 | - | - | - | 16 |
|  | | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS1003** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF PROGRAMMING FOR PROBLEM SOLVING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the two types of software. | | CO1 | R | | 1 |
| 2. | Write the basic header file used in C program. | | CO1 | R | | 1 |
| 3. | flag = (i< 0) ? 0 : 100  Consider the above assignment statement. If the value of i is 8.Identify the output of the statement. | | CO2 | U | | 1 |
| 4. | Write the three types of logical operators in C. | | CO2 | A | | 1 |
| 5. | Write the syntax for the ‘for’ loop in C. | | CO3 | A | | 1 |
| 6. | Write the total number of characters support in C language. | | CO1 | A | | 1 |
| 7. | List any two string function used in C. | | CO4 | R | | 1 |
| 8. | Define recursion. | | CO5 | R | | 1 |
| 9. | Identify the output of C Program.? int main() { int a[] = {1,2,3,4}; int b[4] = {5,6,7,8}; printf("%d,%d", a[0], b[0]); } | | CO5 | R | | 1 |
| 10. | Differentiate call by value and call by reference. | | CO4 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the different types of data types in C. Write with an example. | | CO1 | | R | 3 |
| 12. | Write a C program to implement the following arithmetic expression:  x = (a+b)\*c. | | CO2 | | A | 3 |
| 13. | Differentiate ‘while’ statement and ‘do-while’ loop statement. | | CO3 | | U | 3 |
| 14. | Analyze the various String Manipulation Functions in C. | | CO4 | | An | 3 |
| 15. | Define pointer. How can you declare it? | | CO5 | | R | 3 |
| 16. | Distinguish similarity and dissimilarity of data sets. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe in detail the computer hardware and software. | CO1 | | R | 6 |
|  | b. | Explain the following statements with examples:   1. Labeled Statements. b. Compound Statement. | CO1 | | U | 6 |
| 18. |  | Illustrate about the following operators in C language with example:  a. Increment and decrement operators b. Relational operators  c. Conditional operators d. Logical operators. | CO2 | | U | 12 |
| 19. | a. | Write a C program that reads from the user an arithmetic operator and having three operands, perform the corresponding arithmetic operation and print the result. | CO3 | | A | 8 |
|  | b. | Suppose that x, y and z are integer variables which have been assigned the values 2, 3 and 4, respectively. Identify the output of the following expression: x\*= -4 \* (y+z) / 3. | CO3 | | R | 4 |
| 20. | a. | Define array. Describe the declaration and initialization of one dimensional and two-dimensional array with an example. | CO5 | | R | 6 |
|  | b. | Write a C program to find the sum of all elements in an array. | CO5 | | A | 6 |
| 21. | a. | Explain the following steps involved in the C function (with example).  a. function declaration b. function definition c. Function call. | CO4 | | U | 8 |
|  | b. | Write a C program to calculate a simple interest (Simple Interest = P\*I\*N) using function. | CO4 | | A | 4 |
| 22. | a. | Write a C program to find the factorial of a given number using recursion. | CO4 | | A | 8 |
|  | b. | Write a C program to compare two integers and display the equality. | CO6 | | A | 4 |
| 23. | a. | Apply the binary search algorithm for the below example and find the index position of the key value. [Mention all the steps]  Consider the sorted array: 5 20 26 36 58 62 69 78 84 91 99  [Key value – 69]. | CO6 | | A | 8 |
|  | b. | Explain the basic structure of a C program with an example | CO1 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Illustrate the steps involved in bubble sorting algorithm for the following example:  Consider the unsorted array: 16 37 28 42 15. | CO5 | | U | 8 |
|  | b. | Explain the multiple sequence comparison/alignment are used in Biotechnology field, explain in detail. | CO6 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of computer and software development processes. |
| CO2 | Identify the data type to represent the real time data representation and operators for computation. |
| CO3 | Prepare innovative solutions for the problem using branching and looping statements. |
| CO4 | Decompose a problem into functions and synthesize a complete program using divide and conquer approach. |
| CO5 | Formulate algorithms and programs using arrays, pointers and structures. |
| CO6 | Create a new application software to solve real world problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 11 | 10 | 1 | - | - | - | 22 |
| CO2 | - | 13 | 4 | - | - | - | 17 |
| CO3 | 4 | 3 | 9 | - | - | - | 16 |
| CO4 | 1 | 9 | 12 | 3 | - | - | 25 |
| CO5 | 11 | 8 | 6 | - | - | - | 25 |
| CO6 | - | 7 | 12 | - | - | - | 19 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS1004** | **Duration** | **3hrs** |
| **Course Name** | **APPLICATIONS OF PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the output for the following code:  amount=425000.874  print(“Amount is Rs.%.2f” %amount) | | CO1 | U | | 1 |
| 2. | Translate the following while loop into for loop:  i=1  while i<=5:  print(i)  i=i+1 | | CO1 | U | | 1 |
| 3. | Report the index of DDD =(‘AAA’, ‘BBB’, ‘CCC', 'DDD', 'EEE'). | | CO2 | U | | 1 |
| 4. | Examine the output for the following code:  fruits = ("apple", "banana", "cherry", "orange", "kiwi", "melon", "mango")  print(fruits [2:5]) | | CO2 | An | | 1 |
| 5. | Sketch the syntax to define a function in python. | | CO3 | A | | 1 |
| 6. | Identify the type of inheritance | | CO3 | U | | 1 |
| 7. | Implement on how a turtle object is created. | | CO4 | A | | 1 |
| 8. | Interpret the RGB value for the color gray. | | CO4 | A | | 1 |
| 9. | Define GUI. | | CO5 | R | | 1 |
| 10. | Demonstrate on the purpose of the sticky attribute used in the grid layout manager. | | CO5 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Develop a python code to find the armstrong of a number. | | CO1 | | C | 3 |
| 12. | Appraise on the string functions: upper(), split() and lower() with an example. | | CO2 | | E | 3 |
| 13. | Demonstrate on the use of lambda to create anonymous functions. | | CO3 | | A | 3 |
| 14. | Relate on how a colored image can be converted to a b/w image. | | CO4 | | An | 3 |
| 15. | Discuss on the pack layout manager used in GUI. | | CO5 | | U | 3 |
| 16. | Demonstrate on how python STL files are read. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Appraise on the jump statements associated in python with supporting illustrations. | CO1 | | E | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Examine how elements in a list are inserted and removed. | CO2 | | An | 6 |
|  | b. | Develop a python code to check the string “level” is a palindrome or not. | CO2 | | C | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Develop a python code to find the cube of a number using a function. | CO3 | | C | 6 |
|  | b. | Explain the types of inheritance with examples. | CO3 | | C | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Develop a python code to draw the below shape.  hex12 | CO4 | | C | 6 |
|  | b. | Write a python code to find the edges of the image | CO4 | | E | 6 |
|  |  |  |  | |  |  |
| 21. |  | Organize widgets like combobox, listbox and multiline textbox on the GUI used in tkinter for a GUI application. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Examine how a combo-box is used in a GUI application. | CO5 | | An | 6 |
|  | b. | Develop a python code to blur a given image using Gaussian Blur. | CO4 | | C | 6 |
|  |  |  |  | |  |  |
| 23. |  | Appraise on tuple with the supporting member functions with examples. | CO2 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Relate how the python libraries SciPy, iky, PyMesh and SfePy are supporting any mechanical application. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Choose the basic programming constructs of Python suitably. |
| CO2 | Infer the concepts of string processing, file I/O, lists and dictionary. |
| CO3 | Apply modules for reusability and the object-oriented principles for modeling and developing. |
| CO4 | Software system. |
| CO5 | Utilize the power of graphics for processing images. |
| CO6 | Construct applications with graphical user interface. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 2 | - | - | 12 | 3 | 17 |
| CO2 | - | 1 | - | 7 | 15 | 6 | 29 |
| CO3 | - | 1 | 4 | - | - | 12 | 17 |
| CO4 | - |  | 2 | 3 | 6 | 12 | 23 |
| CO5 | 1 | 3 | 1 | 18 | - | - | 23 |
| CO6 | - | - | 3 | 12 | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2003** | **Duration** | **3hrs** |
| **Course Name** | **AUGMENTED REALITY AND VIRTUAL REALITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the steps to build a simple 3D world. | | CO1 | R | | 1 |
| 2. | Name a low-fidelity VR prototyping tool. | | CO1 | R | | 1 |
| 3. | Distinguish between perception and sensation. | | CO2 | U | | 1 |
| 4. | Illustrate position and motion trackers. | | CO2 | A | | 1 |
| 5. | Compare spatialization and localization in audio displays. | | CO3 | An | | 1 |
| 6. | Give examples of3D rendering APIs. | | CO3 | U | | 1 |
| 7. | Infer on collision detection in VR. | | CO4 | U | | 1 |
| 8. | Compare markerless and marker-based AR. | | CO4 | An | | 1 |
| 9. | List the features of the Microsoft remote assist. | | CO5 | R | | 1 |
| 10. | Explain the concept of Augmented Identity. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Design the flow diagram of a modern VR system pipeline. | | CO1 | | C | 3 |
| 12. | Write notes on distributed VR architectures. | | CO2 | | U | 3 |
| 13. | Illustrate Milgram’s Mixed Reality (MR) continuum. | | CO3 | | A | 3 |
| 14. | Infer on Visual Inertial Odometry (VIO) systems. | | CO4 | | R | 3 |
| 15. | Discuss the usage of social panoramas and Holoportation. | | CO5 | | U | 3 |
| 16. | Visualize Facebook spaces as a future collaboration tool. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Illustrate the five classic components of VR systems. | CO1 | | U | 6 |
|  | b. | Visualize the future of human experience using AR and VR technologies. | CO1 | | U | 6 |
| 18. | a. | Describe human perception models in the context of VR. | CO2 | | U | 6 |
|  | b. | Analyze VR health and safety issues from an end user’s viewpoint. | CO3 | | An | 6 |
| 19. | a. | Explain in detail the visual perception, motion tracking, navigation and manipulation interfaces in VR. | CO2 | | An | 6 |
|  | b. | Discuss the methods of inside-out camera tracking and full-body tracking with suitable examples. | CO4 | | U | 6 |
| 20. | a. | Summarize VR graphics, its challenges, architecture layers, perception-based graphics and foveated rendering. | CO3 | | E | 6 |
|  | b. | Write notes on object hierarchies, physical modeling, collision detection and surface deformation. | CO4 | | A | 6 |
| 22. | a. | Explain in detail the following: FAST corner keypoint detection and tracking from an unknown environment using SLAM. | CO4 | | An | 6 |
|  | b. | Illustrate a collaborative VR environment system setup using a block diagram. | CO5 | | An | 6 |
| 21. | a. | Explain in detail the typical AR interaction methods and design principles with a case study. | CO6 | | A | 6 |
|  | b. | Discuss how VR can be used for the treatment of arachnophobia and other similar fears. | CO5 | | U | 6 |
| 23. | a. | Assess rendering architectures, graphics accelerators and 3D rendering APIs for immersive environments. | CO4 | | U | 6 |
|  | b. | Illustrate the methodologies used for VR-based training for neuro-rehabilitation of paralysis patients with emphasis on the concepts of presence, agency and interactivity. | CO5 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Discuss in detail the application of VR in Building information modeling (BIM) and architectural visualization. | CO6 | | U | 6 |
|  | b. | Examine in detail the applications of AR in advertising and sales, assembly and maintenance, medical trials and enhanced interactive experiences. | CO6 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the augmented reality and virtual reality technologies. |
| CO2 | Demonstrate motion trackers, navigators in augmented and virtual reality environments. |
| CO3 | Estimate the effect of virtual reality and augmented reality simulation on users. |
| CO4 | Analyze camera tracking and 3D rendering in augmented reality. |
| CO5 | Identify the various modeling techniques in virtual reality. |
| CO6 | Design real-time applications using virtual and augmented reality. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 12 | - | - | - | 3 | 17 |
| CO2 | - | 10 | 1 | 6 | - | - | 17 |
| CO3 | - | 1 | 3 | 7 | 6 | - | 17 |
| CO4 | 3 | 13 | 6 | 7 | - | - | 29 |
| CO5 | 1 | 9 | - | 12 | - | - | 22 |
| CO6 | - | 10 | 12 | - | - | - | 22 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2004** | **Duration** | **3hrs** |
| **Course Name** | **AUTOMATIC SPEECH RECOGNITION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Give examples for voiced speech. | | CO1 | U | | 1 |
| 2. | Enumerate the types of phonetics. | | CO1 | R | | 1 |
| 3. | State pitch period of a speech signal. | | CO2 | R | | 1 |
| 4. | Define Spectral distortion. | | CO2 | R | | 1 |
| 5. | Express the parameters of Gaussian-Mixture Model. | | CO3 | U | | 1 |
| 6. | List the types of conventional acoustic models. | | CO3 | R | | 1 |
| 7. | Label the data preprocessing techniques in Deep Neural Network. | | CO4 | U | | 1 |
| 8. | Identify the Minimum Square Error. | | CO4 | R | | 1 |
| 9. | Explain low level features. | | CO5 | U | | 1 |
| 10. | Predict the hidden layers are indeed transferable to other languages. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the basic speech parameters that can be used in many speech recognition applications. | | CO1 | | An | 3 |
| 12. | Estimate the Weighted Cepstral distances. | | CO2 | | U | 3 |
| 13. | Differentiate Gaussian Mixture Model (GMM) and Hidden Markov Model (HMM) model. | | CO3 | | An | 3 |
| 14. | Identify the types of activation function in Deep Neural Network. | | CO4 | | U | 3 |
| 15. | Compare high level and low level features. | | CO5 | | An | 3 |
| 16. | Describe the procedure for cross lingual model transfer. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Illustrate the Linear Predictive Coding (LPC) based synthesizer for a given input speech signal. | CO1 | | U | 8 |
|  | b. | Explain the usage of Short Time Fourier Analysis for speech signals. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. | a. | Describe the computation steps of Mel Frequency Cepstral Coefficients (MFCC) features from the speech signal. | CO2 | | U | 8 |
|  | b. | Explain Linear Predictive Coding (LPC) Analysis model. | CO2 | | An | 4 |
|  |  |  |  | |  |  |
| 19. | a. | Explain the basic architecture of Automatic Speech Recognition (ASR) system. | CO3 | | An | 8 |
|  | b. | Construct the transition matrix of the transition diagram. | CO3 | | A | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Describe the architecture of Deep Neural Network. | CO4 | | U | 8 |
|  | b. | Discuss the limitations of linear activation function in Deep Neural Network. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Express the robustness of features in Deep Neural Network. | CO5 | | U | 8 |
|  | b. | Discover the deep model that jointly learns feature representation  and classification. | CO5 | | U | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Discuss the parameters of a Hidden Markov Sequence Model. | CO3 | | U | 8 |
|  | b. | Compare Gaussian Mixture Model and Hidden Markov Model. | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Categorize the important adaptation techniques developed for Deep Neural Networks. | CO5 | | An | 8 |
|  | b. | Describe the feature hierarchy in Deep Neural Network. | CO5 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the architecture of multitask learning in deep neural networks. | CO6 | | U | 8 |
|  | b. | Illustrate the improved robust speech recognition system by exploiting audio-visual information. | CO6 | | An | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of speech processing techniques. |
| CO2 | Choose the appropriate speech analysis techniques. |
| CO3 | Design a suitable acoustic model for a given input speech. |
| CO4 | Illustrate the models for recognizing given input speech. |
| CO5 | Describe the learning using Deep Neural Networks for a given speech. |
| CO6 | Develop an advanced deep model for Automatic Speech Recognition. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 |  | 2 |  |  | 17 |
| CO2 | 2 | 11 |  | 4 |  |  | 17 |
| CO3 | 1 | 13 | 4 | 11 |  |  | 29 |
| CO4 | 1 | 16 |  |  |  |  | 17 |
| CO5 |  | 17 |  | 11 |  |  | 28 |
| CO6 |  | 12 |  | 4 |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2005** | **Duration** | **3hrs** |
| **Course Name** | **BIGDATA QUERY LANGUAGE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | What is Big Data? | CO1 / R | 1 |
| 2. | What is Web Data? | CO1/ U | 1 |
| 3. | Define is Map Reduce? | CO2/ A | 1 |
| 4. | What is the significance of HDFS? | CO2/ An | 1 |
| 5. | What is a lazy evaluation in Spark? | CO2/ E | 1 |
| 6. | What is a Lineage Graph? | CO3/ C | 1 |
| 7. | What are the data types available in Hive query language? | CO3/ R | 1 |
| 8. | What are the data file formats in Hive databases? | CO4/ U | 1 |
| 9. | What is the role of load function in Python? | CO5/ A | 1 |
| 10. | What are the objectives of PIG data model? | CO6/ U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | What are the differences between descriptive and predictive analytics? | CO1/ R | 3 |
| 12. | What are the features of HADOOP? | CO2/ U | 3 |
| 13. | List out various relational operators available in PIG data model. | CO3/ A | 3 |
| 14. | What is the significance of Apache Spark? | CO4/ E | 3 |
| 15. | Discuss the performance of adhoc query on HDFS data using Hive Query Language. | CO5/ U | 3 |
| 16. | List out various applications of RDBMS design. | CO6/ R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Discuss the challenges in conventional database systems. | CO1/ U | 4 |
| b. | Explain the process of analysis and reporting in Big data. | CO2/ A | 4 |
| c. | Discuss Data analytic tools in Big Data. | CO2/ A | 4 |
|  |  |  |  |  |
| 18. | a. | Explain HDFS architecture. | CO2/ R | 4 |
| b. | Discuss MapReduce architecture. | CO3/ U | 4 |
| c. | Discuss the role of SQL on HADOOP. | CO3/ A | 4 |
|  |  |  |  |  |
| 19. | a. | Explain how to implement Join in PIG data model. | CO4/ A | 4 |
| b. | Describe the process of integrating Pig with Legacy Code and Map Reduce. | CO5/ U | 4 |
| c. | How can we Embed Pig Latin in Python? | CO5/ R | 4 |
|  |  |  |  |  |
| 20. | a. | Discuss Resilient Distributed Datasets. | CO4/ R | 4 |
| b. | Explain Spark clusters. | CO5/ U | 4 |
| c. | Describe RDD and its features in Spark. | CO5/ A | 4 |
|  |  |  |  |  |
| 21. | a. | Explain Data manipulation queries in Hive query language. | CO5/ U | 4 |
| b. | Describe views in Hive. | CO3/ A | 4 |
| c. | Discuss the process of schema design in Hive databases. | CO3/ R | 4 |
|  |  |  |  |  |
| 22. | a. | Describe DAG in Apache spark. | CO4/ U | 4 |
| b. | Explain input and output operators in PIG. | CO4/ A | 4 |
| c. | Discuss transformations in Apache spark. | CO6/ R | 4 |
|  |  |  |  |  |
| 23. | a. | Discuss Architecture of RHADOOP. | CO3/ A | 4 |
| b. | List out features of R language. | CO4/ U | 4 |
| c. | Discuss sampling distributions in Big Data. | CO4/ R | 4 |
|  |  | **Compulsory:** | | |
| 24. | a. | Explain the process of integrating Cassandra with Hadoop. | CO5/ R | 4 |
| b. | Explain the analysis of Covid Data with HDFS and MapReduce Database Design. | CO3/ U | 4 |
| c. | Discuss how to create database and loading schema in Hadoop and MapReduce. | CO2/ A | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the importance and challenges of Big data |
| CO2 | Design applications using HADOOP and RHADOOP |
| CO3 | Identify the appropriate function of PIG data model to be used in development |
| CO4 | Model Big data applications schema and use HIVE QL |
| CO5 | Develop applications with Cassandra. |
| CO6 | Build applications with HDFS and MapReduce |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 5 | - | - | - | - | 9 |
| CO2 | 4 | 3 | 13 | 1 | 1 | - | 22 |
| CO3 | 5 | 8 | 15 | - | - | 1 | 29 |
| CO4 | 8 | 9 | 8 | - | 3 |  | 28 |
| CO5 | 8 | 15 | 5 | - | - | - | 28 |
| CO6 | 7 | 1 | - | - | - | - | 08 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2006** | **Duration** | **3hrs** |
| **Course Name** | **COGNITIVE COMPUTING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | State cognitive science. | | CO1 | R | | 1 |
| 2. | List the types of cognition processes. | | CO1 | R | | 1 |
| 3. | Enumerate three domains that have led to the development of cognitive computing. | | CO2 | R | | 1 |
| 4. | Write a few examples of Intelligent Systems. | | CO4 | A | | 1 |
| 5. | Name two disadvantages of cognitive computing. | | CO2 | R | | 1 |
| 6. | Interpret the uses of Natural Language Processing. | | CO4 | U | | 1 |
| 7. | Define machine learning. | | CO4 | R | | 1 |
| 8. | Infer your views on the corpus. | | CO3 | An | | 1 |
| 9. | Write two key elements of the machine learning process. | | CO3 | A | | 1 |
| 10. | Recite the meaning of Speech Analytics. | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List two tasks of the feature extraction layer. | | CO1 | | R | 3 |
| 12. | Name a few applications of Text analytics. | | CO3 | | R | 3 |
| 13. | Describe the three fundamental principles of the cognitive system. | | CO3 | | U | 3 |
| 14. | Define cune condition. | | CO3 | | R | 3 |
| 15. | Explain the voice of the customer. | | CO6 | | A | 3 |
| 16. | Infer ontologies with example. | | CO3 | | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | List the usage of Cognitive Computing in various fields. | CO1 | | R | 9 |
|  | b. | Enumerate three eras of computing. | CO1 | | R | 3 |
|  |  |  |  | |  |  |
| 18. |  | Summarize how different computer scientists have proposed their views on the development of cognitive computing. | CO1 | | E | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Describe the three types of machine learning with examples. | CO1 | | U | 8 |
|  | b. | Define hypotheses generation and scoring. | CO4 | | R | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Recite three steps involved in STE-M Model in detail with a diagram. | CO4 | | R | 7 |
|  | b. | Sketch the Cognitive Analytics diagram. | CO4 | | A | 5 |
|  |  |  |  | |  |  |
| 21. | a. | Enumerate how the text analytics is done and its importance in the marking field. | CO4 | | R | 9 |
|  | b. | Write the functions of Linguistic analysis. | CO2 | | A | 3 |
|  |  |  |  | |  |  |
| 22. | a. | Explain the Hidden Markov Model and how the Hidden Markov Model is used in speech and image recognition. | CO3 | | A | 8 |
|  | b. | Infer the functionality of Automated Speech Recognition. | CO4 | | An | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Illustrate how lexical analysis is done with examples. | CO3 | | U | 7 |
|  | b. | Write how leveraging the connected world of the Internet of Things is done with a real time example. | CO3 | | A | 5 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | List the Commercial Applications of IBM Watson. | CO5 | | R | 5 |
|  | b. | Discuss computer vision and discuss its usage in different fields. | CO6 | | U | 7 |

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|  | **COURSE OUTCOMES** |
| CO1 | Outline the importance of cognitive computing. |
| CO2 | Analyze the business implications of cognitive computing. |
| CO3 | Apply natural language technologies to business problems. |
| CO4 | Apply machine learning for a specific real-world application. |
| CO5 | Develop Chabot applications for business problems. |
| CO6 | Develop Cognitive applications in health care using machine learning. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 17 | 8 | - | - | 12 | - | 37 |
| CO2 | 2 | - | 3 | - | - | - | 5 |
| CO3 | 7 | 10 | 14 | 4 | - | - | 35 |
| CO4 | 21 | 1 | 6 | 4 | - | - | 32 |
| CO5 | 5 | - | - | - | - | - | 5 |
| CO6 | - | 7 | 3 | - | - | - | 10 |
|  | | | | | | | **124** |

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| **Course Code** | **20CS2007** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER COMMUNICATION AND NETWORKS** | **Max. Marks** | **100** |

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| --- | --- | --- | --- |
| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Define Computer Network. | CO1/R | 1 |
| 2. | Define Topology. | CO1/ R | 1 |
| 3. | State Flow Control. | CO2/ R | 1 |
| 4. | Define ARQ. | CO2 / R | 1 |
| 5. | Define the term Carrier sense in CSMA CD. | CO3 / R | 1 |
| 6. | List the functions of LLC. | CO3 / R | 1 |
| 7. | Define Datagram. | CO4 / R | 1 |
| 8. | What is a bridge? | CO4 / R | 1 |
| 9. | Explain the keys for understanding Link State Routing. | CO5 / U | 1 |
| 10. | Differentiate Encryption and Decryption. | CO6 / U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Write about Analog to digital conversion method. | CO1 / U | 3 |
| 12. | Describe stop and wait ARQ error control. | CO2 / R | 3 |
| 13. | Explain in detail DQDB. | CO3 / U | 3 |
| 14. | List the approaches of Packet switching techniques in detail. | CO4 / R | 3 |
| 15. | Explain Logical Addressing. | CO5 / U | 3 |
| 16. | Describe Congestion Control. | CO6 / R | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Summarize the multiplexing techniques. | CO1 / U | 4 |
| b. | Explain in detail the Modems. | CO1 / U | 3 |
| c. | Illustrate the Hamming code used for error correction with an example | CO1 / U | 5 |
|  |  |  |  |  |
| 18. | a. | Explain character oriented protocol with necessary diagram. | CO2 / U | 5 |
| b. | Explain in detail the types of Bit - Oriented Protocol. | CO2 / U | 3 |
| c. | Analyze the Concept of Go back-n ARQ and Selective repeat ARQ | CO2/ An | 4 |
|  |  |  |  |  |
| 19. | a. | Explain the concept of Token Bus and Token Ring. | CO3 / U | 4 |
| b. | Explain FDDI in detail. | CO3 / U | 4 |
| c. | Explain in detail about IEEE 802.1 | CO3 / U | 4 |
|  |  |  |  |  |
| 20. | a. | Illustrate distance vector routing with an example. | CO4 / U | 5 |
| b. | Explain about Circuit Switching and Message switching. | CO4 / U | 3 |
| c. | Explain in detail about frame relay | CO4 / U | 4 |
|  |  |  |  |  |
| 21. | a. | Explain in detail the protocol which provides synchronization points for data exchange. | CO5 / U | 4 |
| b. | What are Multicast Routing Protocols? | CO5 / R | 4 |
| c. | Analyze the Concept of Address Mapping. | CO5/ An | 4 |
|  |  |  |  |  |
| 22. | a. | Explain the different types of implementation in Ethernet. | CO3 / U | 5 |
| b. | Illustrate SMDS architecture. | CO3 / U | 4 |
| c. | Explain the working principle of CSMA/CD with neat diagram. | CO3 / U | 3 |
|  |  |  |  |  |
| 23. | a. | Explain X.25 protocol. | CO4 / U | 4 |
| b. | What are internetworking devices? | CO4/ R | 4 |
| c. | Elaborate on ATM. | CO4 / U | 4 |
|  |  | **Compulsory:** | | |
| 24. | a. | Describe DNS. | CO6 / U | 4 |
| b. | Explain in detail HTTP. | CO6 / U | 4 |
| c. | What is TELNET? Explain in detail. | CO6 / R | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the components and layered architecture of communication networks  . |
| CO2 | Identify the protocols and services of data link layer |
| CO3 | Analyze the different LAN technologies for building networks. |
| CO4 | Describe the wireless WAN technologies for wireless transmission |
| CO5 | Design network model and determine the routing protocols for different applications |
| CO6 | Construct communication networks for supporting different applications |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 5 | 8 | - | 4 | - | - | 17 |
| CO3 | 2 | 27 | - | - | - | - | 29 |
| CO4 | 9 | 20 | - | - | - | - | 29 |
| CO5 | 4 | 8 | - | 4 | - | - | 16 |
| CO6 | 7 | 9 | - | - | - | - | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **20CS2008** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER NETWORKS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define Protocol. | | CO1 | R | | 1 |
| 2. | List the categories of physical media in computer network. | | CO1 | R | | 1 |
| 3. | Enumerate the application layer protocols. | | CO2 | U | | 1 |
| 4. | List the types of Network topologies. | | CO2 | R | | 1 |
| 5. | Write the services provided by TCP protocol. | | CO3 | R | | 1 |
| 6. | Sketch the UDP header format. | | CO3 | U | | 1 |
| 7. | State the range of class B address in IPv4 address. | | CO4 | R | | 1 |
| 8. | List the types of IPv6 unicast address. | | CO4 | R | | 1 |
| 9. | Mention the role of ARP protocol. | | CO5 | R | | 1 |
| 10. | Define point-to-point link. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Paraphrase the switching techniques for data transmission. | | CO1 | | U | 3 |
| 12. | Write short notes on cookies and web caching. | | CO2 | | An | 3 |
| 13. | Calculate UDP check sum for the following data. 0110011001100000, 1101010101010101 | | CO3 | | A | 3 |
| 14. | Summarize the purpose of ICMP protocol of the network layer. | | CO4 | | U | 3 |
| 15. | Consider a 4 bit generator G=1001, and data D=101110. Compute the value of R using the CRC error detection method. | | CO5 | | A | 3 |
| 16. | Paraphrase the types of clouds. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Summarize the TCP/IP layer of the protocol suite with a neat diagram. | CO1 | | U | 12 |
| 18. | a. | Describe the format of HTTP request and response message. State the different methods in HTTP request message of HTTP/1.0 and HTTP/1.1? | CO2 | | R | 8 |
|  | b. | Summarize the services provided by DNS. | CO2 | | R | 4 |
| 19. | a. | With a neat diagram, discuss the TCP header structure. | CO3 | | R | 6 |
|  | b. | Compare the flow control and congestion features of Transport layer protocol. | CO3 | | An | 6 |
| 20. | a. | Explain the Router architecture in detail. | CO4 | | U | 6 |
|  | b. | Summarize the protocol that is used for error reporting across the devices in the network layer. | CO3 | | R | 6 |
| 21. | a. | Sketch the Ethernet frame structure and explain its fields. | CO5 | | U | 6 |
|  | b. | Explain any two random access protocols in detail. | CO5 | | U | 6 |
| 22. | a. | Describe the BGP protocol used in Inter-AS domain routing. | CO3 | | U | 6 |
|  | b. | Sketch the header format of the IPv4 packet and explain all the fields and give an example for fragmentation. | CO4 | | U | 6 |
| 23. |  | Apply the Dijkstra’s algorithm to compute the shortest path from node A to all other nodes in the topology with given link cost. Write the step by step procedure for finding shortest path with algorithm. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Compare and contrast the traditional IP networks and the Software defined Networks. | CO6 | | An | 6 |
|  | b. | Describe the SDN architecture and explain the operations and devices used in the SDN. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the factors influencing computer network infrastructure and development. |
| CO2 | Apply the network protocols in building the computer networks. |
| CO3 | Analyze the routing algorithms and their behaviors. |
| CO4 | Design computer networks with optimized address assignment |
| CO5 | Evaluate the performance and characteristics of network protocols. |
| CO6 | Develop real life network based projects. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 13 | 1 | - | 3 | - |  | 17 |
| CO3 | 13 | 7 | 15 | 6 | - | - | 41 |
| CO4 | 2 | 15 | - | - |  |  | 17 |
| CO5 | 2 | 12 | 3 | - | - | - | 17 |
| CO6 | - | 9 | - | 6 | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2009** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER ORGANIZATION AND ARCHITECTURE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | PC is located inside the CPU and it hold the number of instructions in the currently executed program. Analyze the statement and defend your answer. | | CO1 | An | | 1 |
| 2. | Recall the name of the process “Read instruction from its memory location into the process”. | | CO2 | R | | 1 |
| 3. | Mention the capacity of a memory cell? | | CO2 | U | | 1 |
| 4. | Consider a direct mapped cache of size 16 KB with block size 256 bytes. The size of the main memory is 128 KB. Find the number of bits required for representing a physical address. | | CO2 | A | | 1 |
| 5. | List the major functions of the I/O module. | | CO2 | R | | 1 |
| 6. | Recite the states of a process. | | CO4 | An | | 1 |
| 7. | Define machine instruction. | | CO4 | A | | 1 |
| 8. | Visualize the little endian byte ordering of the number 651AB2, if the starting address of the storage is 5000. | | CO5 | A | | 1 |
| 9. | List the various types of instruction formats. | | CO3 | U | | 1 |
| 10. | Define micro operation. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Software interrupt may not require an interrupt service routine to correct the error: criticize the above statement. | | CO3 | | A | 3 |
| 12. | Consider the following integer values (+10) and (-7)  Perform 2’s complement addition between above integer values.  Note: above integer values need to be converted into binary representation. | | CO3 | | A | 3 |
| 13. | Compare and contrast the different types of Read Only Memory. | | CO1 | | U | 3 |
| 14. | Illustrate the division of 11100110 by 110 binary integers and compute the remainder and quotient. | | CO2 | | An | 3 |
| 15. | Summarize the four registers that are essential to instruction execution. | | CO1 | | R | 3 |
| 16. | Determine the sequence of micro-operations required to execute the instruction  ADD R1, X. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Analyze the simplified view of the principal components of a typical multi core computer in detail. | CO1 | | U | 6 |
|  | b. | Elucidate in detail about the structure and the functions of a computer. | CO1 | | R | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Consider a direct mapped cache of size 512 KB with block size 1 KB. There are 7 bits in the tag. Find-   1. Size of main memory. 2. Number of bits in physical address. | CO2 | | A | 8 |
|  | b. | Illustrate the error correction process in memory with suitable diagram. | CO2 | | U | 4 |
|  |  |  |  | |  |  |
| 19. |  | Consider the following:  8 bit data: 10101010. While writing this data bit into the memory, how many check bits are required. While reading the same data bit, the following is received from the memory: 10101110. Apply the hamming error detection method to detect the error bit position and rectify the same. Draw the necessary diagram for the above calculation. | CO2 | | E | 12 |
|  |  |  |  | |  |  |
| 20. |  | Compare and contrast the following techniques for I/O operations with necessary block diagrams         1. Programmed I/O         2. Interrupt Driven I/O         3. DMA | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Sketch the instruction execution state diagram with interrupt and relate the instruction execution process with the state diagram. | CO3 | | R | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Sketch the flow diagram of Programmed I/O. Compare and contrast the types  of Programmed I/O. | CO3 | | U | 6 |
|  | b. | Multiply (-2) and (5) using Booth Algorithm. | CO4 | | A | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Analyze the figure given below and describe the type of addressing mode to carry out the operations.  https://lh5.googleusercontent.com/NKWDkKAmlrej8CypWU9Dwd7rdWssGrAwNy37GV05AGiSVe4wZ5BmpXv3KrDjPDYX91SFfuIq8DoyMJqC8b8-rrn98neIloof59AFMqH4YPoJfCUGX_w-p77DGyiNj76oTiCl_YzWOrzs2a4JzClp5I9oXrpi0LE4CSh4isWaHIYuC2CERcBvZeE1xg | CO5 | | E | 6 |
|  | b. | Describe the three types of data hazards with examples. | CO5 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Sketch the block diagram of the control unit and explain internal operation of the control unit. | CO6 | | A | 6 |
|  | b. | Compare and contrast the horizontal and vertical microinstruction to implement a micro programmed control unit. | CO6 | | An | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Explain function of the central processing unit. |
| CO2 | Develop algorithms for error correction for memory modules (main and cache memory). |
| CO3 | Design and understand various input and output modules for central processing unit. |
| CO4 | Select and use standard addressing modes for logical and physical memory addressing. |
| CO5 | List and define various stages of instruction pipelining in processor. |
| CO6 | Explore various ways to implementing the micro instruction sequencing and execution. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 9 | 9 | - | 1 | - | - | 19 |
| CO2 | 2 | 5 | 9 | 3 | 12 | - | 31 |
| CO3 | 12 | 19 | 6 | - | - | - | 37 |
| CO4 | - | - | 7 | 1 | - | - | 8 |
| CO5 | - | 6 | 1 | - | 6 | - | 13 |
| CO6 | 1 | - | 9 | 6 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2013** | **Duration** | **3hrs** |
| **Course Name** | **DATA STRUCTURES AND ALGORITHMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Arrange the given Big O notations in ascending order in terms of rate of growth.  O (log n),O (n),O (n log n),O (n\*n) | | | CO1 | U | | 1 |
| 2. | Represent the function ***“167n2 + n log 2+ 55n”*** in Big-Oh notation. | | | CO1 | U | | 1 |
| 3. | Convert the following infix expression A+B\*C+D-B/(C+A\*D) to its equivalent reverse polish notation. | | | CO2 | R | | 1 |
| 4. | Illustrate the selection sorting for the following unsorted elements for four iterations. | | | CO4 | R | | 1 |
| 5. | Consider a stack with four elements 10, 20, 30 and 40. Indicate the top element after performing two pop operations. | | | CO2 | U | | 1 |
| 6. | List the keys in the following binary tree in post-order | | | CO3 | R | | 1 |
| 7. | In the below tree a) and b) which is AVL tree and which is not an AVL tree? Why? | | | CO5 | An | | 1 |
| 8. | Identify the order of values after the first iteration of insertion sort in the following list of values? ***42, 23, 34, 76, 12, 90*** | | | CO4 | U | | 1 |
| 9. | Estimate the worst-case time complexity for the merge sort algorithm. | | | CO5 | U | | 1 |
| 10. | Identify the number of iterations required by radix sort to the list: ***45, 786, 21, 9, 4576, 98, 35, 2, 65, 125*** | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Visualize and describe the steps and algorithm to solve a Tower of Hanoi puzzle with 4 discs. | | | CO1 | | An | 3 |
| 12. | Given an array, **arr[1………12][1………17]** with base value **100** and the size of each element is **1 Byte** in memory. Locate the address of **arr[7][5]** with the help of row-major order. | | | CO2 | | U | 3 |
| 13. | Consider the following circular linked list:    Write the code to insert “55” at the rear of the above circular linked list | | | CO3 | | An | 3 |
| 14. | Void function (int n)  {  int i, j, k, count=0;  for (i=n/2; i<=n; i++)  {  for (j=1; j+(n/2) <=n; j=j+1)  {  for(k=1;k<=n; k=k\*2)  {  Count ++;  }}}}  Predict the time complexity for the above code snippet. | | | CO4 | | A | 3 |
| 15. | Explain Binary Search tree with an example. | | | CO5 | | An | 3 |
| 16. | Compute the in-degree and out-degree of the vertices in the graph given. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain in detail about time and Space trade off. | CO1 | | R | 4 |
|  | | b. | Describe analysis of algorithm and write recursive algorithm for multiplication of square matrix. | CO1 | | U | 8 |
|  | |  |  |  | |  |  |
| 18. | | a. | Demonstrate the Enqueue, dequeue and display functions of queue data structure with code and example. | CO2 | | U | 8 |
|  | | b. | Describe an algorithm for push and pop operation in stack. | CO2 | | R | 4 |
|  | |  |  |  | |  |  |
| 19. | | a. | Write an algorithm that counts the number of nodes in linked list. | CO3 | | U | 5 |
|  | | b. | Brief note on the following functions in a doubly -linked list with suitable pseudo code:   * Insert at the front * Delete from the end | CO3 | | U | 7 |
|  | |  |  |  | |  |  |
| 20. | |  | Represent an algorithm and necessary code snippet to sort the given list of integers using bubble sort.  ***data = [14, 33, 27, 35, 10]*** | CO4 | | U | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Design an AVL Tree with the values: ***44, 27, 32, 78, 90, 38, 48, 80, 62, 54***. Explain the different rotations that are used to balance the tree | CO5 | | A | 6 |
|  | | b. | Create a B-Tree of order 5 from the list of items:  ***1, 7, 6, 2, 11, 4, 8, 13, 10, 5, 19, 9, 18, 24, 3, 12, 14, 20, 21, 16.*** | CO5 | | C | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Explain hashing technique for storing and accessing data. Illustrate the linear probing method for handling collisions by keeping the following values in a hash table of size 10. Apply the hash function “**key % 10”**.  ***760, 739, 249, 732, 865, 329, 372, 563.*** | CO3 | | A | 6 |
|  | | b. | Consider the following singly linked list and create the pseudocode to insert a node with data 100 after the node with element 5: | CO3 | | A | 6 |
|  | |  |  |  | |  |  |
| 23. | |  | Consider the following binary search tree:    Insert the following elements in the tree and elucidate the pseudocode for inserting elements in the binary search tree  ***100,1,38,24,56,21,14,11,43,34,32*** | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Describe the Depth First Search algorithm of the graph with an example. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of abstract data type and algorithm analysis. |
| CO2 | Illustrate the use of array to implement stack and queue. |
| CO3 | Apply linked list to design stack and queue data structures. |
| CO4 | Demonstrate the working of sorting and searching algorithms and application of hashing. |
| CO5 | Understand the different types of tree data structures and demonstrate the methods for traversing trees. |
| CO6 | Differentiate the graph representations and traversals. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 10 | - | 3 | - | - | 17 |
| CO2 | 5 | 12 | - | - | - | - | 17 |
| CO3 | 1 | 12 | 12 | 3 | - | - | 28 |
| CO4 | 1 | 13 | 3 | - | - | - | 17 |
| CO5 | 3 | 1 | 18 | 1 | - | 6 | 29 |
| CO6 | 12 | 4 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2014** | **Duration** | **3hrs** |
| **Course Name** | **DATA VISUALIZATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define visual perception. | | | CO6 | R | 1 |
| 2. | Name the term which is handled primarily by the cerebral cortex in the front of the brain. | | | CO6 | R | 1 |
| 3. | Enumerate any two visualization tools. | | | CO1 | R | 1 |
| 4. | List the three types of visual analytics. | | | CO2 | R | 1 |
| 5. | Express the visualization systems based on analysis type. | | | CO2 | U | 1 |
| 6. | Name any two classes of interaction techniques. | | | CO5 | R | 1 |
| 7. | Define treemaps. | | | CO3 | R | 1 |
| 8. | State tri-connected graph. | | | CO1 | R | 1 |
| 9. | Express Lambert Cylindrical Projection. | | | CO4 | U | 1 |
| 10. | Define area phenomena. | | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Discuss Information overloads. | | | CO2 | U | 3 |
| 12. | A student X surveyed his classmates on how many donuts they eat in a month. Create a visual representation with the following table which shows their responses:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 6 | 6 | 6 | 0 | 0 | | 31 | 2 | 3 | 8 | 8 | | 4 | 4 | 4 | 15 | 15 | | 5 | 9 | 2 | 0 | 5 | | 20 | 21 | 25 | 6 | 7 | | | | CO6 | C | 3 |
| 13. | Summarize the data value space in interaction techniques. | | | CO5 | U | 3 |
| 14. | Express the matrix representations for graphs. | | | CO1 | U | 3 |
| 15. | Explain the visualization of geographic information. | | | CO3 | U | 3 |
| 16. | Indicate the disadvantage of choropleth maps. | | | CO4 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Illustrate the Gestalt Principles in detail with examples. | | CO6 | A | 12 |
| 18. |  | Explain visual analytics in detail with examples. | | CO4 | U | 12 |
| 19. |  | Describe the various interaction techniques in detail. | | CO5 | U | 12 |
| 20. |  | Sketch the processes for displaying arbitrary graphs/networks. | | CO5 | A | 12 |
| 21. |  | Design adashboard with a dataset of the Tennis Players and assess the visualization.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Name** | **Height** | **Handedness** | **Points** | **Age** | **Games Played** | | Mike | 6'5" | Right | 1255 | 21 | 300 | | Pete | 6'7.5" | Left | 6500 | 26 | 450 | | Maria | 6'3" | Right | 4897 | 25 | 410 | | Roger | 6'2" | Right | 1080 | 24 | 255 | | Micky | 7' | Right | 8000 | 25 | 614 | | Stefy | 5'8" | Left | 5606 | 27 | 589 | | Lee | 7' | Right | 6982 | 28 | 612 | | Mark | 6' | Right | 4551 | 28 | 488 | | Warner | 5'5" | Right | 5555 | 24 | 563 | | | CO1 | C | 12 |
| 22. |  | Illustrate the various structures for evaluating visualization. | | CO2 | A | 12 |
| 23. |  | Write a python program to visualize the data in bar graph, scatter plot, histogram and pie chart using the matplotlib library. | | CO3 | C | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | | Illustrate the visualization of area data with real-time examples. | CO6 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design visualization dashboards by utilizing various visualization methods and tools. |
| CO2 | Describe the design process to develop visualization methods and visualization systems, and methods for their evaluation. |
| CO3 | Summarize large-scale abstract data. |
| CO4 | Understand visual mapping and the visualization. |
| CO5 | Apply actual visualization, interaction and distorting techniques. |
| CO6 | Infer recent visual perception techniques. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 3 |  |  |  | 12 | 17 |
|  |  |  |  |  |  |  |  |
| CO2 | 1 | 4 |  |  |  | 12 | 17 |
| CO3 | 1 | 3 |  |  |  | 12 | 16 |
| CO4 |  | 16 |  |  |  |  | 16 |
| CO5 | 2 | 15 | 12 |  |  |  | 29 |
| CO6 | 2 |  | 24 |  |  | 3 | 29 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2015** | **Duration** | **3hrs** |
| **Course Name** | **DATA VISUALIZATION AND PRESENTATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Define semantics. | | CO2 | R | | | 1 |
| 2. | Differentiate lookup and locate. | | CO1 | U | | | 1 |
| 3. | Enumerate the arrange design. | | CO1 | R | | | 1 |
| 4. | State space-filling layout. | | CO4 | R | | | 1 |
| 5. | Recall node-link diagrams. | | CO3 | R | | | 1 |
| 6. | Express colormap. | | CO2 | U | | | 1 |
| 7. | Define tokens. | | CO6 | R | | | 1 |
| 8. | Name any two interaction operators. | | CO3 | R | | | 1 |
| 9. | Enumerate screen space distortion. | | CO6 | R | | | 1 |
| 10. | List the issues of data in visualization research directions. | | CO5 | R | | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Summarize grid types. | | CO4 | | U | | 3 |
| 12. | Express direct volume rendering. | | CO3 | | U | | 3 |
| 13. | Distinguish rods and cones. | | CO1 | | U | | 3 |
| 14. | Discuss self-organizing maps. | | CO2 | | U | | 3 |
| 15. | Describe Object space in interaction techniques. | | CO6 | | U | | 3 |
| 16. | Explain Jigsaw visualization tool and its uses. | | CO5 | | R | | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. |  | Illustrate the four levels of validation in analysis. | CO2 | | | A | 12 |
| 18. |  | Sketch the Vector Fields with the diagrams. | CO4 | | | A | 12 |
| 19. |  | Describe the color theory in visualization techniques. | CO1 | | | U | 12 |
| 20. |  | Write a program that generates a word cloudshowing the size of the text corresponds to the frequency of the word in the document. | CO3 | | | C | 12 |
| 21. |  | Discuss the various steps in designing visualizations in detail. | CO6 | | | U | 12 |
| 22. |  | Explain the visualization systems based on data type. | CO5 | | | U | 12 |
| 23. |  | Construct the pseudocode to compute tf-idf vectors in a given document collection. | CO4 | | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. |  | Imagine that you watch a weather report on television on two separate occasions, oncewith only the sound, and the other time with only the visuals (notext, either).   1. Illustrate the quantitative and qualitative informationyou got out of each report, including the strengths and weaknessesof each technique. 2. How much more information would need to bein the visual presentation to equal the quantitative accuracy of thespoken/written report? 3. How much more information would need to bein the spoken/written report to convey qualitative information seen inthe visual presentation? 4. Suggest possible enhancements to each. | CO6 | | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Choose knowledge of perception and cognition to evaluate visualization design alternatives. |
| CO2 | Understand the role of visualization in the processing and analysis of data coming from a broad range of sources. |
| CO3 | Apply suitable data visualization tools for various applications. |
| CO4 | Identify appropriate data visualization techniques given particular requirements imposed by the data. |
| CO5 | Describe the cutting-edge research ideas in the field of visualization. |
| CO6 | Apply appropriate design principles in the creation of presentation and visualization. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 |  |  |  |  | 17 |
| CO2 | 1 | 4 | 12 |  |  |  | 17 |
| CO3 | 2 | 3 |  |  |  | 12 | 17 |
| CO4 | 1 | 3 | 24 |  |  |  | 28 |
| CO5 | 4 | 12 |  |  |  |  | 16 |
| CO6 | 2 | 15 | 12 |  |  |  | 29 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2017** | **Duration** | **3hrs** |
| **Course Name** | **DEEP LEARNING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the types of regression algorithms. | | CO1 | R | | 1 |
| 2. | Define learning. | | CO1 | U | | 1 |
| 3. | Recognize the part of the biological neural network which carries the output from the neuron body. | | CO1 | R | | 1 |
| 4. | State the fundamental difference between a densely connected layer and a convolution layer. | | CO2 | U | | 1 |
| 5. | Apply max pooling operation on an image of size 55 x55. If a filter of size 3 x 3 with a stride of 2 is applied on the image, what will be size of output image? | | CO2 | A | | 1 |
| 6. | Compare ReLU and Leaky ReLU activation functions. | | CO1 | An | | 1 |
| 7. | Tabulate the types of stochastic gradient descent optimization techniques. | | CO4 | R | | 1 |
| 8. | Identify the gate in “Gated Recurrent Units” which combines the operation of forget and input gates of LSTM. | | CO2 | U | | 1 |
| 9. | Recall the hyper parameters of autoencoders. | | CO4 | U | | 1 |
| 10. | Name the deep learning based natural language processing tasks. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Distinguish learning rate and momentum parameters in Multiple Layer Perceptron (MLP). | | CO1 | | An | 3 |
| 12. | Summarize atleast four activation functions. | | CO1 | | R | 3 |
| 13. | Consider the following input image and filter and answer the following questions:   * What will be the size of output image? * Calculate ONLY the first element of the output image? (Note: Stride=1, Padding=0).  |  |  | | --- | --- | |  | Input Image | |  | Filter | | | CO2 | | A | 3 |
| 14. | Describe the concept of skip connections in ResNet architecture. | | CO2 | | U | 3 |
| 15. | State the benefit of denoising autoencoders. | | CO3 | | An | 3 |
| 16. | Explain all the terminologies of reinforcement learning. | | CO1 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Explain the concepts of Support Vector Machine (SVM) and state its merits over MLP algorithm. Discuss the kernel trick approach in SVM with suitable illustration for converting the non-linear decision boundary to linear decision boundary. | CO1 | | An | 8 |
|  | b. | Elaborate the concept of “Perceptron learning law”. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. |  | Consider the following MLP architecture. Apply the back propagation algorithm and determine the new weight values at the end of first iteration.  Input vector [20, 22, 40], desired output [0, 1] and η=1. Use unipolar sigmoidal activation function. Initialize the weight links with the following values.  [I1, H1] = 0.25, [I2, H1] = -0.21, [I3, H1] = 0.14, [I1, H2] = 0.34, [I2, H2] = -0.2, [I3, H2] = 3.2, [H1, O1] = 5.1, [H1, O2] = 3.2, [H2, O1] = 0.5, [H2, O2] = 2.17.  **I1**  **I2**  **I3**  **O1**  **O2**  **H1**  **H2** | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 19. |  | State the purpose of ‘regularization’. Discuss all the available regularization techniques in detail with suitable illustration. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Consider an input image of size 32x32x1 and explain the concept of every layer of LeNet-5 architecture. | CO2 | | A | 6 |
|  | b. | Discuss the operation of all the layers of CNN and write down the equations to calculate the output image size of convolution and max pooling layers. | CO2 | | A | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Demonstrate the power of recurrent neural network (RNN) in resolving the vanishing gradient problem. Draw the architecture of RNN and describe its operation. | CO4 | | An | 6 |
|  | b. | Compare the architecture and functionalities of RNN and LSTM. | CO2 | | An | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Mention the drawbacks of latent space representation in autoencoders. Describe the type of autoencoder that helps to resolve the limitations. | CO3 | | An | 8 |
|  | b. | Explain the two sub-models of Generative Adversarial Networks (GAN) with suitable diagrams. | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the recursive greedy learning procedure for the Deep Belief Network (DBN) | CO2 | | U | 8 |
|  | b. | Compare atleast two transfer learning models | CO2 | | An | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss in detail the following techniques:   1. Word2Vec to handle large corpus of text 2. Sentimental analysis to identify the emotions | CO5 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of deep learning. |
| CO2 | Implement various deep learning models. |
| CO3 | Realign high dimensional data using reduction techniques. |
| CO4 | Analyze optimization and generalization in deep learning. |
| CO5 | Explore the deep learning applications. |
| CO6 | Apply the algorithms to real time problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 8 | 12 | 12 |  |  | 37 |
| CO2 |  | 13 | 16 | 22 |  |  | 51 |
| CO3 |  | 4 |  | 11 |  |  | 15 |
| CO4 | 1 | 1 |  | 6 |  |  | 8 |
| CO5 | 1 | 12 |  |  |  |  | 13 |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2018** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN AND ANALYSIS OF ALGORITHM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Define Order of Growth. | | | CO1 | R | | 1 |
| 2. | Arrange the following rate of growth in increasing order.  2N, n log n, n2, 1 , n, log n, n!, n3 | | | CO1 | U | | 1 |
| 3. | Find the code word for the character ‘b’ from the Huffman tree given. | | | CO2 | U | | 1 |
| 4. | How many linear searches will it take to find the value 7 in the list [1,4,8,7,10,28]? | | | CO2 | A | | 1 |
| 5. | Compare Prim’s and Kruskal's algorithm for the construction of the Minimum Spanning Tree. | | | CO5 | U | | 1 |
| 6. | Calculate the transitive closure matrix of the following graph. | | | CO3 | A | | 1 |
| 7. | Consider the items of size {6, 7, 5, 3} and bins of size 10. The first three items are placed in bins 1, 2 & 3 respectively.   |  |  |  | | --- | --- | --- | | Bin 1 | Bin 2 | Bin 3 | | |  | | --- | |  | | 6 | | |  | | --- | |  | | 7 | | |  | | --- | |  | | 5 | |   Which of the bins will have the item of size 3 if the Best Fit algorithm is followed to pack the items? | | | CO4 | U | | 1 |
| 8. | Identify the node number which will be explored further if LIFO branch and bound is applied in the following state space tree of the solution for travelling salesman problem. | | | CO4 | A | | 1 |
| 9. | Define Minimum Spanning Tree. | | | CO5 | R | | 1 |
| 10. | State the definition of the class NP. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Define Algorithm, Time Complexity and Space Complexity. | | | CO1 | | R | 3 |
| 12. | Consider the following Text, T[0..n-1] and Pattern, P[0..m-1]. Identify the indices in which the pattern is found.  Text: A A B AA C A A D A A B A A B A  Pattern: A A B A | | | CO2 | | A | 3 |
| 13. | Construct all possible BSTs with the following keys {8, 17, 12} and calculate their costs. | | | CO3 | | C | 3 |
| 14. | Consider branch and bound solution for the following instance of Travelling Salesman Problem by having the source node as ‘A’. Compute the cost of the root node: | | | CO4 | | A | 3 |
| 15. | Construct a minimum spanning tree by applying Kruskal's algorithm for the below graph. | | | CO5 | | C | 3 |
| 16. | State the difference between NP-Hard and NP-Complete Problems? | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain the Steps in Mathematical Analysis of Recursive Algorithms with an example. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Find the optimal solution for the fractional knapsack problem by applying greedy approach. Consider  No of items = 5  Knapsack capacity = 60 kg  The weights and profits of each item is given as follows:  (w1, w2, w3, w4, w5) = (5, 10, 15, 22, 25)  (p1, p2, p3, p4, p5) = (30, 40, 45, 77, 90) | CO2 | | A | 4 |
|  | | b. | Assume that you are given 10 tasks. The execution of each task requires 1 unit of time. Each task Ti has profit Pi and deadline di. Profit Pi is earned if task Ti is completed before dith unit of time.  Calculate the maximum profit earned and the sequence of jobs that achieves the maximum profit. | CO2 | | A | 8 |
|  | |  |  |  | |  |  |
| 19. | | a. | Solve the following instance of Matrix Chain Multiplication problem using a dynamic programming approach.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Matrix | A1 | A2 | A3 | A4 | A5 | A6 | | Dimensions | 30 x 35 | 35 x 15 | 15 x 5 | 5 x 10 | 10 x 20 | 20 x 25 | | CO3 | | A | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Find the optimal solution for the 0/1 knapsack problem by applying the LC branch and bound technique:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Items | 1 | 2 | 3 | 4 | | Profit | 40 | 30 | 50 | 105 | | Weight | 2 | 5 | 10 | 2 |   Knapsack capacity W = 16 | CO4 | | A | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Using Dijkstra’s Algorithm, find the shortest distance from source vertex ‘S’ to remaining vertices in the following graph. | CO5 | | A | 6 |
|  | | b. | Consider the undirected graph below. Construct a minimum spanning tree by applying Prim's algorithm. | CO5 | | A | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Write an algorithm to find the max element in an array of numbers. Analyze its efficiency? | CO1 | | An | 12 |
|  | |  |  |  | |  |  |
| 23. | | a. | Consider the undirected graph given. Construct a minimum spanning tree by applying Kruskal's algorithm. | CO5 | | C | 6 |
|  | | b. | Consider the following initial flow network where the first value of each edge represents the flow, and the second value represents the capacity. Calculate the maximal flow of the network. | CO5 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Demonstrate backtracking technique for finding the solution to N-Queen’s problem and write the algorithm. | CO4 | | R | 8 |
|  | | b. | Explain the difference between NP-Hard and NP-Complete. | CO6 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | analyze given algorithm and express its complexity in asymptotic notation |
| CO2 | design algorithms using brute force and greedy techniques |
| CO3 | develop dynamic programming solutions for optimization problems |
| CO4 | propose solutions using backtracking and branch-and-bound technique |
| CO5 | solve problems using fundamental graph algorithms |
| CO6 | apply suitable algorithmic technique to solve a problem and identify the problems belonging to the class of P, NP-Complete or NP-Hard |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 13 | - | 12 | - | - | 29 |
| CO2 | - | 1 | 16 | - | - | - | 17 |
| CO3 | - | - | 13 | - | - | 3 | 16 |
| CO4 | 8 | 1 | 16 | - | - | - | 25 |
| CO5 | 1 | 1 | 18 | - | - | 9 | 29 |
| CO6 | 1 | 7 | - | - | - | - | 8 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2021** | **Duration** | **3hrs** |
| **Course Name** | **DISTRIBUTED COMPUTING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | A \_\_\_\_\_\_\_\_\_\_\_\_ is one in which components located at networked computers communicate and coordinate their actions only by passing messages. | CO1 / R | 1 |
| 2. | Interaction models deals with the structure and sequencing of the communication between the elements of the system. True or False. | CO2 / U | 1 |
| 3. | \_\_\_\_\_\_\_\_\_\_\_ is used to establish a server on remote machine that can respond to queries and to retrieve information by calling a query by other computers. | CO1 / R | 1 |
| 4. | Define thread. | CO2 / U | 1 |
| 5. | Define name space. | CO2 / U | 1 |
| 6. | Why are logical clocks required in distributed system? | CO1 / R | 1 |
| 7. | Define nested transaction. | CO1 / R | 1 |
| 8. | \_\_\_\_\_\_\_\_\_\_\_ is a set of technologies for copying and distributing data and database objects from one database to another. | CO1 / R | 1 |
| 9. | What is the purpose of using distributed shared memory? | CO2 / U | 1 |
| 10. | The planned allocation and scheduling of resources to meet the needs of multimedia and other applications is referred to as \_\_\_\_\_\_\_\_\_\_\_\_. | CO1 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Write the important characteristics of IPC. | CO1 / R | 3 |
| 12. | List the major goals of Sun NFS? | CO2 / U | 3 |
| 13. | Give the important features of peer-to-peer systems. | CO2 / U | 3 |
| 14. | How are transactions recovered in distributed system? | CO3 / A | 3 |
| 15. | Why do we require replication in distributed system? | CO2 / U | 3 |
| 16. | Discuss the sequential consistency in DSM. | CO2 / U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Describe the architectural models of distributed systems. | CO1 / R | 8 |
| b. | List the approaches used in external data representation in distributed system. Explain. | CO2 / U | 4 |
|  |  |  |  |  |
| 18. | a. | Sketch the file service architecture and explain in detail the functions of these components in file service architecture. | CO 2 / U | 8 |
| b. | How does the NFS Auto mounter help to improve the performance and scalability of NFS? | CO4/ An | 4 |
|  |  |  |  |  |
| 19. |  | Write short notes on the following:  Napster and its legacy |  |  |
| a. | CO 2 / U | 6 |
| b. | Peer-to-peer middleware | CO 2 / U | 6 |
|  |  |  |  |  |
| 20. | a. | Describe the working of bully algorithm with an example. | CO 2 / U | 8 |
| b. | Give the read and write rules based on timestamp ordering. | CO 2 / U | 4 |
|  |  |  |  |  |
| 21. | a. | Describe the view-synchronous group communication with illustration. | CO3 / A | 8 |
| b. | Write in brief about fault tolerant services offered by replication. | CO2 / U | 4 |
|  |  |  |  |  |
| 22. | a. | Discuss the working procedure for RPC Model. | CO2 / U | 8 |
| b. | Cite few examples of distributed systems. | CO1 / R | 4 |
|  |  |  |  |  |
| 23. | a. | How the clock synchronization done in Cristian's method? Explain with illustration. | CO3 / A | 8 |
| b. | List the two ways for synchronizing a clock? Explain. | CO2 / U | 4 |
|  |  | **COMPULSORY** | | |
| 24. | a. | Discuss about design and implementation issues of DSM. | CO2 / U | 8 |
| b. | Describe the resource management in DMS. | CO2 / U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the distributed system models. |
| CO2 | Classify inter-process communication mechanisms and their application scenario. |
| CO3 | Illustrate a transaction and recovery control scheme for real time application. |
| CO4 | Compare various file systems architectures used in distributed systems. |
| CO5 | Construct a real time distributed system with suitable IPC, event coordination, file management, name service, transaction and concurrency control techniques. |
| CO6 | Evaluate an efficient distributed system and its applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 21 | - | - | - | - | - | 21 |
| CO2 | - | 80 | - | - | - | - | 80 |
| CO3 | - | - | 19 | - | - | - | 19 |
| CO4 | - | - | - | 4 | - | - | 04 |
| CO5 | - | - | - | - | - | - | 00 |
| CO6 | - | - | - | - | - | - | 00 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2024** | **Duration** | **3hrs** |
| **Course Name** | **ETHICS IN INFORMATION TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Indicate the values examined to develop the profile of an organizational culture. | | | CO1 | U | | 1 |
| 2. | Recall the term quality circle in an organization. | | | CO1 | R | | 1 |
| 3. | List out the unethical behaviors that can exist in an organization when there is a relationship between the IT workers and employers. | | | CO2 | R | | 1 |
| 4. | Identify the sections in the IT Act 2000 for the following offences:   1. Using the password of another person 2. Refusal to comply with the orders | | | CO2 | R | | 1 |
| 5. | Indicate the terms that addresses the ownership of an intellectual property. | | | CO3 | U | | 1 |
| 6. | Name the phenomenon where a firm acquires patents with no intention of manufacturing but licensing the patents to others. | | | CO3 | R | | 1 |
| 7. | Generalize the levels of software development maturity. | | | CO4 | U | | 1 |
| 8. | Examine the factors that affect the national productivity rates. | | | CO4 | R | | 1 |
| 9. | Identify the popular business-oriented Web site used for professional networking, with over 100 million unique visitors each month. | | | CO5 | U | | 1 |
| 10. | Predict the strategies for successful offshore outsourcing. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Analyze the ethical considerations in decision making in an organization. | | | CO1 | | An | 3 |
| 12. | Discuss how the CIA is implemented at the application level in an organization. | | | CO2 | | U | 3 |
| 13. | Appraise on the patent procedure supporting with a diagram. | | | CO3 | | An | 3 |
| 14. | Summarize the pros and cons for teleworking in an organization. | | | CO4 | | U | 3 |
| 15. | Infer on the ethical issues that arises for the social networking websites. | | | CO5 | | An | 3 |
| 16. | Trace and discuss on the threats that affect the business continuity planning. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Determine the approaches considered for an ethical decision making. | CO1 | | A | 4 |
|  | | b. | Interpret the various leadership styles adopted in an organization. | CO1 | | A | 8 |
| 18. | |  | Survey and explain on the various types of exploits encountered. | CO2 | | An | 12 |
| 19. | |  | Interpret on the key issues that apply to intellectual property and information technology. | CO3 | | A | 12 |
| 20. | | a. | Appraise on the types of software testing. | CO4 | | An | 6 |
|  | | b. | Represent and explain the quality management standards which focuses on identifying and meeting the needs, desires, and expectations of the customers. | CO4 | | A | 6 |
| 21. | | a. | Interpret with examples on social network advertising. | CO5 | | A | 6 |
|  | | b. | Explain in detail on online virtual worlds. | CO5 | | A | 6 |
| 22. | | a. | Appraise on PDCA cycle. | CO1 | | U | 8 |
|  | | b. | Sketch the fishbone diagram for the following problem:  You missed the deadline for the task given to you. | CO1 | | A | 4 |
| 23. | |  | Write in detail on Information Technology Act, 2000. | CO2 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Paraphrase on the phases of information security audit. | CO6 | | U | 6 |
|  | | b. | Interpret on the types and stages of security audits. | CO6 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand professional ethics and organizational culture conduct in information technology. |
| CO2 | Identify the various leadership styles and the suitability for the specific organization. |
| CO3 | Identify the possible Computer crimes and the rules and regulations for protection. |
| CO4 | Familiarize with the various types of IPR and the procedures for obtaining IPR |
| CO5 | Understand about the various types of Social Networking and issues. |
| CO6 | Relate to the different national and international organizational model with intellectual ability. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 9 | 16 | 3 |  |  | 29 |
| CO2 | 2 | 3 | 12 | 12 |  |  | 29 |
| CO3 | 1 | 1 | 12 | 3 |  |  | 17 |
| CO4 | 1 | 4 | 6 | 6 |  |  | 17 |
| CO5 |  | 1 | 12 | 3 |  |  | 16 |
| CO6 |  | 10 | 6 |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2027** | **Duration** | **3hrs** |
| **Course Name** | **GEOMETRIC MODELLING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define antialiasing. | | CO5 | R | | 1 |
| 2. | Distinguish pixel and resolution. | | CO1 | U | | 1 |
| 3. | Describe stereo views in 3D. | | CO2 | R | | 1 |
| 4. | Infer on color bleeding and caustics. | | CO4 | An | | 1 |
| 5. | Summarize Painter and Z-buffering algorithms. | | CO4 | E | | 1 |
| 6. | Name the texture filtering methods. | | CO5 | R | | 1 |
| 7. | Identify the usage of MIP maps in 3D graphics. | | CO5 | U | | 1 |
| 8. | Construct an example for a biquadratic Bezier patch. | | CO3 | A | | 1 |
| 9. | Name two software for creating 3D graphics. | | CO1 | R | | 1 |
| 10. | Give examples for 3D reconstruction. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Illustrate keyframes and in-betweening for animation. | | CO1 | | U | 3 |
| 12. | Infer the concepts of dithering and image compositing. | | CO4 | | An | 3 |
| 13. | Discuss on stereo image rectification. | | CO4 | | U | 3 |
| 14. | Describe the 3D graphics pipeline and standards. | | CO5 | | R | 3 |
| 15. | Construct the block diagram of the graphics rendering pipeline. | | CO5 | | C | 3 |
| 16. | Write notes on lofts, sweeps and boundary surfaces. | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Discuss in detail the techniques involved in image-based modeling (IBM) and image-based rendering (IBR). | CO1 | | U | 6 |
|  | b. | Solve Bresenham's line algorithm for computer graphics. | CO3 | | A | 6 |
| 18. | a. | Formulate the midpoint circle drawing algorithm. | CO3 | | C | 6 |
|  | b. | Discuss in detail the types of fill area algorithms with examples. | CO3 | | U | 6 |
| 19. | a. | Illustrate the Hodgman-Sutherland and Weiler-Atherton algorithms for polygon clipping. | CO3 | | An | 6 |
|  | b. | Examine the following 3D transformations: scaling, reflection, and shearing. | CO2 | | R | 6 |
| 20. | a. | Explain in detail the different types of coordinate systems with illustrative examples. | CO2 | | A | 6 |
|  | b. | Discuss on the fundamentals of color and color model transformations with suitable examples. | CO4 | | U | 6 |
| 21. |  | Explain in detail the different types of texture mapping and their significance and challenges in 3D modeling. | CO4 | | An | 12 |
| 22. | a. | Assess the application of Flat, Gouraud and Phong shading models with practical scenarios. | CO4 | | E | 6 |
|  | b. | Analyze the types of rendering algorithms, their limitations and their mathematical complexities. | CO4 | | An | 6 |
| 23. |  | Write notes and brief on the following: curves, splines, tessellation, interpolation, approximation, cubic Bezier curve, NURBS and patches. | CO5 | | C | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the methods in geometric modeling for scientific visualization and representation. | CO6 | | A | 6 |
|  | b. | Construct the steps involved to design a 3D scene with a detailed flow diagram. | CO6 | | C | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of geometric modelling techniques in computer-aided design. |
| CO2 | Describe the different coordinate systems and views. |
| CO3 | Explain the tools and mathematical models involved in geometric modeling. |
| CO4 | Identify the appropriate Illumination and rendering techniques for modelling the virtual objects. |
| CO5 | Implement various algorithms to map and render the basic geometrical primitives into complex models. |
| CO6 | Apply the geometric modelling concepts in the development of CAD applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 10 | - | - | - | - | 11 |
| CO2 | 7 | - | 6 | - | - | - | 13 |
| CO3 | - | 6 | 7 | 6 | - | 6 | 25 |
| CO4 | - | 9 | - | 22 | 7 | - | 38 |
| CO5 | 5 | 1 | - | - | - | 15 | 21 |
| CO6 | - | 1 | 9 | - | - | 6 | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2029** | **Duration** | **3hrs** |
| **Course Name** | **INFORMATION RETRIEVAL AND TEXT ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define information retrieval. | | CO3 | R | | 1 |
| 2. | List the components IR deals with information items. | | CO1 | R | | 1 |
| 3. | Discuss two models on which effective retrieval is based on. | | CO4 | U | | 1 |
| 4. | State the process of stemming. | | CO1 | R | | 1 |
| 5. | Specify the use of collaborative filtering. | | CO1 | U | | 1 |
| 6. | Interpret query expansion. | | CO4 | A | | 1 |
| 7. | Formulate centroid. | | CO4 | C | | 1 |
| 8. | Explain combined measure: F. | | CO5 | An | | 1 |
| 9. | Write the full form of HITS. | | CO5 | A | | 1 |
| 10. | Name the category to which the SVM algorithm belongs to. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Differentiate the in-links and out-links of a directed graph. | | CO1 | | An | 3 |
| 12. | Sketch the process of similarity computation with a diagram. | | CO1 | | A | 3 |
| 13. | Write the formula for recall and precision. | | CO2 | | A | 3 |
| 14. | Enumerate the challenges of the information retrieval process. | | CO4 | | E | 3 |
| 15. | Describe the authority ranking. | | CO4 | | U | 3 |
| 16. | Discuss how Page Rank modification is done. | | CO5 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Summarize the Boolean model and vector space model. | CO2 | | E | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Sketch the inverted-file process with an example. | CO1 | | A | 6 |
|  | b. | Enumerate the formal characterization of IR models. | CO4 | | R | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Discuss the Rocchio algorithm with the graphical representation. | CO1 | | U | 9 |
|  | b. | Represent the tired index with a diagram. | CO2 | | U | 3 |
|  |  |  |  | |  |  |
| 20. | a. | List the factors to measure a good search engine. | CO4 | | R | 5 |
|  | b. | Describe the confusion matrix for the information retrieval system. | CO3 | | U | 7 |
|  |  |  |  | |  |  |
| 21. | a. | Illustrate the HITS algorithm and list its strength and weakness. | CO4 | | U | 8 |
|  | b. | Define centrality and its types. | CO5 | | R | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Write three prestige measures. | CO4 | | A | 6 |
|  | b. | State the data, features, and decision tree with examples. | CO5 | | R | 6 |
|  |  |  |  | |  |  |
| 23. |  | Illustrate combination using similarity scores and write the popular and simple combination methods with its formula. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Interpret your views on Bayes net and list down the applications of Bayes net. | CO4 | | A | 9 |
|  | b. | Name two categories of techniques associated with web spam. | CO6 | | R | 3 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design an effective text indexing system. |
| CO2 | Familiar with the Boolean and vector-space retrieval models. |
| CO3 | Identify the evaluation and interface issues in text processing. |
| CO4 | Understand IR techniques for the web, including crawling, link-based algorithms, and metadata usage. |
| CO5 | Develop Document clustering and classification applications. |
| CO6 | Compare traditional and machine learning-based ranking approaches. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 10 | 9 | 3 | - | - | 24 |
| CO2 | - | 3 | 3 | - | 12 | - | 18 |
| CO3 | 1 | 7 | - | - | - | - | 8 |
| CO4 | 12 | 12 | 16 | - | 3 | 1 | 44 |
| CO5 | 13 | 12 | 1 | 1 | - | - | 27 |
| CO6 | 3 | - | - | - | - | - | 3 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2030** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF THINGS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Outline the functionality of IoT. | | CO1 | U | | 1 |
| 2. | What risks do insecure IoT devices bring to Privacy and Security? | | CO1 | R | | 1 |
| 3. | Define actuator. | | CO2 | R | | 1 |
| 4. | List some connected smart devices. | | CO2 | R | | 1 |
| 5. | List few examples of smart glasses. | | CO3 | R | | 1 |
| 6. | Define wearable device. | | CO3 | R | | 1 |
| 7. | What is IoMT? | | CO4 | R | | 1 |
| 8. | Name the sensors used for identifying neurological diseases. | | CO4 | U | | 1 |
| 9. | Define Yaw Motion. | | CO5 | R | | 1 |
| 10. | How agricultural IoT helps in the improvement of irrigation system? | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain briefly about the security and privacy measures in IoT. | | CO1 | | U | 3 |
| 12. | What is Nest thermostat? Give its use. | | CO2 | | U | 3 |
| 13. | How actuators are controlled from cloud platform? | | CO3 | | R | 3 |
| 14. | Classify the Cardio vascular diseases. | | CO4 | | U | 3 |
| 15. | List the tools and its uses in agricultural IoT. | | CO5 | | U | 3 |
| 16. | Classify drones. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Explain about technology of connected devices in IoT | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Illustrate about smart heating and cooling. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Outline the inertial sensors with its applications | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Classify cardiovascular diseases and discuss its risk factors and measurement indicators. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Show few techniques for monitoring risk factors for cardio vascular diseases | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 22. |  | Sketch the architecture of Raspberry Pi and explain. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Justify the need of smart agriculture and design a smart agriculture system. | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Build a drone by explaining the steps with suitable diagrams. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand internet of Things and its hardware and software components. |
| CO2 | Interface I/O devices, sensors & communication modules. |
| CO3 | Remotely monitor data and control devices. |
| CO4 | Compare the connectivity technologies and protocols in IOT. |
| CO5 | Infer Security issues in IOT. |
| CO6 | Develop real life IoT based projects. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 |  |  |  |  | 17 |
| CO2 | 5 | 12 |  |  |  |  | 17 |
| CO3 | 5 | 24 |  |  |  |  | 29 |
| CO4 | 12 | 5 | 12 |  |  |  | 29 |
| CO5 |  |  | 12 |  |  |  | 17 |
| CO6 |  |  | 12 |  |  |  | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2031** | **Duration** | **3hrs** |
| **Course Name** | **INTRODUCTION TO DATA SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Company XYZ collects the education qualification, age, work experience, and salary details of its employees and stores them in a spreadsheet. Identify the type of data. | | | CO1 | U | | 1 |
| 2. | List a few python toolboxes for data science. | | | CO1 | R | | 1 |
| 3. | Relate the use of the following python command.  data[“country”].unique() | | | CO2 | R | | 1 |
| 4. | A sales company wants to analyze the trend of sales for twelve months. Suggest a suitable plot for the same. | | | CO2 | An | | 1 |
| 5. | Find the mode of the following data:  25,34,12,34,78,93,34,26,12,34 | | | CO2 | U | | 1 |
| 6. | Recall the formula for the spearman correlation coefficient. | | | CO2 | R | | 1 |
| 7. | An educational institution wants to predict if a student will fail or pass the upcoming examination. Suggest a suitable regression technique for the institution. | | | CO4 | U | | 1 |
| 8. | Identify the optimal k value from the following graph. | | | CO3 | R | | 1 |
| 9. | Give an example of a hard partitioning technique for clustering. | | | CO5 | U | | 1 |
| 10. | Recall two applications of recommender systems. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Classify the types of data. | | | CO1 | | R | 3 |
| 12. | A dataset has columns as age, gender and country. Write a suitable python command for the following operations  i)To sort the dataset by age in descending order.  ii) To remove the null values in the dataset  iii) To find the number of countries in the dataset | | | CO1 | | A | 3 |
| 13. | Differentiate box plot and histogram. | | | CO2 | | U | 3 |
| 14. | Classify the types of machine learning techniques. | | | CO3 | | R | 3 |
| 15. | Discuss the need for a Graph-based clustering technique. | | | CO5 | | U | 3 |
| 16. | Given below are the movie reviews by viewers. Swetlana watches Movie 1. Predict the movie recommendation for Swetlana based on content-based filtering. Justify your answer.  Movie 1 - Thriller and Scary  Movie 2 - Spiritual  Movie 3 - Scary  Movie 4 - Family and Love | | | CO6 | | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | A leading Textile shop in the city wants to understand the type of customers, trends, and sales forecast. Discuss the data science lifecycle for the textile shop analysis. | CO1 | | U | 6 |
|  | | b. | Define the V’s of Big Data. | CO1 | | R | 6 |
| 18. | | a. | Demonstrate the following data visualization techniques with suitable examples.  i) scatter plot ii) Box plot iii) Histogram | CO2 | | R | 6 |
|  | | b. | Write python code snippet for the following with the given data:   |  |  |  |  | | --- | --- | --- | --- | | ID | Temperature | Humidity | Gas | | 4330 | 14 | 30 | 513 | | 4331 | 16 | 32 | 514 | | 4332 | 16 | 30 | 513 | | 4333 | 15 | 30 | 510 | | 4334 | 15 | 29 | 510 | | 4335 | 15 | 30 | 510 | | 4336 | 14 | 31 | 509 | | 4337 | 16 | 30 | 510 |   i) Read the given data as a csv file.  ii) Display last 3 rows  iii) Print the column names.  iv) Append a new row with ID 4338, Temperature 17, Humidity 30 and Gas 509.  v) Print the statistical report of the dataset.  vi) Drop the column Humidity from the dataset | CO1 | | U | 6 |
| 19. | | a. | Illustrate the techniques used to preprocess the dataset by removing outliers and replacing null values with suitable examples. | CO3 | | R | 6 |
|  | | b. | Analyze the correlation between age and weight in the given table using Pearson’s correlation coefficient for the following   |  |  |  | | --- | --- | --- | | Subject | Age (X) | Weight (Y) | | 1 | 40 | 99 | | 2 | 25 | 79 | | 3 | 22 | 69 | | 4 | 54 | 89 | | CO2 | | An | 6 |
| 20. | | a. | Enumerate the various central tendency and variability measures used in exploratory data analysis with suitable example | CO2 | | A | 6 |
|  | | b. | Write the steps in hypothesis testing. A principal at a certain school claims that the students in his school are above average in intelligence. A random sample of thirty students IQ scores has a mean score of 112.5. Is there sufficient evidence to support the principal’s claim? The mean population IQ is 100 with a standard deviation of 15. | CO2 | | U | 6 |
| 21. | | a. | Describe in detail about machine learning algorithms. | CO3 | | U | 6 |
|  | | b. | Derive the various performance metrics of the tumor classifier from the given confusion matrix. | CO6 | | A | 6 |
| 22. | | a. | Briefly discuss the clustering Techniques. | CO4 | | R | 6 |
|  | | b. | Divide the data into two clusters C1 and C2 based on the similarity between the data points. Given the initial centroids are (5, 3) and (10, 15). Compute 2 iterations of the k-means algorithm.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *x1* | 5 | 10 | 15 | 24 | 30 | 85 | 71 | 60 | 55 | 80 | | *x2* | 3 | 15 | 12 | 10 | 45 | 70 | 80 | 78 | 52 | 91 | | CO4 | | A | 6 |
| 23. | | a. | The mean lifetime of a sample of 169 light bulbs manufactured by a company is found to be 1350 hours with a standard deviation of 100 hours. Establish 90% confidence limits within which the mean lifetime of light bulbs is expected to lie. | CO2 | | A | 4 |
|  | | b. | Demonstrate the working principle of the KNN algorithm with a suitable example. State any two advantages and disadvantages of KNN Classification. | CO3 | | U | 8 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Explain in detail to develop a retail recommendation system. | CO5 | | U | 8 |
|  | | b. | Find the cosine similarity for the following word table: | CO6 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | remember the key concepts of data science, data characteristics, its applications, and the toolkit used by data scientists |
| CO2 | recall the mathematical concepts for descriptive and statistical analysis of the given dataset |
| CO3 | discuss on the principle operation of various supervised and unsupervised machine learning techniques |
| CO4 | select appropriate mathematical machine learning techniques for solving real-world problems. |
| CO5 | apply the relevant techniques for implementing solutions to solve real-world problems |
| CO6 | access the performance of prediction, classification, and recommendation of machine learning techniques |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 13 | 3 | - | - | - | 26 |
| CO2 | 8 | 10 | 10 | 7 | - | - | 35 |
| CO3 | 10 | 14 | - | - | - | - | 24 |
| CO4 | 6 | 1 | 6 | - | - | - | 13 |
| CO5 | - | 12 | - | - | - | - | 12 |
| CO6 | 1 | 4 | 6 | 3 | - | - | 14 |
|  | | | | | | | **124** |

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| **Course Code** | **20CS2033** | **Duration** | **3hrs** |
| **Course Name** | **NATURAL LANGUAGE PROCESSING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | | | **Bloom’s Level** | **Marks** | | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | | |
| 1. | Consider the words “Change”, “Changing” and “Changes”. Predict the output if these words passed through stemming algorithm | | CO1 | | | R | 1 | | |
| 2. | How do you define the morphemes that cannot stand alone, but must be attached to another morpheme to have meaning? | | CO1 | | | U | 1 | | |
| 3. | Mention two examples for word formation with blending process. | | CO2 | | | R | 1 | | |
| 4. | Identify the number of morphemes in the word ‘*Table*’ | | CO2 | | | U | 1 | | |
| 5. | Assign a proper POS tag for the given statement:  *‘I like to read books’* | | CO3 | | | U | 1 | | |
| 6. | Consider the sentence: “*Ramesh scored a brilliant century*”. Identify the type of the following relation. *Century->brilliant* | | CO3 | | | U | 1 | | |
| 7. | Illustrate the basic idea of Lexical semantics. | | CO4 | | | U | 1 | | |
| 8. | Express the Headword in the rule set ‘‘*NP →DT NNP NN’* in Probabilistic Context-Free Grammer. | | CO4 | | | R | 1 | | |
| 9. | Predict the context words for the sentence ‘ *The cute cat jumps over the lazy dog’* with *C=2,* and the centre word ‘*cat’*. | | CO5 | | | U | 1 | | |
| 10. | In Latent Dirichlet allocation model for text classification purposes, what does alpha and beta hyper parameter represent? | | CO6 | | | U | 1 | | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | | |
| 11. | Mention the various sources of ambiguity in Natural Language | | CO1 | | | U | | | 3 |
| 12. | Express the orthographic rules and FSTs in finite state morphological processing. | | CO2 | | | U | | | 3 |
| 13. | Produce a list the generic named entity types with the kinds of entities they refer to, with examples for each. | | CO3 | | | U | | | 3 |
| 14. | Differentiate between Inflection and Derivation word classes with examples. | | CO4 | | | An | | | 3 |
| 15. | Analyze the challenges in CKY parsing and discuss on the solution to overcome those challenges. | | CO5 | | | An | | | 3 |
| 16. | Show the anatomy of an entity linking system in NLP process and illustrate the difference stages of operation. | | CO6 | | | A | | | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | | | |
| 17. | a. | Highlight the importance of string similarity and alignment in spell correction and explain the initialization, recurrence relation and termination stages of edit distance algorithm. | | CO1 | | U | | 6 | |
|  | b. | Apply Levinstein dynamic programming approach to calculate the edit distance to transform the word ‘***KITTEN’ to ‘SITTING’,*** by constructing a two-dimensional array. (Assume cost for each edit operation to be 1) | | CO1 | | A | | 6 | |
|  |  |  | |  | |  | |  | |
| 18. | a. | Summarize the fundamental problems in the HMM tagger discuss the algorithm for learning the HMM parameters A and B when an observation sequence O and the set of possible states are given. | | CO2 | | U | | 6 | |
|  | b. | Consider an example (Ice cream count for every day) of training a Markov model, with the following set of input observations O = {1 ,3,2} and the aligned hidden state sequences(h,c):    Compute the HMM parameters by maximum likelihood estimation from the training data. | | CO2 | | A | | 6 | |
|  |  |  | |  | |  | |  | |
| 19. |  | Build a goal- oriented and data-directed paring trees for the given sentence:**“***The angry bear chased the frightened little squirrel”*  Use the following grammar rules to create the parse tree and analyze the challenges in both the parsing methods.  S → NP VP  NP → Det Nom  VP → V NP  Nom →Adj Nom | N  Det → the  Adj→ little | angry | frightened  N → squirrel | bear  V → chased | | CO3 | | An | | 12 | |
|  |  |  | |  | |  | |  | |
| 20. |  | Apply CKY Probabilistic Parser algorithm toparse the sentence *"Book the Flight Through Houston"*using the following set of rules. Illustrate all the steps in tabular formats. | | CO4 | | A | | 12 | |
|  |  |  | |  | |  | |  | |
| 21. | a. | Express the importance of lexical semantics and discuss in detail the elements of lexical semantics with examples for each. | | CO5 | | U | | 6 | |
|  | b. | Show the one-hot embedding matrix for the statement: *I ate an apple and played the piano’* anddiscuss the challenges in one hot encoding methods. | | CO5 | | A | | 6 | |
|  |  |  | |  | |  | |  | |
| 22. |  | Examine the process of word embedding using Word2Vec model and explain the two popularly used architectures for embedding with text data. | | CO5 | | An | | 12 | |
|  |  |  | |  | |  | |  | |
| 23. | a. | Describe the steps taken in the Noisy channel model for spellingcorrection in detail. | | CO1 | | U | | 6 | |
|  | b. | Consider the training corpus with four sentences:  <s> This is a dog </s>  <s> This is a cat </s>  <s> I love my cat </s>  <s> This is my name </s>  Estimate the Bigram probability of the test sentence  ***<s>****This is my cat </s>.* | | CO1 | | An | | 6 | |
| **COMPULSORY QUESTION** | | | | | | | | | |
| 24. | a. | Highlight the goals of Information Retraction in NLP process and describe the process of transforming an unstructured text or a collection of texts into sets of facts. | | | CO6 | U | | 6 | |
|  | b. | Analyze the task of extracting semantic relationships from a text and discuss the techniques used for relation extraction. | | | CO6 | A | | 6 | |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the different linguistic components of natural language. |
| CO2 | Design a morphological analyzer for a given natural language. |
| CO3 | Prefer appropriate parts of speech technique. |
| CO4 | Choose on the appropriate parsing techniques necessary for a given language and applications. |
| CO5 | Decide on the appropriate semantic techniques necessary for a given language and applications. |
| CO6 | Design application involving natural language. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 | 6 | 6 | - | - | 29 |
| CO2 | 1 | 10 | 6 | - | - | - | 17 |
| CO3 | - | 5 | - | 12 | - | - | 17 |
| CO4 | 1 | 1 | - | 15 | - | - | 17 |
| CO5 | - | 7 | 6 | 15 | - | - | 28 |
| CO6 | - | 7 | 9 | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2035** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Rewrite the equivalent for each loop for the code given below.  int a[ ] = {1,2,3,4,5};  for (int i=0; i < a.length; i++)  {  System.out.println ("The Values in the array are: "+ a[i]);  } | | CO1 | U | | 1 |
| 2. | State the acronym of JRE and JVM. | | CO1 | R | | 1 |
| 3. | Discover the error(s) (if any) in following code and justify your answer.  abstract class CSE{  abstract void display();  }  public class AIDS extends CSE{  public static void main(String[] args) {  System.out.println("Welcome to CSE");  }} | | CO2 | U | | 1 |
| 4. | Predict the output of compiling the following code.  public class Type {  public static void main(String[] args) {  Integer a=10;  double b=a.doubleValue();  System.out.println(b);  }} | | CO1 | U | | 1 |
| 5. | Predict the output of the following program.  class Test{  enum Apple {  Jonathan(10), GoldenDel(9), RedDel(12), Winesap(15), Cortland(8);  int price;  Apple(int p) { price = p; }  }  public static void main(String arg[]){  System.out.println(Apple.RedDel.price);  }  } | | CO3 | U | | 1 |
| 6. | Distinguish InputStream and Reader classes. | | CO6 | U | | 1 |
| 7. | Define functional interface with an example. | | CO2 | R | | 1 |
| 8. | Identify the error in the following statement and rewrite it.  GenericClass<int> ob1 = new GenericClass<int>(80); | | CO6 | U | | 1 |
| 9. | Predict the output for the following code:  TreeSet<String> t = new TreeSet<String>();  t.add("Computer");  t.add("Science");  t.add("And");  t.add("Engineering");  System.out.print(t.last()); | | CO6 | U | | 1 |
| 10. | Name the listener to recognize the state change of an item in Java Swing. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Differentiate ‘static’ variable and ‘final’ variable with suitable example for each. | | CO1 | | U | 3 |
| 12. | Given two files A.java and Test.java, predict the output of the following code.  **A.java**  package pck1;  public class A{  int x = 10;  public int y = 20;  protected void exam() {  System.out.print("I am exam function!..");  }}  **Test.java**  package pck2;  import pck1.\*;  class Test{  public static void main(String []args) {  A a = new A();  System.out.println(a.x);  System.out.println(a.y);  System.out.println(a.exam());  }} | | CO2 | | A | 3 |
| 13. | Visualize the diagram to illustrate the states of a thread. | | CO3 | | R | 3 |
| 14. | Predict the values in the variables s1 & s2, after running the code.  String str="Green World, Clean World";  int len=str.length();  int remain=100-len;  String s1 = str.toUpperCase());  String s2 = Integer.toString(remain)+" more characters can be entered"; | | CO1 | | U | 3 |
| 15. | Demonstrate a Stack operations using Collection framework. | | CO6 | | A | 3 |
| 16. | Describe the standard dialog boxes in the JOptionPane class with syntax. | | CO5 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Create a class called “Event” with Event\_name, Budget and Venue as data members. Develop the member functions such as add\_event, edit\_event and display\_event. Demonstrate the above-mentioned class with five array of objects. | CO2 | | C | 6 |
|  | b. | Write a program to search a string from an array of Strings. | CO1 | | R | 6 |
| 18. | a. | Describe the object-oriented programming concepts with necessary example. | CO2 | | U | 6 |
|  | b. | Examine any three control statements with suitable Java code. | CO1 | | R | 6 |
| 19. | a. | Create an interface called Banking with two services deposit(), withdraw(). Illustrate the banking operations via interface by creating SBI & AXIS bank classes and demonstrate dynamic method dispatch. | CO3 | | A | 8 |
|  | b. | Demonstrate the method overloading and method overriding with suitable Javacode snippet. | CO2 | | U | 4 |
| 20. | a. | Visualize the three types of inheritance with sample Java code. | CO4 | | A | 6 |
|  | b. | Illustrate the user defined Exception by getting a numerical number as input and test whether the given number is a multiple of five. If so, throw a user defined exception called Five Multiple Exception. If the number is a prime number throw and user defined exception named Prime Exception. | CO4 | | A | 6 |
| 21. | a. | Create a class to print any multiplication table. Construct two threads to share the multiplication table class to print fifth and tenth multiplication table without colliding each table. | CO6 | | A | 6 |
|  | b. | Develop a Java application to demonstrate the following operations.   * Write your own profile into the file, "MyProfile.txt". The profile contains the data such as name, regno, age and CGPA. * Read the contents of a file named "MyProfile.txt" by character by character and write the same in another file called "MyData.txt". | CO4 | | A | 6 |
| 22. | a. | Develop a Java application to perform the following functionalities in ArrayList.   * Create a ArrayList to hold the product names of data type String. * Add five different product names. * Print the first and last product names. * Print the size of the ArrayList. * Remove a particular product from ArrayList. * Replace the existing element with new element in the ArrayList. | CO6 | | A | 8 |
|  | b. | Discuss the following string functions with suitable Java code.  i)substring() ii)join() | CO1 | | U | 4 |
| 23. | a. | Elucidate the TCP Socket programming model with an example program to send a message from server to client. | CO6 | | A | 8 |
|  | b. | Describe the levels of access protection available for packages with program illustrations. | CO3 | | R | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Design a Java Swing GUI application for the Login functionality as per the sample design given below. Popup a message box with "Login Successful" message if username and password is "Admin", otherwise display "Try Again" message. | CO5 | | A | 8 |
|  | b. | Explain the Flow Layout and Grid Layout in Java Swing with suitable examples. | CO5 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Acquire the knowledge of structure and model of object-oriented programming. |
| CO2 | Identify classes, objects, members of a class and relationships among them needed for a specific problem. |
| CO3 | Evaluate requirements of software functionality to build an application . |
| CO4 | Design and build robust console-based applications using object-oriented features. |
| CO5 | Develop desktop applications using GUI to solve real-time problems. |
| CO6 | Choose engineering approach to solve problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 12 | - | - | - | - | 25 |
| CO2 | 1 | 11 | 3 | - | - | 6 | 21 |
| CO3 | 7 | 1 | 8 | - | - | - | 16 |
| CO4 | - | - | 18 | - | - | - | 18 |
| CO5 | 4 | 4 | 8 | - | - | - | 16 |
| CO6 | - | 3 | 25 | - | - | - | 28 |
|  | | | | | | | **124** |

Graphical user interface, application

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| **Course Code** | **20CS2036** | **Duration :** | **3hrs** |
| **Course Name :** | **OPERATING SYSTEMS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | Define Segmentation. | CO1 | R | 1 |
| 2. | Describe Operating System. | CO1 | U | 1 |
| 3. | Explain the types of scheduling. | CO3 | A | 1 |
| 4. | List the two types of threads. | CO3 | R | 1 |
| 5. | Several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place. This is called \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO3 | U | 1 |
| 6. | State the requirements required to satisfy the critical section problem. | CO3 | R | 1 |
| 7. | Trace the methods to avoid deadlocks in the system. | CO4 | U | 1 |
| 8. | Recall the drawbacks of variable partitioning. | CO4 | R | 1 |
| 9. | Suppose that a process is in “Blocked” state waiting for some I/O service. When the service is completed, it goes to the \_\_\_\_\_\_\_\_. | CO4 | R | 1 |
| 10. | The interval from the time of submission of a process to the time of completion is called \_\_\_\_\_\_\_\_\_\_\_\_\_. | CO4 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | Explain Multi programming. | CO3 | U | 3 |
| 12. | Differentiate thread and process. | CO3 | U | 3 |
| 13. | Summarize Demand Paging Concept. | CO4 | E | 3 |
| 14. | Write short notes on Semaphores. | CO3 | A | 3 |
| 15. | Illustrate the significance of resource allocation graph. | CO1 | An | 3 |
| 16. | Compare boot block and bad block. | CO6 | E | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23, QNo. 24 is compulsory)** | | | | | |
| 17. | a. | Sketch the Computer System architecture with detail explanation. | CO1 | A | 6 |
| b. | Discuss virtual file system. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Summarize the various issues involved in implementing Inter Process communication when Processes executing concurrently in the operating system require an Inter Process communication mechanism to exchange data and information. | CO3 | E | 6 |
| b. | Compute disk scheduling algorithm. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Propose any two approaches for handling critical section problems that arise during concurrent access to shared data. | CO4 | C | 12 |
|  |  |  |  |  |  |
| 20. | a. | Determine Classic problems of synchronization. | CO3 | A | 6 |
| b. | With diagrammatic representation, explain segmentation hardware. | CO6 | R | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss in detail about various RAID levels with its architecture. | CO6 | U | 6 |
| b. | Generalize the free space management techniques. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Interpret the contiguous file allocation methods with examples. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Consider the following page reference string:  7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1  Calculate the page faults that would occur for the following page replacements algorithms, assuming an allocation of 3 frames.   1. LRU b.FIFO c.Optimal | CO4 | E | 12 |
|  |  | **COMPULSORY QUESTION** | | | |
| 24. |  | Formulate the following requests are in the disk queue:  98, 183, 37,122, 14, 124, 65, 67 (head starts at 53)  Analyze the procedure to provide services for above request sequence with the help of different disk scheduling algorithms. | CO6 | C | 12 |

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|  | COURSE OUTCOMES |
| CO1 | Understand how operating systems makes it possible for many applications to share resources and to make programming easier for user space applications |
| CO2 | Distinguish between user and kernel level operating |
| CO3 | Analyze the thread context management, synchronization methods and various scheduling algorithms |
| CO4 | Apply various memory management schemes especially paging and segmentation in real time applications. |
| CO5 | Illustrate file systems in operating systems like UNIX/Linux and Windows |
| CO6 | Discover input output management, use of device driver and secondary storage (disk) mechanism |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 7 | 6 | 3 | - | - | 17 |
| CO2 | - | - | - | - | - | - | 00 |
| CO3 | 2 | 7 | 28 | - | - | - | 37 |
| CO4 | 2 | 2 | - | - | 21 | 12 | 37 |
| CO5 | - | 6 | - | - | - | - | 6 |
| CO6 | 6 | 6 | - | - | 3 | 12 | 27 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2037** | **Duration** | **3hrs** |
| **Course Name** | **OPTIMIZATION METHODOLOGIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List the types of constraints. | | | CO1 | U | | 1 |
| 2. | Give an example for variable bound. | | | CO1 | R | | 1 |
| 3. | State the role of surplus variables in the simplex method. | | | CO2 | R | | 1 |
| 4. | Define duality in Linear Programming. | | | CO2 | R | | 1 |
| 5. | Name the Integer Programming Algorithms. | | | CO3 | U | | 1 |
| 6. | Define branch and bound algorithm. | | | CO3 | R | | 1 |
| 7. | Identify whether f(x)=-12x+6  is concave or convex. | | | CO4 | U | | 1 |
| 8. | State the formula to calculate X(i+1) in gradient descent method from x(i). | | | CO4 | R | | 1 |
| 9. | Name any one method to find a solution for a Transportation Problem. | | | CO5 | U | | 1 |
| 10. | Identify the queuing models with FIFO discipline. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Analyze six applications of optimization techniques. | | | CO1 | | An | 3 |
| 12. | Describe the steps involved in the formulation of linear Programming model. | | | CO2 | | U | 3 |
| 13. | Construct the dual of the problem  Minimize Z=3x1-2x2+4x3  Subject to            3x1+5x2+4x3 ≥ 7            6x1+x2+3x3 ≥ 4           7x1-2x2-x3 ≤ 10  x1-2x2+5x3 ≥ 3           4x1+7x2-2x3 ≥ 2          x1,x2,x3 ≥ 0 | | | CO3 | | An | 3 |
| 14. | State Karush-Kuhn Tucker Conditions. | | | CO4 | | U | 3 |
| 15. | Predict the given transportation problem table as a balanced or unbalanced problem. | | | CO5 | | An | 3 |
| 16. | Discuss the applications of queueing models. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain the following with suitable examples:  i) Objective function       ii) Constraints. | CO1 | | U | 6 |
|  | | b. | Determine  i) Objective Function  ii) Constraints for the below:  A company produces two types of hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second type to 150 and 250 hats. Assume that the profits per hat are Rs.8 for type A and Rs.5 for type B. | CO1 | | A | 6 |
|  | |  |  |  | |  |  |
| 18. | |  | Solve the following problem using Simplex method to Maximize Z=2x1+4x2  Subject to                 x1+4x2 ≤ 24                3x1+x2 ≤ 21                x1+x2 ≤ 9                 x1,x2 ≥ 0 | CO2 | | A | 12 |
|  | |  |  |  | |  |  |
| 19. | |  | Solve the problem to maximize the revenue and analyze the following:   1. If the firm increases the daily capacity from 8 hours to 9 hours in machine 1, what is the impact on optimum revenue? 2. If the firm increases the daily capacity from 8 hours to 9 hours in machine 2, what is the impact on optimum revenue?   Which machine should be given higher priority after the above increases? A manufacturing firm produces two products on two machines. A unit of product 1 requires 2 hours on machine 1 and 1 hour on machine 2. For product 2, a unit requires 1 hour on machine 1 and 3 hours on machine 2. The revenues per unit of products 1 and 2 are $30 and $20, respectively. The total daily processing time available for each machine is 8 hours. | CO3 | | A | 12 |
|  | |  |  |  | |  |  |
| 20. | |  | Solve using separable programming:      Maximize (x1) ² + x2  subject to  x1 + x2<= 7  x1<= 5  x2<= 3  x1,x2>= 0 | CO4 | | A | 12 |
|  | |  |  |  | |  |  |
| 21. | |  | Apply the different subassemblies to contractors so as to minimize the total cost for the following:   A machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is shown in the following table in hundreds of rupees. | CO5 | | A | 12 |
|  | |  |  |  | |  |  |
| 22. | |  | Discuss the traveling salesman problem and find the shortest problem for the following graph using the same. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 23. | | a. | Solve the below using Graphical method  Maximize Z= 2x1+x2  Subject to:           x1+2x2 ≤ 10             x1+x2 ≤ 6             x1-x2 ≤ 2         x1-2x2 ≤ 1         x1,x2 ≥ 0 | CO2 | | A | 8 |
|  | | b. | State and explain the complementary slackness theorem in duality. | CO3 | | R | 4 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Explain the various elements in the queuing model. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Formulation of optimization problems. |
| CO2 | Define and use optimization terminology and concepts. |
| CO3 | Describe the appropriate the linear programming techniques. |
| CO4 | Choose the appropriate optimization for real world problems. |
| CO5 | Customize the optimization methodologies for real time problems. |
| CO6 | Apply the knowledge to solve the queuing problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 19 | 6 | 3 | - | - | 29 |
| CO2 | 2 | 3 | 20 | - | - | - | 25 |
| CO3 | 6 | - | 15 | - | - | - | 21 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | - | 1 | 12 | 3 | - | - | 16 |
| CO6 | - | 4 | 12 | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2042** | **Duration** | **3hrs** |
| **Course Name** | **REAL TIME OPERATING SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Define operating system. | | CO1 | R | | 1 |
| 2. | List the meaning of high-quality software in RTOS. | | CO1 | R | | 1 |
| 3. | Infer the role of scheduler in RTOS. | | CO2 | U | | 1 |
| 4. | List the types of semaphore. | | CO2 | R | | 1 |
| 5. | Recall the functionality of task awakening in RTOS. | | CO3 | R | | 1 |
| 6. | Infer the use of sharing mechanism in embedded OS. | | CO4 | R | | 1 |
| 7. | Expand SSD. | | CO4 | R | | 1 |
| 8. | Define resource contention. | | CO5 | R | | 1 |
| 9. | Identify the need for dynamic memory allocation. | | CO5 | R | | 1 |
| 10. | List the types of unbounded priority inversion. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Draw the internal architecture of the task control block. | | CO1 | | R | 3 |
| 12. | Write about timed cyclic scheduling technique. | | CO2 | | R | 3 |
| 13. | Infer the merits of semaphore. | | CO3 | | U | 3 |
| 14. | Characterize the various combination of process versus threads. | | CO4 | | U | 3 |
| 15. | List any two execution issues in embedded multiprocessors. | | CO5 | | R | 3 |
| 16. | Mention the preconditions that are necessary for a deadlock to occur. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Describe how RTOS support simplifies the functional design of software, thus making it easier to produce high-quality systems. | CO1 | | R | 6 |
|  | b. | Describe the working mechanism of task-based software design. | CO1 | | R | 6 |
|  |  |  |  | |  |  |
| 18. |  | Describe these in the context of simple cyclic, timed cyclic, and cooperative scheduling techniques with a neat diagram | CO2 | | R | 12 |
|  |  |  |  | |  |  |
| 19. |  | Demonstrate the following table to measure the burst time and list the number of iterations performed by each process.   |  |  |  | | --- | --- | --- | | **Process ID** | **Arrival Time** | **CPU Burst Time** | | P0 | 3 | 2 | | P1 | 2 | 4 | | P2 | 0 | 6 | | P3 | 1 | 4 | | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Explain the mutual exclusion mechanisms types with necessary diagrams. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain the characteristics of producing deadlock-free systems and the types used to prevent deadlock occurrence in RTOS. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Illustrate the “data transfer without synchronization” with a neat diagram and explain its working functionality with real-time applications. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain the working usage of volatile and non-volatile storage (memory) devices based on real-time applications. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the software issues that take place in job partitioning and allocation. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concepts of real-time systems and modeling. |
| CO2 | Outline the potential benefits of distributed systems. |
| CO3 | Analyze the time complexity in job handling. |
| CO4 | Design real time embedded systems using the concepts of RTOS. |
| CO5 | Identify and evaluate the storage management policies with respect to different storage management. |
| CO6 | Design applications in Embedded systems by using RTOS. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 17 | - | - | - | - | - | 17 |
| CO2 | 16 | 1 | 12 | - | - | - | 29 |
| CO3 | 1 | 3 | - | - | - | - | 4 |
| CO4 | 2 | 27 | - | - | - | - | 29 |
| CO5 | 5 | 24 | - | - | - | - | 29 |
| CO6 | 12 | 4 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2045** | **Duration** | **3hrs** |
| **Course Name** | **RFID TECHNOLOGIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List the types of RFID tags. | | CO1 | R | | 1 |
| 2. | Define RFID read range. | | CO1 | R | | 1 |
| 3. | List two classical frequencies used for RFID. | | CO2 | R | | 1 |
| 4. | What are the various contactless smart cards? | | CO2 | R | | 1 |
| 5. | Recall the abbreviation for ISM. | | CO3 | R | | 1 |
| 6. | State two privacy enhancing technologies in RFID. | | CO4 | R | | 1 |
| 7. | Classify the types of payments. | | CO5 | R | | 1 |
| 8. | What is Bolus? | | CO5 | R | | 1 |
| 9. | How is RFID used in shipping containers? | | CO5 | R | | 1 |
| 10. | What are the two types of access control systems? | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Discuss the advantages of RFID technology. | | CO1 | | R | 3 |
| 12. | How tags store data? | | CO2 | | R | 3 |
| 13. | Classify the types of Tag antenna in RFID. | | CO3 | | U | 3 |
| 14. | Sketch the block diagram of close coupling cards. | | CO4 | | R | 3 |
| 15. | State three traits of security. | | CO5 | | R | 3 |
| 16. | What are ski tickets? | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Classify RFID tags based on physical form factor. | CO1 | | U | 6 |
|  | b. | Recall RFID frequency range, read range and its applications. | CO1 | | R | 6 |
| 18. | a. | Discuss various anti-collision techniques in RFID. | CO2 | | R | 6 |
|  | b. | Assign suitable identifiers for medical supplies shifted from warehouse to hospital. | CO2 | | A | 6 |
| 19. | a. | Describe the working of switched beam antenna. | CO2 | | R | 6 |
|  | b. | Describe the physics of RFID. | CO2 | | R | 6 |
| 20. | a. | Summarize the RFID standards used for animal identification. | CO3 | | U | 6 |
|  | b. | Discuss about the standard used for container identification. | CO3 | | U | 6 |
| 21. |  | Analyze various privacy concern in RFID and discuss about the solutions adopted by government and industry to mitigate the attacks. | CO4 | | An | 12 |
| 22. |  | A multispecialty hospital has consented to implement RFID based modules for the below functions:   1. Patient monitoring 2. Child theft monitoring 3. Asset monitoring 4. Access control   Discover the security threat zones, possible vulnerabilities and suggest suitable countermeasures for the above scenario. | CO5 | | A | 12 |
| 23. | a. | Discuss the application of animal identification using RFID. | CO5 | | R | 6 |
|  | b. | Discuss about the types of transponders used in animal identification. | CO5 | | R | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Devise a smart RFID system for waste bin management of a city. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the architecture of RFID, types of readers and tags and their protocols. |
| CO2 | Interface RFID based systems with smart antennas and various levels of frequencies. |
| CO3 | Apply the appropriate RFID configuration for effective communication. |
| CO4 | Analyze the security and privacy issues, standards of RFID technologies. |
| CO5 | Compare the influence of RFID technologies in different case studies. |
| CO6 | Design and deploy RFID based real time Industrial Applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 11 | 6 |  |  |  |  | 17 |
| CO2 | 23 |  | 6 |  |  |  | 29 |
| CO3 | 1 | 15 |  |  |  |  | 16 |
| CO4 | 4 |  |  | 12 |  |  | 16 |
| CO5 | 18 |  | 12 |  |  |  | 30 |
| CO6 | 4 |  |  | 12 |  |  | 16 |
|  | | | | | | | **124** |

**Description: Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2046** | **Duration** | **3hrs** |
| **Course Name** | **ROBOTIC PROCESS AUTOMATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List one main difference between RPA and BPA. | | | CO1 | R | | 1 |
| 2. | Recall the ancient concepts related to the history of RPA. | | | CO1 | R | | 1 |
| 3. | Quote the founder who coined the term ‘lean’. | | | CO2 | R | | 1 |
| 4. | Identify few key factors that are considered right for RPA development. | | | CO2 | R | | 1 |
| 5. | Select any two advantage of using a COE. | | | CO3 | R | | 1 |
| 6. | Distinguish one feature of meta data and semi-structures data. | | | CO3 | U | | 1 |
| 7. | Cite the types of log message. | | | CO4 | U | | 1 |
| 8. | State some popular RPA analytics tool. | | | CO4 | R | | 1 |
| 9. | Indicate any one security practices used in BluePrism. | | | CO5 | U | | 1 |
| 10. | Identify the popular RPA vendor from IBM . | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Group the different approaches of cloud services. | | | CO1 | | U | 3 |
| 12. | State the core principles of lean and Six Sigma. | | | CO2 | | R | 3 |
| 13. | Compare and contrast the roles and responsibilities of a RPA developer and RPA supervisor. | | | CO3 | | U | 3 |
| 14. | Identify the different types of bot testing. | | | CO4 | | U | 3 |
| 15. | Classify the common categories of data sources | | | CO5 | | U | 3 |
| 16. | Compare and contrast between PEGA Robotic Desktop Automation  and PEGA Robotic Process Automation. | | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | |  | Describe on the Optical Character Recognition (OCR) and Artificial Intelligence technologies and its relevance with RPA. | CO1 | | U | 12 |
| 18. | | a. | Discuss the factors to be considered for using a consulting firm when planning a RPA along with a case study. | CO2 | | U | 6 |
|  | | b. | Discuss on the Six Sigma Roles and Levels for a sample project. | CO2 | | U | 6 |
| 19. | |  | Discuss the main responsibilities of business analyst, developer, solution architect, and RPA supervisor with respect to COE. | CO3 | | U | 12 |
| 20. | |  | Sketch and explain loops used in UiPath with an example scenario along with their structure and execution. | CO4 | | A | 12 |
| 21. | |  | Discuss the steps in the cross-industry standard process for data mining (CRISP-DM). | CO5 | | U | 12 |
| 22. | | a. | Summarize the benefits of RPA. | CO1 | | U | 4 |
|  | | b. | Compare RPA with BPO, BPM and BPA. | CO1 | | U | 8 |
| 23. | |  | Discuss on the following leading RPA vendors;  a. BluePrism  b. UiPath | CO6 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Explain the steps that are involved for an effective process mining. | CO5 | | U | 6 |
|  | | b. | Discuss on the importance of privacy and ethics that needs to be considered when dealing with RPA. | CO5 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Articulate the history of RPA technology, benefits, drawbacks, and comparisons to  other automation technologies. |
| CO2 | Examine the implementation of RPA and ensure its processes are in good shape. |
| CO3 | Choose the right RPA software by considering its costs, training, functionality, and security. |
| CO4 | Create a bot to develop the UiPath and establish the workflow structures. |
| CO5 | Evaluate the bots and ensure its functionality through scaling and optimization. |
| CO6 | Review the large and small RPA software developers and vendors. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 27 |  |  |  |  | 29 |
| CO2 | 5 | 12 |  |  |  |  | 17 |
| CO3 | 1 | 16 |  |  |  |  | 17 |
| CO4 | 1 | 4 | 12 |  |  |  | 17 |
| CO5 |  | 28 |  |  |  |  | 28 |
| CO6 | 1 | 15 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2047** | **Duration** | **3hrs** |
| **Course Name** | **ROBOTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Name the commonly used robot configuration system. | CO1/R | 1 |
| 2. | List the transmissions used in a robot manipulator. | CO1/U | 1 |
| 3. | Define robot kinematics. | CO2/R | 1 |
| 4. | As shown in the Fig.1, a planar four-bar mechanism whose links, including the ground, are connected in a loop by four revolute joints. Here, s = 3, r = 4, and p = 4. Find the degrees of freedom.    Fig. 1 | CO2/U | 1 |
| 5. | List the different types of tactile sensor. | CO3/R | 1 |
| 6. | Recall thresholding. | CO3/R | 1 |
| 7. | List the types of hydraulic actuators. | CO4/R | 1 |
| 8. | Outline the features of dynamixel actuator. | CO4/U | 1 |
| 9. | Define PID controller. | CO5/R | 1 |
| 10. | Draw the schematic diagram of a robotic control system. | CO5/U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Mention the selection criteria required for selecting a robot. | CO1/U | 3 |
| 12. | Write the Denavit-Hartenberg convention. | CO2/R | 3 |
| 13. | Explain the working principle of inductive proximity sensor. | CO3/A | 3 |
| 14. | Write short notes on timing belts. | CO4/U | 3 |
| 15. | Why the adaptive control method is used in robots? | CO5/A | 3 |
| 16. | List the selection considerations of robot controller. | CO6/U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Explain in detail the robot subsystems. | CO1/R | 6 |
| b. | Fig. 2 shows a screw mechanism for the transmission of motion from the motor to link 4 via link 3. If the nut on Link 3 has to be translated by 50 mm while moving on the screw of 5 mm pitch. Find the **θ** times that the screw should be turned.    Fig.2 | CO1/An | 6 |
|  |  |  |  |  |
| 18. | a. | Draw and represent ZYZ Euler angles for the overall rotation of the matrix by Q . | CO2/A | 3 |
| b. | Derive the expression for inverse kinematics of 4 degrees of freedom robot manipulator. | CO2/An | 9 |
|  |  |  |  |  |
| 19. | a. | Explain the capacitive type touch sensor. | CO3/U | 6 |
| b. | Explain the machine vision system of a robot. | CO3/U | 6 |
|  |  |  |  |  |
| 20. | a. | Explain the Set-point Control of a 2-link Robot Arm Moving Vertical. | CO5/A | 6 |
| b. | Write the State-space of a Single-DOF Planar Arm as shown in Fig.3    Fig.3 | CO5/An | 6 |
|  |  |  |  |  |
| 21. | a. | Compare electric, hydraulic and pneumatic actuators. | CO4/U | 5 |
| b. | Illustrate the steps to interface DC geared motor with Tiva C Launch pad. | CO4/A | 7 |
|  |  |  |  |  |
| 22. | a. | Discuss the fundamental configurations of robot arm. | CO1/U | 6 |
| b. | Find the Homogeneous Transformation Matrices of the Three-link Planar Arm shown in Fig.4. and the DH parameters are given in the table below. | CO2/An | 6 |
|  |  |  |  |  |
|  |  | Fig.4 |  |  |
| 23. | a. | Find the rotational matrix for a reference frame M coincides with the fixed frame F. Now, the frame M is rotated by an angle a about the axis Z, as shown in Fig. 5. The unit vectors of the new frame M can be described in terms of their components in the reference frame F as    where S=Sin and C=Cos    Fig.5 | CO2/An | 5 |
| b. | How ROS and Gazebo can be used to simulate a robotic arm? | CO2/U | 7 |
|  |  | **Compulsory** | | |
| 24. | a. | Brief the hardware architecture of an industrial robot. | CO6/U | 6 |
| b. | How to write a ROS python driver for ChefBot. | CO6/C | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Perform kinematic and dynamic analyses with simulation |
| CO2 | Design control laws for a robot. |
| CO3 | Integrate mechanical and electrical hardware for a real prototype of robotic device. |
| CO4 | Select a robotic system for given application. |
| CO5 | Describe the different physical forms of robot architectures. |
| CO6 | Develop simple robot control systems integrating perception, planning. and action |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 10 | - | 6 | - | - | 23 |
| CO2 | 4 | 1 | 3 | 27 | - | - | 35 |
| CO3 | 2 | 12 | 9 | 6 | - | - | 29 |
| CO4 | 1 | 9 | 7 | - | - | - | 17 |
| CO5 | 1 | 1 | 3 | - | - | - | 05 |
| CO6 | 3 | 6 | - | - | - | 6 | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2050** | **Duration** | **3hrs** |
| **Course Name** | **SOFTWARE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | What is Agility? | CO1/R | 1 |
| 2. | List any two evolutionary process model. | CO1/R | 1 |
| 3. | Define the term traceability. | CO2/R | 1 |
| 4. | List any two open source tools available for requirement management. | CO2/A | 1 |
| 5. | Define modularity. | CO3/R | 1 |
| 6. | What is information hiding? | CO3/R | 1 |
| 7. | Differentiate the term verification and validation activities in software development. | CO4/U | 1 |
| 8. | What is Black box testing? | CO4/U | 1 |
| 9. | Define SQA. | CO5/R | 1 |
| 10. | List any two core steps of six sigma methodology. | CO5/R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Write short notes on concurrent process model. | CO1/R | 3 |
| 12. | Explain the Negotiating requirements stated by Boehm. | CO2/U | 3 |
| 13. | Briefly describe the four elements of the design model. | CO3/R | 3 |
| 14. | Write short notes on incremental integration testing. | CO4/R | 3 |
| 15. | Explain the elements of configuration management system. | CO5/R | 3 |
| 16. | Differentiate between LOC and FP estimation of a software project. | CO6/An | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Government of India has identified a leading software consultancy firm to develop an application for “Passport Services”. As a vendor, your team has to develop a system from scratch in 18 months’ duration with team size of 50 to 55 professionals.   1. Help the Software Project Manager of the company to identify and decide the appropriate software process model suitable for the above project? 2. Also compare the proposed model with other process models and justify the advantages of your model over other models. | CO1/E | 12 |
|  |  |  |  |  |
| 18. | a. | Consider the online fast food restaurant system. The modules of the system are represented as: customer orders, customer’s bill and orders to the kitchen. Customer bill interface has 3 sub modules: debit card, credit card and internet banking.  Identify the key functional and non-functional requirements for the above system. | CO2/An | 6 |
| b. | Describe the importance of ‘Requirement Engineering process’ and the phases involved in Requirement Engineering as part of the requirement elicitation process. | CO2/R | 6 |
|  |  |  |  |  |
| 19. |  | Develop an Expert system that has to be made expertise in diagnosing the disease of the patient who comes for consultation. Once the expert system is developed by acquiring the expert knowledge, it can be refined and used by the practitioner in their domain. |  |  |
| a. | Identify the appropriate actors / Use cases and also draw an appropriate use case / sub use case diagram for the above system. | CO3/C | 6 |
| b. | Design a class diagram with all possible relationships and cardinalities for the above system. | CO3/C | 6 |
|  |  |  |  |  |
| 20. | a. | Explain in detail about object oriented testing methods. | CO4/R | 6 |
| b. | Calculate the cyclomatic complexity of the following code.  i = 0;  while (i<n-1) do  j = i + 1;  while (j<n) do  if A[i]<A[j] then  swap(A[i], A[j]);  end do;  i=i+1;  end do; | CO4/A | 6 |
|  |  |  |  |  |
| 21. | a. | List the Steps involved in Statistical Quality assurance. | CO5/R | 6 |
| b. | Explain the SCM process in detail. | CO5/R | 6 |
|  |  |  |  |  |
| 22. | a. | As a software engineer, you have been assigned to build a software for low-cost video editing system. The system accepts digital video as input, stores the video on disk, and then allows the user to do a wide range of editing. Develop a plan for risk mitigation, risk monitoring and risk management for the given software. | CO6/A | 6 |
| b. | Explain different levels of process capability used in CMMI | CO6/R | 6 |
|  |  |  |  |  |
| 23. | a. | Explain refactoring technique in detail. | CO4/R | 4 |
| b. | SHOW BOOKING is an online portal for booking movie tickets. The main page allows the user to select the city and date. It then navigates to a page where all the movies and their corresponding show times are available. Based on the user’s selection of movie and time, a windowpops up asking to select the seats. When the user does it, it diverts to the previous page displaying city, theatre, movie name, show time and seats and asking user to confirm the same. Once user selects the confirm button, it will automatically routed to the Payment screen where the user pays for the ticket. If the payment is successful, the website navigates to download the ticket.  Draw a suitable architecture diagram for the given scenario. | CO4/C | 8 |
|  |  | **Compulsory:** | | |
| 24. | a. | List the approaches used for agile project estimation | CO6/R | 5 |
| b. | A large chemical company is planning to develop a new software to track the raw materials. It will be developed by an in-house team of programmers and analysts who have been developing similar software for several years. An initial study has determined that the size of the program will be roughly 32,000 delivered source instructions. Using the Basic COCOMO equations, find the development time and cost of the software. The unit cost of effort is Rs. 20,000/- per PM, A=2.4, B=1.05, C=2.5 and D=0.38. | CO6/E | 7 |

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|  | **COURSE OUTCOMES** |
| CO1 | Discover an effective software engineering process to develop software-intensive systems. |
| CO2 | Translate the requirements specification into an implementable design. |
| CO3 | Construct UML diagrams along with design strategies and design patterns. |
| CO4 | Analyze architectural design methods. |
| CO5 | Evaluate the system using various testing strategies. |
| CO6 | Develop the software system with quality measures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | - | - | - | 12 | - | 17 |
| CO2 | 7 | 3 | 1 | 6 |  |  | 17 |
| CO3 | 5 | - | - | - | - | 12 | 17 |
| CO4 | 13 | 2 | 6 | - |  | 8 | 29 |
| CO5 | 17 | - | - | - | - | - | 17 |
| CO6 | 11 | - | 6 | 3 | 7 | - | 27 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2052** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEM ADMINISTRATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List the flavours of Suse Linux enterprise. | | | CO1 | R | | 1 |
| 2. | Cite a Linux command to open the vim window vertically and horizontally. | | | CO1 | R | | 1 |
| 3. | Name the grub component that boots the third boot menu entry. | | | CO2 | R | | 1 |
| 4. | Name the sections of unit file structure. | | | CO2 | R | | 1 |
| 5. | List the two types of basic process in process administration. | | | CO3 | R | | 1 |
| 6. | Cite a Linux command which displays the information about tux in Suse Linux. | | | CO3 | U | | 1 |
| 7. | List the libzypp utilities of RPM. | | | CO4 | R | | 1 |
| 8. | Define the term Network Broadcast. | | | CO4 | R | | 1 |
| 9. | State the full form of MBR and GPT. | | | CO5 | R | | 1 |
| 10. | State the two dependencies of development tool module in chrony. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Describe the roles of directory in Linux file types. | | | CO1 | | R | 3 |
| 12. | Recall the configuration file of ssh\_server, ssh\_client, Individual user settings. | | | CO2 | | R | 3 |
| 13. | Label the output fields of /etc/passwd  **geeko:x:1000:100:Geeko Chameleon:/home/geeko:/bin/bash** | | | CO3 | | R | 3 |
| 14. | Infer the ways in which you could compile the source code using the keyword make and illustrate it with an example. | | | CO4 | | U | 3 |
| 15. | Configure LVM using the given data. Create a striped logical volume across 2 physical volumes with a stripe of 64kB. The size of logical volume should be 50 gigabytes, and name it as gfslv, and carve it out of volume group vg0. | | | CO5 | | U | 3 |
| 16. | List the elements of rsyslog configuration. | | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Differentiate sockets and pipes from Linux file types and visualize the diagrammatic representation of Linux file System Structure. | CO1 | | U | 7 |
|  | | b. | Define info pages and illustrate the different ways in which you can navigate into it. | CO1 | | U | 5 |
| 18. | | a. | In a company, some users contacted them saying that their Windows computer does not come with Windows Remote Desktop by default and asked if there is an alternative. The answer to this is Yes. There are many remote access applications on the market and among them there is VNC which is free for less than five remote devices. Now, illustrate the ways in which you can configure VNC for remote administration. | CO2 | | A | 7 |
|  | | b. | Assume that you are working as a system administrator. Your company asked you to secure the Linux web-server’s grub using a password. Illustrate the steps using relevant Linux commands. | CO2 | | U | 5 |
| 19. | | a. | Imagine, your manager wants to run a script to fetch the logs from directory. Help him schedule the process during every Monday on 10AM for one whole year 2022 using the cron tab. And show the classifications present in system cron jobs using the flow chart. | CO3 | | An | 7 |
|  | | b. | Discuss the Filesystem Permissions given below.   1. File Permissions and Ownership 2. File / Directory Modes 3. Modifying File / Directory Modes and Ownership 4. Umask 5. Sticky Bit | CO3 | | R | 5 |
| 20. | | a. | Enumerate the guidelines to update RPM configuration files to achieve software management. | CO4 | | R | 5 |
|  | | b. | Discuss the following Network configuration files along with its syntax   1. Address Configuration 2. Route Configuration 3. Link Configuration 4. Ethernet Configuration | CO4 | | R | 7 |
| 21. | | a. | Discuss all the 5 levels of Raid to manage storage efficiently. | CO5 | | R | 6 |
|  | | b. | Explain Network file system along with its working and example. | CO5 | | R | 6 |
| 22. | | a. | Outline SSH v2 Connection Process using appropriate figure. | CO1 | | R | 7 |
|  | | b. | Assume that you are working as a system administrator. Your company asked you to secure the Linux web-server’s grub using a password. Illustrate the steps using relevant Linux commands. | CO1 | | An | 5 |
| 23. | | a. | Apply the required Linux commands to perform the following storage management operations.   1. View the current LVM logical volumes 2. Create one Logical Volume in the vg0 Volume Group by adding the size as 8GB 3. Create a logical volume file system in the directory named lv\_basic0 4. Create a mount point for the logical volume and mount the created lvm file system in the mount point 5. Check that the logical volume has successfully mounted 6. Unmount the logical volume file system from the created directory. | CO5 | | A | 6 |
|  | | b. | Apply the required Linux commands and to perform the following operations   1. Create a btrfssubvolume 2. View btrfssubvolumes 3. Create btrfssubvolume snapshots 4. Reduce the size of the file system by 2 GB 5. Command to view the uuid 6. List the subvolumes present in btrfs file system | CO5 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Interpret how Network Time Protocol works better than netdate in time synchronization with chrony. | CO6 | | An | 6 |
|  | | b. | Describe the six modules in chrony along with its dependencies. | CO6 | | R | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the application of Linux commands and Linux flavours. |
| CO2 | Use remote administration and secure system bootup process. |
| CO3 | Managing Process, Identity and Security. |
| CO4 | Managing Software packages. |
| CO5 | Create and Manage storage devices. |
| CO6 | Create policies to monitor and perform installation. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 12 | 12 | - | 5 | - | - | 29 |
| CO2 | 5 | 5 | 7 | - | - | - | 17 |
| CO3 | 9 | 1 | - | 7 | - | - | 17 |
| CO4 | 4 | 6 | 7 | - | - | - | 17 |
| CO5 | 13 | 3 | 12 | - | - | - | 28 |
| CO6 | 10 | - | - | 6 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS2054** | **Duration** | **3hrs** |
| **Course Name** | **THEORY OF COMPUTATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Let ∑ = {0, 1} and L be a language of strings ending with “01”. Write strings of length 4 in L. | | CO1 | U | | 1 |
| 2. | List any two strings of length less than 4 generated by the CFG: S🡪aA, A🡪aA | b. | | CO1 | U | | 1 |
| 3. | Define Linear grammar. | | CO2 | R | | 1 |
| 4. | Represent the language L = {an bam | n>=0 and m>3} using regular expression. | | CO2 | U | | 1 |
| 5. | Compute the yield of the parse tree given:  Parse Tree | Derivations | Automata | Gate Vidyalay | | CO3 | U | | 1 |
| 6. | Show an example for Right Linear Grammar. | | CO2 | R | | 1 |
| 7. | State the condition for a context free grammar to be ambiguous. | | CO3 | U | | 1 |
| 8. | Specify the automaton that accepts context sensitive grammar. | | CO4 | R | | 1 |
| 9. | Define unrestricted grammar. | | CO5 | R | | 1 |
| 10. | State undecidable problem. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Sketch the Chomsky hierarchy for the formal languages. Name the machines used for representing each of the languages. | | CO1 | | R | 3 |
| 12. | Design a DFA for the language of strings ending with **“0101”** over the alphabet {0, 1}. | | CO2 | | U | 3 |
| 13. | Identify whether “aab” is a member of the language represented by the grammar: S 🡪 AB, A 🡪 BB | a, B 🡪 AB | b | | CO3 | | A | 3 |
| 14. | State the restrictions imposed on Nondeterministic Turing Machine to become Linear Bounded Automaton. | | CO4 | | U | 3 |
| 15. | Compare and contrast Pushdown automata and Turing Machine. | | CO5 | | An | 3 |
| 16. | Differentiate Recursive and Recursively enumerable language. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Design an non-deterministic finite automata for the regular expression: a(ab+b)\*(bb+a) | CO2 | | U | 6 |
|  | b. | Convert the non-deterministic finite automata to deterministic finite automata:  NFA | CO2 | | A | 6 |
| 18. | a. | Write the regular expression for the language represented by the finite automata:  DFA to Regular Expression | Examples | Gate Vidyalay | CO2 | | U | 6 |
|  | b. | Construct the equivalent minimized deterministic finite automata for the given DFA.  DFA Minimization | CO2 | | A | 6 |
| 19. | a. | Transform the given left linear grammar to finite automata:  A -> Ba/Ab/b  B -> Ca/Bb  C -> Aa/Cb | CO2 | | U | 6 |
|  | b. | Convert the given finite automata to left linear grammar: | CO2 | | U | 6 |
| 20. | a. | State and prove the pumping lemma for regular language. | CO1 | | R | 6 |
|  | b. | Design the Finite Automata for the intersection and union of the M1 and M2:   |  |  |  |  | | --- | --- | --- | --- | | M1: |  | M2: |  | |  |  |  |  | | CO2 | | U | 6 |
| 21. | a. | Construct a Nondeterministic Pushdown Automata (NPDA) that accepts the language L = {wwR : w∈{a,b}\*} | CO3 | | A | 6 |
|  | b. | Convert the given pushdown automata (PDA) to equivalent context free grammar (CFG).  δ(q0, a, z0) = (q1, z1z0)  δ(q0, b, z0) = (q1, z1z0)  δ(q1, b, z1) = (q1, λ)  δ(q1, a, z1) = (q1, λ)  δ(q1, a, z0) = (q1, λ) | CO3 | | A | 6 |
| 22. | a. | Simplify the given Context free grammar after removing λ-productions, unit productions and useless productions.  A ->aB | aCC  B ->aaB | λ  C ->bC | bbD  D -> C | CO3 | | A | 6 |
|  | b. | Convert the following context free grammar (CFG) to Chomsky Normal Form(CNF)  S ->bA | aB  A ->bAA | aS | a  B ->aBB | bS | b | CO3 | | A | 6 |
| 23. | a. | Design a Turing Machine for the language L = {anc\*bn: n≥1} | CO5 | | U | 6 |
|  | b. | Prove that the Context Free Languages are closed under  i) Union (ii) Concatenation (iii) Star-closure | CO3 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain in detail the following variants of Turing Machine (TM)   * Non-Deterministic TM * TM with stay option * Offline TM | CO6 | | U | 6 |
|  | b. | Prove that if a language L and its complement L are both recursively enumerable, then both languages are recursive. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of languages, basics of grammars and the hierarchy of languages. |
| CO2 | Construct and compare deterministic and non-deterministic finite automata. |
| CO3 | Develop push down automata from a given context free language or context free grammar. |
| CO4 | Recognize context sensitive grammars. |
| CO5 | Design Turing machine for recursively enumerable language. |
| CO6 | Compare computability & non-computability and Decidability & Un-decidability. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 9 | 2 | - | - | - | - | 11 |
| CO2 | 2 | 34 | 12 | - | - | - | 48 |
| CO3 | - | 8 | 27 | - | - | - | 35 |
| CO4 | 1 | 3 | - | - | - | - | 4 |
| CO5 | 1 | 6 | - | 3 | - | - | 10 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2056** | **Duration** | **3hrs** |
| **Course Name** | **WEB TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the HTML attribute to merge two columns in a HTML table. | | | CO1 | R | 1 |
| 2. | State the CSS property to adjust the space between the content and border of the HTML element. | | | CO1 | R | 1 |
| 3. | Express the Javascript code to display the “Hello World” inside the following HTML DIV element.  <div id= “box”></div> | | | CO2 | U | 1 |
| 4. | Recall the JQuery method that is used to find the immediate ancestor in the HTML DOM tree. | | | CO2 | R | 1 |
| 5. | Indicate the bootstrap code to display the image as a thumbnail. | | | CO6 | U | 1 |
| 6. | Define a JSON string to store a person name | | | CO3 | R | 1 |
| 7. | State the purpose of ng-model directive in angular js. | | | CO4 | R | 1 |
| 8. | Describe the angular js code to bind the value of num inside the following DIV view.  <div ng-init=‘num=10’></div> | | | CO4 | U | 1 |
| 9. | Tell the nodejs module name to access files. | | | CO5 | R | 1 |
| 10. | Give the nodejs statement to set the HTTP header as text/html. | | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Implement CSS code to change the background and text color of a DIV element while the user keeps the mouse over it. | | | CO1 | A | 3 |
| 12. | Illustrate the JQuery code to add one more fruit name “Pineapple” in the following ordered list with proper HTML code.  1. Apple 2. Orange 3. Mango | | | CO2 | U | 3 |
| 13. | List the various data types supported by JSON. | | | CO3 | R | 3 |
| 14. | Demonstrate an alert message using angular js controller function when button is clicked. | | | CO6 | U | 3 |
| 15. | Illustrate http module in node js to display response as “Hello World” from server. | | | CO5 | U | 3 |
| 16. | Demonstrate insertMany() method in MongoDB Shell. | | | CO4 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | Develop the HTML web page to display the following user registration with all fields as mandatory. | CO1 | A | 6 |
|  | | b. | Discuss the following CSS positioning with suitable programs each.  I) relative ii) absolute iii) fixed iv) sticky | CO1 | U | 6 |
|  | |  |  |  |  |  |
| 18. | | a. | Develop a HTML program with JavaScript code to perform the Electricity Bill (EB) calculation as given below   * Get user details including name, previous unit and current unit through input fields. * Calculate the consumed units and perform EB calculation with following constraints   0-100 units = Free  101-400 units = Rs. 4.50 per unit  401- 500 units = Rs. 6 per unit  501 and above units= Rs. 8 per unit   * Display the customer name, total units consumed and bill amount using the DIV element. | CO2 | A | 6 |
|  | | b. | Design a HTML page as per the following and read the value of text boxes A and B using JQuery and display the sum of A and B in the Result textbox when the user clicks the “Addition” button. | CO2 | A | 6 |
|  | |  |  |  |  |  |
| 19. | | a. | Prepare a JSON to represent the following Bank Accounts details and convert JSON string to Javascript Object and access individual values and display the account details having balance greater than Rs.10000 on a web page. | CO3 | U | 6 |
|  | | b. | Construct JSON Schema for the given JSON data | CO3 | A | 6 |
|  | |  |  |  |  |  |
| 20. | | a. | Develop a HTML page with Angular JS to calculate the Monthly EMI, Total Repayment, and Total Interest for the given input when the Find EMI button is clicked.  Formula Reference:  E = p x r x (1 + r )^n / ( ( 1 + r )^n - 1 ) where E is EMI, p is principal loan amount, r is monthly rate of interest, n is number of months. | CO5 | A | 6 |
|  | | b. | Demonstrate the following with suitable HTML with Angular JS program illustrations.   * Form Validation for type=email, required and show error * Angular JS routing with two hyperlinks | CO5 | U | 6 |
|  | |  |  |  |  |  |
| 21. | |  | Demonstrate nodejs application by creating a HTML form to collect the details such as Name, Regno, Year of study, Dept, College in the home page and display those details in next page when the form is submitted. | CO4 | A | 12 |
|  | |  |  |  |  |  |
| 22. | | a. | Explain the following in HTML page design with suitable example programs.  i) Ordered list ii) Unorder list iii) Internal Hyperlink  iv) External Hyperlink | CO6 | U | 6 |
|  | | b. | Discuss the document object model methods used to access the HTML elements in Javascript. | CO3 | U | 6 |
|  | |  |  |  |  |  |
| 23. | | a. | Explain the following special effects in JQuery with proper HTML and JQuery code.  i) fading ii) sliding iii) animation | CO6 | U | 6 |
|  | | b. | Demonstrate any four angularjs filters with proper HTML and Angularjs programs. | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | |  | Demonstrate the following mongodb operations to manage the employee information such as name, empid, gender, email, phone, salary.  a) Create database ‘Infosys’  b) Create collection ‘Teams’  c) Insert the above mentioned employee information for 5 employees.  d) Search a particular employee data using empid.  e) Change the salary of a particular employee  f) Delete the particular employee data | CO4 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the relevant properties and methods to facilitate dynamic web application development. |
| CO2 | Explain the development of fully functional web applications that incorporates frontend and back-end design technologies. |
| CO3 | Apply client and server side technologies for creating interactive data driven websites. |
| CO4 | Model dynamic web applications using suitable server-side technologies integrated with the database. |
| CO5 | Develop extensible web applications using the Model View Controller (MVC) framework. |
| CO6 | Apply web development framework for designing attractive web pages along with dynamic and flexible schema. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 6 | 9 | - | - | - | 17 |
| CO2 | 1 | 4 | 12 | - | - | - | 17 |
| CO3 | 4 | 12 | 6 | - | - | - | 22 |
| CO4 | 1 | 4 | 24 | - | - | - | 29 |
| CO5 | 1 | 9 | 12 | - | - | - | 22 |
| CO6 | - | 17 | - | - | - | - | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| --- | --- | --- | --- |
| **Course Code** | **20CS2057** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF WEB DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | **Marks** | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Indicate the HTML tag which is used to display text in the title bar of a web document. | | | CO1 | R | 1 | |
| 2. | Identify the HTML tag that is used to display the data in tabular form. | | | CO1 | R | 1 | |
| 3. | Recall the HTML tag that is used to declare the internal CSS. | | | CO1 | R | 1 | |
| 4. | Name the property for controlling the image repetition of the background in CSS. | | | CO2 | R | 1 | |
| 5. | Identify the type of CSS in the following code snippet.  <h1 style="color:blue;"> Blue Heading</h1> | | | CO2 | U | 1 | |
| 6. | List the units in CSS through which you can set the size to maintain alignments. | | | CO2 | R | 1 | |
| 7. | Identify the keyword that is used to print the text on the screen in JavaScript. | | | CO3 | R | 1 | |
| 8. | Predict the result of the following JavaScript code.  <script>  let $$ = 33;  alert($$);  </script> | | | CO4 | An | 1 | |
| 9. | List the different types of looping statementssupported in PHP. | | | CO5 | R | 1 | |
| 10. | Predict the output of the following JavaScript code.  <?php  $txt = 50;  $txt=$txt+$txt;  echo $txt;  ?> | | | CO6 | A | 1 | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Create the following unordered list using HTML.   * Coffee * Tea * Juice * Milk | | | CO1 | C | 3 |
| 12. | Write the CSS code to set the margin for the page as follows:  Top=20px, Bottom=20px, Right=10px, Left=10px. | | | CO2 | A | 3 |
| 13. | Write a CSS program to control the image repetition. | | | CO2 | A | 3 |
| 14. | Explain the term responsive web design. | | | CO3 | R | 3 |
| 15. | Write a program in Java Script to print five names of the student using an array. | | | CO4 | A | 3 |
| 16. | Write a PHP program to find the biggest among two numbers. | | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | a. | Describe the following concepts of search engine mechanisms.  i) Web crawler ii) Ranking iii) Indexing. | | CO1 | U | 6 |
|  | b. | Discuss the following types of websites.  i) Hybrid website ii) Landing page-based website  iii)Brochure website | | CO1 | C | 6 |
|  |  |  | |  |  |  |
| 18. |  | Create the following static web page using HTML. | | CO1 | C | 12 |
|  |  |  | |  |  |  |
| 19. | a. | Describe the different types of CSS that can be included in HTML. Give an example. | | CO2 | R | 6 |
|  | b. | Write a program to load an image in HTML and set the dotted border using CSS. | | CO2 | A | 6 |
|  |  |  | |  |  |  |
| 20. |  | Design the given table using HTML and apply the following styles using CSS.   |  |  | | --- | --- | | **Product** | **Flavors** | | Milk | Almond | | Mango | | Chocolate | | These are exclusive flavors | |   a) Display all the contents of the table at the left.  b) Apply padding space as 15px.  c) Highlight the table rows on mouseover in orange color.  d) Fix the table size on the entire page. | | CO2 | C | 12 |
|  |  |  | |  |  |  |
| 21. | a. | Discuss CSS backgrounds and list the properties. Give an example. | | CO2 | U | 6 |
|  | b | Explain CSS box model elements. | | CO2 | U | 6 |
|  |  |  | |  |  |  |
| 22. | a. | Write the difference between class selectors and id selectors with an example program. | | CO2 | R | 6 |
|  | b. | Describe various positioning properties in CSS. Give an example. | | CO2 | R | 6 |
|  |  |  | |  |  |  |
| 23. | a. | Describe the functions used in JavaScript with an example. | | CO3 | U | 6 |
|  | b. | Write a JavaScript program to perform arithmetic operations (+,-,\*,/,%) with three operands using functions. | | CO6 | C | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. |  | | Develop a web application to maintain student marks using PHP and a database. The database should contain the register number, name of the student, mark1, mark2, mark3, and grade, and do the following.  a. Store the student details in the database  b. Display student details from the database. | CO5 | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the concepts used for web development. |
| CO2 | Select appropriate design standards for designing attractive web pages. |
| CO3 | Identify latest client and server-side technologies for creating interactive data driven websites. |
| CO4 | Apply properties and methods which facilitate dynamic application development. |
| CO5 | Create fully functional web applications that incorporate planning, designing, coding, testing, and publishing to a web server. |
| CO6 | Formulate and build extensible responsive featured web applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 6 | - | - | - | 21 | 30 |
| CO2 | 20 | 13 | 12 | - | - | 12 | 57 |
| CO3 | 4 | 6 | - | - | - | - | 10 |
| CO4 | - | 3 | - | 1 | - | - | 4 |
| CO5 | 1 | 3 | - | - | - | 12 | 16 |
| CO6 | - | - | 1 | - | - | 6 | 7 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **21CS2007** | **Duration** | **3hrs** |
| **Course Name** | **ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Mention the four views of Artificial Intelligence. | CO 1/ R | 1 |
| 2. | List the factors a rational agent should depend on at any given time. | CO 1/ U | 1 |
| 3. | Mention the criteria for the evaluation of search strategy. | CO2 / R | 1 |
| 4. | Whether uniform cost search is optimal? | CO2/ U | 1 |
| 5. | Differentiate predicate logic and propositional logic. | CO3 / U | 1 |
| 6. | “Anything anyone eats and not killed is food” convert this sentence into predicate logic. | CO3 / A | 1 |
| 7. | Compare procedural knowledge with declarative knowledge. | CO4 / U | 1 |
| 8. | Write the equation for Bayes Rule. | CO4 / R | 1 |
| 9. | Define semantic network. | CO5 / U | 1 |
| 10. | Brief on STRIPS planning language. | CO5 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Write a short note on applications of AI. | CO1 / U | 3 |
| 12. | List out the various control strategies available in AI. | CO2 / R | 3 |
| 13. | Briefly describe the four types of knowledge representation techniques in detail. | CO3 / R | 3 |
| 14. | Write a short note on Conceptual dependency. | CO4 / U | 3 |
| 15. | How to calculate the certainty factor (CF) to express a degree of subjective belief? | CO5 / U | 3 |
| 16. | Define the term pattern, features, and class with an example | CO6/ U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Write a PEAS description for at least three agent types. | CO1 / U | 4 |
| b. | List out the different types of environments with suitable examples. | CO1 / R | 4 |
| c. | Explain in detail the learning agent. | CO 1/ U | 4 |
|  |  |  |  |  |
| 18. | a. | Explain in detail about Depth-first search algorithm with the help of the water jug problem. | CO2/ An | 4 |
| b. | Explain the A\* search algorithm with a suitable example. | CO2 / U | 4 |
| c. | Discuss the progress of Map Coloring problem using backtracking search in Constraint Satisfaction Problem (CSP). | CO2/ A | 4 |
|  |  |  |  |  |
| 19. | a. | Briefly explain the various issues in knowledge representation. | CO3 / U | 4 |
| b. | Describe a procedure for converting a sentence to CNF with an example | CO3/ U | 3 |
| c. | Discuss the significance of the Unification algorithm in FOL. | CO3 / U | 5 |

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| 20. | a. | Discuss the Prolog programming with a suitable example. | CO4 / U | 4 |
| b. | Compare forward reasoning with backward reasoning. | CO4 / R | 4 |
| c. | How to model uncertainty with Dempster-Shafer’s theory? | CO4/ U | 4 |
|  |  |  |  |  |
| 21. | a. | Explain in detail the script knowledge representation. | CO5/ U | 2 |
| b. | Explain the need for frames to represent the knowledge about ‘Book.’ | CO5/ A | 5 |
| c. | Analyze the goal stack planning using STRIPS language with appropriate examples. | CO5/An | 5 |
|  |  |  |  |  |
| 22. | a. | Explain the utility-based agents with a neat diagram. | CO1 / R | 2 |
| b. | Explain the Constraint Satisfaction Problem (CSP) and trace the constraint satisfaction procedure for solving the following the crypt arithmetic problem  EAT  + THAT  APPLE | CO2 / A | 8 |
| c. | Explain the simple hill-climbing algorithm with a suitable example. | CO2/ U | 2 |
|  |  |  |  |  |
| 23. | a. | Consider the following sentences  1. All people who are graduating are happy.  2. All happy people smile.  3. Someone is graduating.  4. Conclusion: Is someone smiling?  (i)Translate these sentences into formulas in predicate logic (2)  (ii)Convert the formulas of a part into clause form (2)  (iii)Prove the conclusion using resolution(2) | CO3 / A | 6 |
| b. | Discuss the importance of the Bayesian Network. | CO4/ U | 3 |
| c. | Describe the need for a hierarchical planning system. | CO5/ U | 3 |
|  |  | **Compulsory:** | | |
| 24. | a. | What is the need for genetic algorithm in learning? | CO6/ R | 2 |
| b. | Describe the concept of learning from examples using the Decision tree technique. | CO6/ U | 6 |
| c. | Explain the components involved in building an expert system. | CO6/ R | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | The student will be able to describe the basics of Artificial Intelligence. |
| CO2 | The student will be able to identify the appropriate search algorithms for any AI problem |
| CO3 | The student will be able to prepare appropriate knowledge-based rules to identify causal relationships and conditional independence of a real-world situation. |
| CO4 | The student will be able to select the appropriate search method for identifying different search spaces. |
| CO5 | The student will be able to evaluate the working knowledge of reasoning in the presence of incomplete and/or uncertain information. |
| CO6 | The student will be able to evaluate produce the learning theory for expert systems |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 14 | - | - | - | - | 21 |
| CO2 | 4 | 7 | 12 | 4 | - | - | 27 |
| CO3 | 3 | 13 | 7 | - | - | - | 23 |
| CO4 | 5 | 15 | - | - | - | - | 20 |
| CO5 | 1 | 7 | 5 | 5 | - | - | 18 |
| CO6 | 6 | 9 | - | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21CS2008** | **Duration** | **3hrs** |
| **Course Name** | **ARTIFICIAL INTELLIGENCE FOR GAMES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | List the three basic needs addressed by Artificial Intelligence (AI) in games. | | | CO1 | U | | 1 |
| 2. | Identify the importance of SIMD. | | | CO1 | R | | 1 |
| 3. | Define Landing Pads. | | | CO2 | R | | 1 |
| 4. | Recall Flocking and Swarming. | | | CO2 | R | | 1 |
| 5. | Define a Directed Weighted Graph. | | | CO3 | U | | 1 |
| 6. | List the popular path-finding algorithms for designing games. | | | CO3 | R | | 1 |
| 7. | Indicate the purpose of a leaf in the decision tree. | | | CO4 | U | | 1 |
| 8. | Sketch a tree depicting the AND-OR combination of decisions. | | | CO4 | U | | 1 |
| 9. | Name the classification of games as per game theory. | | | CO5 | R | | 1 |
| 10. | Define the key AI requirements for real-time strategy games. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11 | Analyze the different kinds of AI in games. | | | CO1 | | An | 3 |
| 12. | Describe 2 ½ D static representation of a character in AI games using Kinematic concepts. | | | CO2 | | U | 3 |
| 13. | Compare and contrast the Dijkstra and A\* Algorithm. | | | CO3 | | An | 3 |
| 14. | Discuss the performance and complexity of decision trees. | | | CO4 | | An | 3 |
| 15. | Explain a game tree with suitable examples. | | | CO5 | | U | 3 |
| 16. | Sketch the AI architecture for turn-based games. | | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Describe in detail the model of Game AI with an appropriate diagram. | CO1 | | U | 10 |
|  | | b. | Identify the low-level hardware issues related to the design and construction of AI code. | CO1 | | R | 2 |
| 18. | |  | Explain the steering behavior algorithms with appropriate pseudocode for the following movements in games:  a) Seek  b) Flee  c) Pursue  d) Evade | CO2 | | U | 12 |
| 19. | | a. | Illustrate in detail the Dijkstra pathfinding algorithm and find the shortest path between **C** and other nodes. | CO3 | | U | 6 |
|  | | b. | Describe the working of Hierarchical Pathfinding and Continuous Time Pathfinding techniques. | CO3 | | U | 6 |
| 20. | | a. | Explain the Goal Oriented Behaviour in detail. | CO4 | | R | 4 |
|  | | b. | Infer the use of ID3 Algorithm to create a decision tree.   1. Calculate the entropy of the dataset 2. For each feature calculate entropy for all its categorical values. 3. Calculate information gain for the feature. 4. Find the feature with maximum Information Gain. 5. Identify the root node | CO4 | | A | 8 |
| 21. | |  | Illustrate the Min Max algorithm for solving Tic-Tac-Toe game problem. | CO5 | | A | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Illustrate the generation of the graph in an artificial intelligence-based police car pathfinder. Explain the four types of nodes that are generated. | CO3 | | U | 8 |
|  | | b. | Explain utility-based decision-making. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 23. | | a. | Examine the problems with blended steering behaviors in real games. | CO2 | | An | 2 |
|  | | b. | Describe the steering pipeline and its four stages with a neat diagram. | CO2 | | R | 10 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Explain in detail the most significant AI needs for shooting games and describe the design of AI-based shooting games in detail. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of artificial intelligence in games. |
| CO2 | Identify the different steering behaviors in movement of characters. |
| CO3 | Choose the path finding techniques for designing games. |
| CO4 | Illustrate decision making method for games. |
| CO5 | Design the strategies for the games using game theory. |
| CO6 | Select the appropriate design for artificial intelligence games genre. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 11 | - | 3 | - | - | 17 |
| CO2 | 12 | 15 | - | 2 | - | - | 29 |
| CO3 | 1 | 21 | - | 3 | - | - | 25 |
| CO4 | 4 | 6 | 8 | 3 | - | - | 21 |
| CO5 | 1 | 3 | 12 | - | - | - | 16 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **21CS3010** | **Duration** | **3hrs** |
| **Course Name** | **NATURAL LANGUAGE PROCESSING AND APPLICATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Identify and describe the major challenges in Natural language processing. | CO1 | U | 10 |
|  | b. | Explain the performance metrics *Perplexity* and *Entropy* used to evaluate the performance of N-gram Model. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Describe the text-preprocessing methods to be applied before implementing an NLP machine-learning algorithm to a given corpus. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Demonstrate the following Hypothesis testing in detail:  T- test,Pearson’s chi-square test and Likelihood ratios | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the text annotation process and illustrate the NLP Text Annotation Application for Web Search. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Examine the process of text summarization with neat architecture and explain how automatic text summarization is applied for NEWS application. | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Analyze the N-gram model structure and discuss the real-world applications of the n-gram model in detail**.** | CO3 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Compare and contrast Inflectional and Derivational Morphology with examples. | CO2 | An | 10 |
|  | b. | Outline the process of Word Sense Disambiguation with neat architecture | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Summarize the fundamental problems in the HMM tagger discuss the algorithm for learning the HMM parameters A and B when an observation sequence O and the set of possible states are given. | CO5 | U | 10 |
|  | b. | Express the importance of lexical semantics and discuss in detail the elements of lexical semantics with examples for each. | CO1 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Investigate on Shallow Parsing and Semantic Role Labelling with Conditional Random Fields. | CO6 | A | 10 |
|  | b. | Highlight the goals of Information Extraction in NLP process and analyze the process of transforming an unstructured text or a collection of texts into sets of facts. | CO6 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Apply the principles and Process of Human Languages such as English and other Indian Languages using computers. |
| CO2 | Realize semantics and pragmatics of English language for text processing |
| CO3 | Check a current method for statistical approaches to machine translation. |
| CO4 | Perform POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language. |
| CO5 | Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology. |
| CO6 | Develop a Statistical Methods for Real World Applications and explore deep learning-based NLP. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 30 |  |  |  |  | 30 |
| CO2 |  |  | 20 | 10 |  |  | 30 |
| CO3 |  |  | 20 | 20 |  |  | 40 |
| CO4 |  | 10 |  | 20 |  |  | 30 |
| CO5 |  | 10 |  |  | 20 |  | 30 |
| CO6 |  |  | 10 | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **21CS3011** | **Duration** | **3hrs** |
| **Course Name** | **NETWORK AND SYSTEM SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Describe the motives of cybercriminals and write a short note on threats and attacks on assets that should be prevented in order to assure security for the system and network. | CO1 | R | 8 |
|  | b. | Discuss the following based on password authentication schemes   * The vulnerability of passwords * The use of hash-based passwords * Password selection strategies | CO1 | U | 8 |
|  |  |  |  |  |  |
| 2. | a. | Enumerate the steps involved in Data Encryption Standard and represent the structure of encryption in each stage. | CO2 | R | 8 |
|  | b. | Suppose you have to store your files on any of the cloud services available. You have to be sure that the files that you store are not tampered by any third party. You do it by computing “hash” of that file using a Cryptographic hash algorithm. Estimate the hash function technique and justify that the integrity is not compromised along with its architecture. | CO2 | A | 8 |
|  |  |  |  |  |  |
| 3. | a. | Describe the protocols of Transport Layer Security along with its architecture. | CO3 | U | 8 |
|  | b. | Due to the nature of IT work, ABC employees needed to connect remotely with customers through the internet, with assurance that there would be no connectivity issues or dropped connection. The firm needed a new solution that would allow them to provide prompt support to its customers and they needed it to be reliable, affordable, and easy to use. Express the suitable solution and explain about its technology and protocols. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 4. | a. | Discuss the following overflow attacks   * Replacement stack frame * Return to system call * Heap overflows * Global Data Area Overflows. | CO4 | U | 8 |
|  | b. | We assume a role-based access control system. Carla and Dirk are users of the system. Carla is a student (s) in course c1. Dirk is a  teacher (t) in course c1 but may also access the system as a student; thus two roles are assigned to Dirk; the student role is assigned a lower security clearance and the teacher role a higher security clearance. Based on this scenario bring out the mechanism of Bell-Lapadula model and mention the practical limitations of the model. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 5. | a. | Enumerate the top 5 cloud security threats provided by  ‘The Cloud Security Alliance [CSA13]”, with its respective countermeasures. | CO5 | R | 8 |
|  | b. | Illustrate the preventive measures to be followed during environmental threats caused by fire or smoke in an industry environment. | CO5 | A | 8 |
|  |  |  |  |  |  |
| 6. | a. | Describe the following Asymmetric algorithms.  a. RSA b. DSS c. Diffie - Hellman Key exchange | CO2 | R | 8 |
|  | b. | Illustrate the appropriate algorithm to show how the block cipher mode of operation can be utilized to protect network communication. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the following overflow attacks   * Replacement stack frame * Return to system call * Heap overflows * Global Data Area Overflows. | CO4 | U | 8 |
|  | b. | In modern world, attackers use a technique called as buffer overflows to corrupt the execution stack of a web application which causes the data to be overwritten by the memory address next to it. As a security analyst, explain the defenses used against buffer overflows. | CO4 | A | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | In Blockchain, we use protocols to achieve consensus between participants as to what a blockchain should contain at a given time. Here identify the protocols used in Blockchain and describe each one of them. | CO6 | U | 10 |
|  | b. | Describe the steps to generate bitcoin address manually in Blockchain along with the generation of its private key and public key. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the computer security principles and practices. |
| CO2 | Describe the cryptographic algorithms used in network and system. |
| CO3 | Interpret network features and vulnerabilities to design and enhance network security. |
| CO4 | Analyze the vulnerabilities and threats in software and web security. |
| CO5 | Appraise the security challenges related to the emerging technologies. |
| CO6 | Discuss the challenges of blockchain and its applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 8 | - | - | - | - | 16 |
| CO2 | 16 | 8 | 8 | - | - | - | 32 |
| CO3 | - | 8 | 8 | - | - | - | 16 |
| CO4 | - | 16 | 16 | - | - | - | 32 |
| CO5 | 8 | 8 | - | - | - | - | 16 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **21CS3012** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF CYBER SECURITY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(5 X 16= 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Discuss about computing security with different types of assets. Enumerate the assets available in the computing environment. | CO1 | R | 10 |
|  | b. | Explain about CIA triad with real time examples and brief about advanced persistent threats (APT). | CO1 | U | 6 |
|  |  |  |  |  |  |
| 2. | a. | An IT firm has been hosting client-based OS deployment, you have been requested to custom-tailored OS design for the firm. Recall the functions of OS and functions related to the security of OS. | CO2 | R | 10 |
|  | b. | Interpret operation of OS in terms of Layered Design and Layered Trust. | CO2 | R | 6 |
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| 3. | a. | An organization is need of low-cost firewall, to filter out packets and block certain malicious Ips. Find the suitable firewall for this case and discuss about the different types of firewall available in the market. | CO3 | A | 10 |
|  | b. | Mention the different function of Intrusion Detection System (IDS). | CO3 | R | 6 |
|  |  |  |  |  |  |
| 4. | a. | A firm uses windows active directory for multiple clients, mention a suitable cryptographic security system authenticate provide sessions for the users with explanation. | CO4 | R | 10 |
|  | b. | Discuss about the security services mentioned in X.800 in detail. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Discuss about the Data Mining. Analyze the threats to privacy in data mining and mention the methods to address the threats. | CO5 | U | 10 |
|  | b. | Authentication is recommended to ensure confidentiality and privacy of an information, with this regard explain authentication and different modes of authentication. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 6. | a. | An organization which is potential to cyber-attacks have been planning to secure their perimeters. Discuss about the control groups and control measures that can be implemented in the organization. | CO1 | U | 8 |
|  | b. | Discuss about access control and the access control paradigm. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 7. | a. | During startup of any PC, the OS would start in stages, and trusted path would be present to rely on operations of such parameters. Explain in detail about the trusted system function in the Operating System. | CO2 | R | 10 |
|  | b. | Brief about rootkits, and discuss about different types of rootkits currently exists in real-time. | CO2 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | An organization has started assessing the risk management, and for Business Continuity Planning, it has been recommended to analyze the contingency plan when dealing with disaster. Analyze the different types of potential disaster and mention the steps to address the disaster in the future. | CO6 | An | 10 |
|  | b. | A company is in need to frame a contingency plan for BCP, discuss about the methods used in contingency planning for IT infrastructure. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Explain the various attacks in the Cyberspace. |
| CO2 | Classify the various risks which threatens Cyber Security. |
| CO3 | Apply different controls for ensuring security of information. |
| CO4 | Discover ways and means of identifying security breaches. |
| CO5 | Recommend suitable controls and procedures for ensuring security. |
| CO6 | Analyze the risk (and maximize safety ) in transacting business in cyber space. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 14 | 8 | - | - | - | 32 |
| CO2 | 26 | 6 | - | - | - | - | 32 |
| CO3 | 6 | - | 10 | - | - | - | 16 |
| CO4 | 10 | 6 | - | - | - | - | 16 |
| CO5 | - | 16 | - | - | - | - | 16 |
| CO6 | - | - | 10 | 10 | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **22CS3001** | **Duration** | **3hrs** |
| **Course Name** | **MICROSERVICE ARCHITECTURE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Summarize the key benefits of microservices. | CO1 | U | 10 |
|  | b. | Compare and contrast the terms Microservice and Service-oriented architecture. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Paraphrase the different types of integration supported by microservices. | CO1 | R | 20 |
|  |  |  |  |  |  |
| 3. |  | Demonstrate the handling of database dependencies during splitting monoliths. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss the various types of artifacts used in the deployment of Microservices. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Exemplify the primary testing approaches used in microservice architectures | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Explain how the correlation IDs used in monitoring. Also demonstrate the uniqueness of semantic monitoring. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | Write short notes on the following terms,   * Single responsibility principle * Common closure principle | CO4 | A | 10 |
|  | b. | Discuss the pros and cons of Broker-based Messaging. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | List down the patterns used in query operations of microservices with necessary block diagrams. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Deployment of a project with microservices is a tedious task. There may be tens to hundreds of services that are written in a variety of languages and framework. Also, more moving elements need to be managed in the project. Therefore, summarize the deployment strategies you know in terms of deploying microservice projects. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the variety of ancillary members of the Microservices. |
| CO2 | Measuring the benefits of microservices over the monolith applications. |
| CO3 | Experiment the existing microservices’ performance by monitoring and testing through metrics. |
| CO4 | Exemplify the communication between microservices and application with the support of patterns. |
| CO5 | Practice the operational pattern to build the functionality of microservices. |
| CO6 | Prepare and manage the microservices for cloud-based application using aspect-oriented patterns. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 20 | - | - | - | - | 40 |
| CO2 | - | 20 | 20 | - | - | - | 40 |
| CO3 | 20 | - | 20 | - | - | - | 40 |
| CO4 | - | - | 10 | 10 | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | - | 20 | - | - | - | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18CS1004** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | State the number of bytes reserved for an integer variable in windows 64-bit applications. | | | CO1 | R | | 1 |
| 2. | Identify the invalid variable(s) in the following declarations.   * int 9nr; * float for; * int variable\_count; * int n; | | | CO1 | R | | 1 |
| 3. | Define identifiers. | | | CO2 | R | | 1 |
| 4. | List the different types of logical operators that are included in C. | | | CO2 | R | | 1 |
| 5. | Identify the unconditional branching statement that terminates the execution of a loop. | | | CO3 | U | | 1 |
| 6. | State the important facts of the goto statement. | | | CO3 | R | | 1 |
| 7. | List some predefined string functions. | | | CO4 | R | | 1 |
| 8. | Identify the value of num[4] from the below line of code  int num[]={11,34,56,67,88,94,56}; | | | CO4 | U | | 1 |
| 9. | State the uses of recursion in C. | | | CO5 | R | | 1 |
| 10. | Predict the output for the following code.  char a[50]="All the best!";  printf("Length of string a = %d \n",strlen(a)); | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Describe the steps to develop a program. | | | CO1 | | U | 3 |
| 12. | Discuss the order of precedence in C and predict the output of the program.  #include<stdio.h>  int main()  {  int s=5, u=6, t=2, a;  a = 4\*(s-u\*t);  printf("Result = %f", a);  return 0;  } | | | CO2 | | U | 3 |
| 13. | Write a simple program to find whether a number is divisible by 5. | | | CO3 | | A | 3 |
| 14. | Discuss the Bubble Sort algorithm with illustrations. | | | CO4 | | U | 3 |
| 15. | Explain passing argument to a function with an example. | | | CO5 | | U | 3 |
| 16. | Develop an application in C programming to store vehicle details such as vehicle registration numbers and model names using structures. | | | CO6 | | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Explain pointers in C program along with its features. | CO1 | | U | 4 |
|  | | b. | Draw a flowchart to find the area of the rectangle by getting the values from the user. Convert the flow chart into an algorithm and develop the program for the same. | CO1 | | U | 8 |
|  | |  |  |  | |  |  |
| 18. | | a. | Explain the Relational and Logical operators in C with sample code. | CO2 | | U | 5 |
|  | | b. | Write a C program to find whether a number is divisible by seven or not using the conditional operator. | CO2 | | A | 7 |
|  | |  |  |  | |  |  |
| 19. | | a. | Develop a C program to swap two numbers using pointers and functions with and without using a temporary variable. | CO5 | | A | 9 |
|  | | b. | Differentiate between a while and do while statements. | CO3 | | U | 3 |
|  | |  |  |  | |  |  |
| 20. | | a. | Define an array and explain the declaration of multidimensional arrays with an example. | CO4 | | U | 6 |
|  | | b. | Write a C program to sort the list of values stored in an array in ascending and descending order. | CO4 | | A | 6 |
|  | |  |  |  | |  |  |
| 21. | | a. | Describe self-referential structures in the C program and explain how the structure variables are declared and initialized. | CO6 | | U | 6 |
|  | | b. | Using functions, write a C program to find the odd numbers from an integer array. | CO5 | | A | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Develop a program in C to initialize two 2-dimensional matrices of MXN order and find their sum. | CO4 | | A | 6 |
|  | | b. | Write a program to find the reverse of a string, and concatenate it with the original string to display it. | CO4 | | U | 6 |
|  | |  |  |  | |  |  |
| 23. | | a. | Develop a C program to add the value 5 to all the numbers in an array using the call-by address (pointers or reference) method. | CO6 | | A | 8 |
|  | | b. | Differentiate Structures with Arrays. | CO6 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Develop a C program to find the sum of all the elements in an array using the recursion function. | CO5 | | A | 6 |
|  | | b. | Write the C program to search a character array and find the number of vowels in the array. | CO4 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of computer and software development process. |
| CO2 | Identify the data type to represent the real time data representation and operators for computation. |
| CO3 | Prepare innovative solutions for the problem using branching and looping statements. |
| CO4 | Decompose a problem into functions and synthesize a complete program using the divide and conquer approach. |
| CO5 | Formulate algorithms and programs using arrays, pointers, and structures. |
| CO6 | Create a new application software to solve real-world problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO/P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 2 | 8 | 7 | - | - | - | 17 |
| CO3 | 1 | 4 | 3 | - | - | - | 8 |
| CO4 | 1 | 14 | 20 | - | - | - | 35 |
| CO5 | 1 | 3 | 21 | - | - | - | 25 |
| CO6 | - | 11 | 11 | - | - | - | 22 |
|  | | | | | | | 124 |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS1001** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | List any two format specifiers in C. | | CO1 | R | | 1 |
| 2. | Define syntax error. | | CO1 | R | | 1 |
| 3. | Suppose that x, y and z are integer variables which have been assigned the values 2, 3 and 4, respectively. Identify the output of the following expression: x\*= -2 \* (y+z) / 3. | | CO2 | U | | 1 |
| 4. | Determine the output of the flowing statement.  printf("integer: %d\n", sizeof(integer)); | | CO2 | U | | 1 |
| 5. | Predict the output of the following program.  #include<stdio.h>  int main()  {  int j;  for(j=0;j<=8;j++)  {  if(j==4)  {  continue;  }  printf(“%d”,j);  }  return 0;  } | | CO3 | U | | 1 |
| 6. | Recall the syntax for ‘while’ loop. | | CO3 | R | | 1 |
| 7. | Identify the output of C Program.  int main()  { int a[];  a[4] = {1,2,3,4};  printf("%d", a[0]);  } | | CO5 | U | | 1 |
| 8. | Mention the string function used to convert a string to lowercase. | | CO5 | A | | 1 |
| 9. | Outline the concept of recursion. | | CO4 | R | | 1 |
| 10. | Describe formal parameters used in the function with an example. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the benefits of SDLC. | | CO1 | | R | 3 |
| 12. | Develop a C program that gets two numbers from the user, divides the numbers, and prints the remainder and quotient. | | CO2 | | A | 3 |
| 13. | Construct aC program to find the given number is odd or even using ‘if else’ statement. | | CO3 | | A | 3 |
| 14. | Implement a C program to find the length of the given string using string function. | | CO4 | | A | 3 |
| 15. | Describe the process of passing arrays to function. | | CO5 | | A | 3 |
| 16. | Elucidate about any three file handling functions in C. | | CO6 | | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Illustrate the software life cycle model in detail. | CO1 | | U | 6 |
|  | b. | Explain the following console input/output with suitable example:  a. gets() b. puts() c. scanf() d. printf() | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Enumerate about following operators in detail:  a. Relational operator b. Unary operator. | CO2 | | R | 6 |
|  | b. | Develop a C program demonstrating all the logical operators. [consider a=5, b=5, c=10] | CO2 | | A | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Construct a C program to read the age of a candidate and determine whether it is eligible for casting his/her own vote using ‘if-else’ statement. | CO3 | | A | 4 |
|  | b. | Compare and contrast the ‘while’ and ‘do-while’ loop with suitable C code. | CO3 | | U | 8 |
|  |  |  |  | |  |  |
| 20. | a. | Create a C program for searching an element in an array and displaying its position. | CO5 | | A | 8 |
|  | b. | Write short notes on following:  a. strrev() b. strcat() | CO5 | | A | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Differentiate between call by value and call by reference. | CO4 | | U | 4 |
|  | b. | Construct a C Program to find the factorial of a number using function. | CO4 | | A | 8 |
|  |  |  |  | |  |  |
| 22. | a. | Construct a C program for adding two integers by passing pointer to a function. | CO5 | | U | 6 |
|  | b. | Compose C code to search the array in the reverse order, returning ‘0’ when the element is not found. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Build a C program to find the size of int, float, double and char. | CO2 | | A | 5 |
|  | b. | Describe in detail about computer hardware and software. | CO1 | | R | 7 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Construct a C program to create an employee database contains empname, emp id, company name, year of experience using Structure. | CO6 | | A | 6 |
|  | b. | Develop a C program to create a file named customer.txt and store the content of any two customer’s information. (Name, Address, contact no, Customer ID). | CO6 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of computer and software development process. |
| CO2 | Identify the data type to represent the real time data representation and operators for computation. |
| CO3 | Prepare innovative solutions for the problem using branching and looping statements. |
| CO4 | Decompose a problem into functions and synthesize a complete program using divide and conquer approach. |
| CO5 | Formulate algorithms and programs using arrays, pointers and structures. |
| CO6 | Create a new application software to solve real world problems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 12 | 12 | - | - | - | - | 24 |
| CO2 | 6 | 2 | 14 | - | - | - | 22 |
| CO3 | 1 | 9 | 7 | - | - | - | 17 |
| CO4 | 2 | 10 | 11 | - | - | - | 23 |
| CO5 | - | 7 | 16 | - | - | - | 23 |
| CO6 | - | 3 | 12 | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20CS1004** | **Duration** | **3hrs** |
| **Course Name** | **APPLICATIONS OF PYTHON PROGRAMMING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Predict the output of the following program:  str1 = 'hello Mech'  str2 =” how are you”  print (str1[0:2])  print (str1[4])  print (str1\*2)  print (str1 + str2) | | | CO1 | A | | 1 |
| 2. | State the operator is used to assign value to a variable. | | | CO1 | R | | 1 |
| 3. | Recall the Syntax of open a file. | | | CO2 | R | | 1 |
| 4. | Define Cipher text. | | | CO2 | R | | 1 |
| 5. | Identify the method used to display the object data in customized format. | | | CO3 | U | | 1 |
| 6. | Predict the output of the following program:  class test:  def \_\_init\_\_(self,a="Hello World"):  self.a=a  def display(self):  print(self.a)  obj=test()  obj.display() | | | CO3 | A | | 1 |
| 7. | State the methods used to reposition the turtle pen. | | | CO4 | R | | 1 |
| 8. | Identify the function used to convert a color image to grayscale. | | | CO4 | U | | 1 |
| 9. | Identify the attribute that is used to align the widget inside the grid cell of grid layout manager. | | | CO5 | U | | 1 |
| 10. | Recall the acronym ofSfePy. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Predict the output of the following program:  d = {1:'Jimmy', 2:'Alex', 3:'john', 4:'mike'};  print("1st name is "+d[1]);  print("2nd name is "+ d[4]);  print (d);  print (d.keys());  print (d.values()); | | | CO1 | | A | 3 |
| 12. | Convert the Binarynumber 1100111to Decimal. | | | CO2 | | U | 3 |
| 13. | Develop a python program for Overloading Comparison Operator *“==”*. | | | CO3 | | A | 3 |
| 14. | Give examples for converting an Image to Black and White. | | | CO4 | | U | 3 |
| 15. | Prepare a python program for creating Label widget. | | | CO5 | | A | 3 |
| 16. | List the functions in the main stl module used to read STL files. | | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | | |
| 17. | | a. | Discuss the various types of function with examples. | CO1 | | U | 6 |
|  | | b. | Illustrate a while loop to reverse the given number. | CO1 | | U | 6 |
| 18. | | a. | Describe the Data Encryption. | CO2 | | U | 6 |
|  | | b. | Discuss about various types of String Methods with examples. | CO2 | | U | 6 |
| 19. | | a. | Discuss the various types of Inheritance. | CO3 | | U | 6 |
|  | | b. | Explain in detail about Operator Overloading with examples. | CO3 | | U | 6 |
| 20. | | a. | Develop a program to load an image and demonstrate the following operations on it:  i) Reduce the Image size of its half size  ii) Rotate the image 145 degrees | CO4 | | A | 6 |
|  | | b. | Develop a program to load an image and demonstrate the following operations on it:  ii) Crop the image  ii) Change the color image to GrayScale, Black and White | CO4 | | A | 6 |
| 21. | | a. | Discuss about the following GUI Resources:  i. Accessing Database ii. Storing and Retrieving data | CO5 | | U | 6 |
|  | | b. | Discuss about Multi-Line Text Widgets with example. | CO5 | | U | 6 |
| 22. | | a. | Construct a Python Program for jump Table. | CO3 | | A | 6 |
|  | | b. | Prepare a python program for Storing objects in a List. | CO3 | | A | 6 |
| 23. | | a. | Develop a program to draw a filled rectangle using Turtle. | CO4 | | A | 6 |
|  | | b. | Construct a python program for Blur the image. | CO4 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Explain the working principles of matplotlib with an example program. | CO6 | | U | 6 |
|  | | b. | Explain in detail about NumPy in Python. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Choose the basic programming constructs of Python suitably. |
| CO2 | Infer the concepts of string processing, file I/O, lists and dictionary. |
| CO3 | Apply modules for reusability and the object-oriented principles for modeling and developing software system. |
| CO4 | Utilize the power of graphics for processing images. |
| CO5 | Construct applications with graphical user interface. |
| CO6 | Develop software solutions using standard libraries for mechanical applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 01 | 12 | 04 |  |  |  | 17 |
| CO2 | 02 | 15 |  |  |  |  | 17 |
| CO3 |  | 13 | 16 |  |  |  | 29 |
| CO4 | 01 | 04 | 24 |  |  |  | 29 |
| CO5 |  | 13 | 03 |  |  |  | 16 |
| CO6 | 04 | 12 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2024** | **Duration** | **3hrs** |
| **Course Name** | **ETHICS IN INFORMATION TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the virtue which is considered as the cornerstone of ethical behaviour. | | CO1 | U | | 1 |
| 2. | Differentiate between morals and ethics. | | CO1 | R | | 1 |
| 3. | Enumerate the three basic groups of cybercrime commission. | | CO2 | U | | 1 |
| 4. | Recall the importance of digital signature. | | CO2 | R | | 1 |
| 5. | Define Rootkit. | | CO3 | U | | 1 |
| 6. | Mention the two forms of dynamic testing. | | CO4 | U | | 1 |
| 7. | Sketch any two sample tools used in PDCA cycle. | | CO5 | U | | 1 |
| 8. | List out the Social Networking ethical issues. | | CO5 | R | | 1 |
| 9. | List out the characteristics guiding Continiuity Planning. | | CO6 | R | | 1 |
| 10. | Mention the need for ISMS. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Sketch the fishbone diagram for the following statement:  “Late for college” | | CO1 | | U | 3 |
| 12. | Examine on the relationship between IT workers and employer. | | CO2 | | A | 3 |
| 13. | Summarize the limitations of using copyrights to protect intellectual property. | | CO3 | | U | 3 |
| 14. | Discuss the types of Software product liability. | | CO4 | | R | 3 |
| 15. | Mention the advantages and disadvantages of Offshore Outsourcing. | | CO5 | | U | 3 |
| 16. | Identify the top threats to Business Continuity. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | Summarize the ways to improve corporate ethics to reduce unethical practices and behavior in an organization. | CO1 | | U | 6 |
|  | b. | Comment on the importance of learning from the past, using the nuclear reactor accident at Three Mile Island as an example.  Explain the various steps involved in ethical decision-making process. | CO1 | | U | 6 |
| 18. |  | Analyze on the various leadership styles and justify the leadership style appreciated by you. | CO2 | | An | 12 |
| 19. | a. | Attackers use a variety of techniques to identify and take advantage of system weaknesses in the applications. Explain the various types of exploits in detail. | CO2 | | U | 6 |
|  | b. | Sketch the CIA security triad and discuss how it is implemented in network level, application level and end user level. | CO2 | | U | 6 |
| 20. | a. | Explain the various key issues that apply to intellectual property and information technology. | CO3 | | U | 6 |
|  | b. | Interpret on the types of perpetrators. | CO3 | | U | 6 |
| 21. | a. | Discuss about the different types of testing. | CO4 | | U | 6 |
|  | b. | Appraise about telework and mention the pros and cons of teleworking. | CO4 | | An | 6 |
| 22. | a. | Express your view on digital divide and industry 4.0 in the area of healthcare. | CO5 | | R | 6 |
|  | b. | Interpret the development of safety-critical systems. | CO5 | | U | 6 |
| 23. |  | Describe the following Non-traditional workers   1. Contingent Workers. 2. H1-B Workers. 3. Outsourced Workers. | CO6 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Interpret on the roles and responsibilities in Information Asset Management with a neat sketch. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand professional ethics and organizational culture conduct in information technology. | | | | | | | |
| CO2 | Identify the various leadership styles and the suitability for the specific organization. | | | | | | | |
| CO3 | Identify the possible Computer crimes and the rules and regulations for protection. | | | | | | | |
| CO4 | Familiarize with the various types of IPR and the procedures for obtaining IPR. | | | | | | | |
| CO5 | Understand about the various types of Social Networking and issues. | | | | | | | |
| CO6 | Relate to the different national and international organizational model with intellectual ability. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 16 | - | - | - | - | 17 |
| CO2 | | 1 | 13 | 3 | 12 | - | - | 29 |
| CO3 | | - | 16 | - | - | - | - | 16 |
| CO4 | | 3 | 7 | - | 6 | - | - | 16 |
| CO5 | | 7 | 10 | - | - | - | - | 17 |
| CO6 | | 4 | 13 | 12 | - | - | - | 29 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20CS2039** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF INDUSTRY 4.0** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the Industrial Internet term coined by CISCO organization. | | CO1 | R | | 1 |
| 2. | State the term “Power of 1%” in Industrial Internet. | | CO1 | R | | 1 |
| 3. | Name the Internet-enabled device that lies at the heart of all the recent trends in IoT and machine learning. | | CO2 | R | | 1 |
| 4. | Recall the term first coined by Cisco to describe a cloud infrastructure that is located close to the network edge. | | CO2 | R | | 1 |
| 5. | Name the raw material used in 3D printing. | | CO3 | R | | 1 |
| 6. | State the term “People versus Automation” in Industrial Internet. | | CO3 | R | | 1 |
| 7. | Identify the networking technology that became the de facto in the enterprise across the business computers. | | CO4 | U | | 1 |
| 8. | Recall the term Wi-Fi Backscatter. | | CO4 | R | | 1 |
| 9. | Name the protocol that depends on three-way handshake mechanism. | | CO5 | R | | 1 |
| 10. | Recall the stateless protocol that doesn’t acknowledge the packets being sent. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the advancements in Industry 4.0. | | CO1 | | R | 3 |
| 12. | Define Miniaturization with an example. | | CO2 | | R | 3 |
| 13. | List the differences between IPv4 and IPv6. | | CO3 | | R | 3 |
| 14. | List the categories of Cloud Services. | | CO4 | | R | 3 |
| 15. | Recall API with an example. | | CO5 | | R | 3 |
| 16. | Define Identify Access Management with an example. | | CO6 | | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. |  | Describe the following:   1. Innovation and the IIoT. 2. Key Opportunities and Benefits. 3. Evolution and Revolution of Industrial Internet. | CO1 | | U | 12 |
| 18. |  | Describe the following:   1. Discuss in detail about how Augmented Reality helps the Industrial Internet of Things for proper planning with minimal collateral damage. 2. Big Data and Analytics. 3. 3D Printing. | CO2 | | U | 12 |
| 19. |  | Explain in detail about Industrial Internet Architecture Framework (IIAF) with suitable diagram. | CO3 | | U | 12 |
| 20. |  | Discuss in detail about Proximity Network Communication Protocol with a suitable architecture diagram. | CO4 | | U | 12 |
| 21. |  | Explain the different types of Middleware Transport protocols in detail with suitable parameters. | CO5 | | U | 12 |
| 22. |  | Describe the following web services:   1. SOAP. 2. REST. 3. Profinet. 4. Carrier Ethernet. | CO4 | | U | 12 |
| 23. |  | Describe the following IIoT WAN Technologies:   1. SigFox. 2. LoRaWAN. 3. NWave. 4. Dash7. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe the following:   1. Smart Manufacturing. 2. Smart Factories. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the drivers and enablers of Industry 4.0. |
| CO2 | Define the smartness in Smart Factories, Smart cities, smart products and smart services. |
| CO3 | Understand the various systems used in a manufacturing plant and their role in an Industry 4.0 world. |
| CO4 | Summarize the power of Cloud Computing in a networked economy. |
| CO5 | Express the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits. |
| CO6 | Identify the security challenges involved in industry 4.0. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 12 | - | - | - | - | 17 |
| CO2 | 5 | 12 | - | - | - | - | 17 |
| CO3 | 5 | 12 | - | - | - | - | 17 |
| CO4 | 4 | 25 | - | - | - | - | 29 |
| CO5 | 5 | 24 | - | - | - | - | 29 |
| CO6 | 3 | 12 | - | - | - | - | 15 |
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| **Course Code** | **18CS3070** | **Duration** | **3hrs** |
| **Course Name** | **OPTIMIZATION TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and the daily capacity of the three machines are given in the table below:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Machine | Time per unit (minutes) | | | Machines Capacity (minutes/day) | | Product 1 | Product 2 | Product 3 | | M1 | 2 | 3 | 2 | 440 | | M2 | 4 | - | 3 | 470 | | M2 | 2 | 5 | - | 430 |   It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs.3 and Rs.6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical (L.P.) model that will maximize the daily profit | CO2 | U | 10 |
|  | b. | Describe the steps of formulation of Linear Programming Problem. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compute the following using simplex method.  max x + 2y  sub to x + 3y ≤ 15  2x – y ≤ 12  x, y ≥ 0 | CO2 | A | 15 |
|  | b. | Convert the following problem into slack form of LPP  min 4x+5y  sub to 7x + 4y = 28  15x +12y ≤ -20  x, y>0 | CO1 | U | 5 |
|  |  |  |  |  |  |
| 3. | a. | Compute the following using revised simplex method.  max  z=2x+y  sub to             3x+4y≤ 6           6x+y≤ 3         x, y≥ 0 | CO2 | A | 15 |
|  | b. | Convert the given problem into its dual.  Max z= 2x1+ 3x2 + x3  subject to 4x1+ 3x2 + x3 = 6  x1+ 2x2 + 5x3 = 4  x1, x2 ≥ 0 | CO1 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Solve the given assignment problem using Hungarian algorithm.  Solution of assignment problems (Hungarian Method) - Procedure, Example  Solved Problem | Operations Research | CO3 | A | 05 |
|  | b. | Solve the given transportation problem using   1. Least Cost Cell Method. 2. North West Corner Method 3. Vogel’s Approximation Method  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | **D1** | **D2** | **D3** | **D4** | **D5** | **Supply** | | **S1** | 10 | 2 | 3 | 15 | 9 | 35 | | **S2** | 5 | 10 | 15 | 2 | 4 | 40 | | **S3** | 15 | 5 | 14 | 7 | 15 | 20 | | **S4** | 20 | 15 | 13 | 25 | 8 | 30 | | **Demand** | 20 | 20 | 40 | 10 | 35 |  | | CO3 | A | 15 |
|  |  |  |  |  |  |
| 5. |  | Explain Semi definite programming with an example | CO4 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Explain quadratic programming with an example. | CO4 | R | 20 |
|  |  |  |  |  |  |
| 7. |  | Design solution using genetic algorithm to solve the maximization problem f(x) = x2-20x where 0 <x<20. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Design ant colony optimization algorithm to solve travelling salesman problem. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Elaborate on the methodology of Particle Swarm Optimization. | CO6 | R | 10 |
|  | b. | Illustrate the application of Particle Swarm Optimization technique to solve the job scheduling problem using single processor. | CO6 | U | 10 |

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Define and use optimization terminology and concepts. |
| CO2 | Formulate optimization problems. |
| CO3 | Understand and apply the concept of optimality criteria for various types of optimization problems. |
| CO4 | Solve various constrained and unconstrained problems in single variable as well as multivariable. |
| CO5 | Apply the methods of optimization in real life situation. |
| CO6 | Implement basic optimization algorithms in a computational setting and apply existing optimization software packages to solve engineering problems. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 |  | 10 | 30 |  |  |  | 40 |
| CO3 |  |  | 20 |  |  |  | 20 |
| CO4 | 40 |  |  |  |  |  | 40 |
| CO5 |  |  | 40 |  |  |  | 40 |
| CO6 | 10 | 10 |  |  |  |  | 20 |
|  | | | | | | | **180** |