**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **09EC224/14EC2014/EC228/EC245/12EC216** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SIGNAL 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. | Examine the DTFT of the sequence x[n] = u [n-2]. | | CO1 | R | | 1 |
| 2. | Indicate the computational efficiency of 512 point FFT over DFT. | | CO1 | U | | 1 |
| 3. | Tell any two **properties of Chebychev filter.** | | CO2 | R | | 1 |
| 4. | Show the magnitude response of Butterworth filter. | | CO2 | U | | 1 |
| 5. | Report the advantages of FIR filter. | | CO2 | U | | 1 |
| 6. | List the windowing techniques. | | CO2 | R | | 1 |
| 7. | Convert into one’s complement. | | CO3 | U | | 1 |
| 8. | Sketch the basic signal flow graph of DIF-FFT. | | CO1 | A | | 1 |
| 9. | Define round off noise. | | CO3 | R | | 1 |
| 10. | Define quantization step size. | | CO3 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Determine the DFT of the sequence x[n]=[-1]n; 0<n<5. | | CO1 | | A | 3 |
| 12. | Determine the circular convolution of the following signals  x1[n]={1,2,3,4} x2[n]={2,2,2,2}. | | CO1 | | A | 3 |
| 13. | Compare impulse invariant and bilinear transformation. | | CO2 | | A | 3 |
| 14. | Compare IIR and FIR filter characteristics. | | CO2 | | A | 3 |
| 15. | Give examples of floating point representation. | | CO3 | | U | 3 |
| 16. | Summarize any one application of adaptive filters. | | 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. |  | Determine the sectioned convolution using overlap add method for the given sequences x[n]=[1,-3,2,2,4,2,2,-4,-2,1]and . | CO1 | | A | 12 |
| 18. |  | The 8-point sequence is given by x[n]=[1]n. Compute the 8 point DIT FFT of x (n). Draw the flow graph and tabulate the intermediate stage results. | CO1 | | A | 12 |
| 19. |  | Develop a Chebyshev filter for the following specifications    Use impulse invariant technique. | CO2 | | A | 12 |
| 20. |  | Develop the digital IIR low pass butter worth filter to meet the following specifications:  Pass band gain=0.89  Pass band edge frequency=30 Hz  Stop band attenuation=0.20  Stop band edge frequency=75 Hz  Use Bilinear transformation. Assume sampling frequency is 200 Hz | CO2 | | A | 12 |
| 21. |  | Determine the dead band of a system  y[n]=0.2y[n-1]+0.5y[n-2]+x[n]. Assume 8 bits are used for system representation. | CO3 | | A | 12 |
| 22. |  | Explain in detail the finite word length effects in digital filter | CO3 | | U | 12 |
| 23. |  | The desired response of the filter is    Determine the frequency response H(ejw) for N=11 using Hanning window | CO2 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss about LMS algorithm and list out the practical limitations of basic LMS algorithm. | CO3 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | The students gain basic knowledge about digital signal processing. |
| CO2 | The students understand Digital (IIR and FIR) filter design procedures. |
| CO3 | The students acquire knowledge on finite word length effects and PDSPs. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 31 | - | - | - | 33 |
| CO2 | 2 | 2 | 42 | - | - | - | 46 |
| CO3 | 2 | 7 | 36 | - | - | - | 45 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **11EC203/14EC2003/EC227/EC285/12EC214** | **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. | Observe the even and odd components of the signal x(t) = ejt | | CO1 | R | | 1 |
| 2. | Construct the waveform δ(t – 2) + δ(t + 2). | | CO1 | A | | 1 |
| 3. | List any two properties of CTFS. | | CO1 | R | | 1 |
| 4. | Show the significance of Parsevals relation. | | CO1 | U | | 1 |
| 5. | Define Nyquist rate. | | CO2 | R | | 1 |
| 6. | Construct the waveform of with and without aliasing error. | | CO2 | A | | 1 |
| 7. | Define Power Spectral Density. | | CO2 | R | | 1 |
| 8. | Differentiate DFT and DTFT. | | CO3 | U | | 1 |
| 9. | Describe a mount IIR system. | | CO3 | U | | 1 |
| 10. | Determine the Z transform of 3n  u( n – 2). | | CO3 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Determine the linear convolution of the given sequences:  x(n) = { 1,2,–3 }and h(n) = {4,–2}. | | CO1 | | A | 3 |
| 12. | State and prove Complex Time Shifting property of Continuous Time Fourier Transform. | | CO1 | | R | 3 |
| 13. | Evaluate the nyquist rate of 10KHz signal is to be sampled. | | CO1 | | An | 3 |
| 14. | Estimate the DTFT of x(n) = na nu(n). | | CO2 | | U | 3 |
| 15. | Determine the inverse Z transform of X(Z) = ln (1– a Z – 1 ) for 0<a<1. | | CO2 | | A | 3 |
| 16. | Define frequency response. State its properties. | | CO3 | | 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 Convolution Sum. | CO1 | | An | 6 |
|  | b. | Discriminate whether the given system y[n] = Ax(n)+B is linear and time invariant. | CO1 | | E | 6 |
| 18. |  | Determine the step response for the LTI system having the impulse response . | CO1 | | A | 12 |
| 19. |  | Determine the Fourier transform of the following and sketch the magnitude and phase.  1. 2. | CO2 | | A | 12 |
| 20. | a. | Explain the reconstruction of CT signal from its samples. | CO2 | | A | 6 |
|  | b. | Construct the spectrum of a sampled signal and explain aliasing. | CO2 | | A | 6 |
| 21. | a. | Estimate the Fourier transform of the following  i.  ii.  iii. iv. | CO3 | | U | 6 |
|  | b. | State and prove any three properties of DTFT. | CO3 | | R | 6 |
| 22. |  | State and prove any five important properties of the Z transform. | CO2 | | R | 12 |
| 23. |  | Estimate the impulse response and step response for the following system | CO2 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | A difference equation of a discrete time system is given below: y(n)-3/4 y(n-1) +1/8 y(n-1) = x(n) +1/2 x(n-1). Develop direct form I and direct form II. | CO3 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Students gain knowledge about discrete and continuous time signals and systems. |
| CO2 | Students acquire knowledge about the frequency of continuous time signals and systems using CTFT and Laplace transforms. |
| CO3 | Students are familiarized on the sampling process and frequency analysis of discrete time signals and systems using DTFT and Z transform. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 1 | 16 | 9 | 6 | - | 37 |
| CO2 | 14 | 15 | 28 | - | - | - | 57 |
| CO3 | 9 | 8 | 1 | - | - | 12 | 18 |
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**Graphical user interface, application

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| **Course Code** | **12EC236/14EC2038/19EC2041** | **Duration** | **3hrs** |
| **Course Name** | **CELLULAR MOBILE 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. | Define frequency reuse. | | CO1 | R | | 1 |
| 2. | List the types of interferences in wireless communication. | | CO1 | R | | 1 |
| 3. | Quote any one antenna used in mobile radio environment. | | CO2 | R | | 1 |
| 4 | Define cross talk. | | CO3 | R | | 1 |
| 5 | State the importance of micro zonal concept. | | CO3 | R | | 1 |
| 6 | Tell the feature of SDMA. | | CO4 | R | | 1 |
| 7 | State any one application of FDMA. | | CO5 | R | | 1 |
| 8 | Recite the types of fading. | | CO5 | R | | 1 |
| 9. | Recite the function of home location register (HLR). | | CO5 | R | | 1 |
| 10. | Recall the applications of GPRS. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the importance of sectoring. | | CO1 | | R | 3 |
| 12. | Illustrate the Near End Far End Interference. | | CO2 | | U | 3 |
| 13. | List the limitations in conventional mobile telephone system. | | CO3 | | R | 3 |
| 14. | Illustrate the interfaces in GPRS. | | CO3 | | U | 3 |
| 15. | Recall the advantages of CDMA. | | CO4 | | R | 3 |
| 16. | List the types of spread spectrum techniques. | | 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. |  | Describe in detail the Concept of frequency Reuse and cell splitting. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Express cochannel and its interference, also find the distance between 2 cochannel cells for N=7 and radius 3km. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Discuss the importance of diversity in cellular communication. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Summarize the generation of cellular communication. | CO4 | | E | 12 |
|  |  |  |  | |  |  |
| 21. |  | Describe the working of Time Division Multiplexing. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Recite the effect of delay spread in wireless communication. | CO5 | | R | 5 |
|  | b. | Analyze types of fading in mobile communication. | CO6 | | An | 7 |
|  |  |  |  | |  |  |
| 23. | a. | Justify the importance of spread spectrum technique. | CO3 | | E | 6 |
|  | b. | Summarize the architecture of GPRS. | CO1 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Enumerate the architecture and services in the GSM segment supporting the development of the GSM system. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand impairments due to multi path fading channel. |
| CO2 | Apply fundamental techniques to overcome the different fading effects, Co-channel and Non-Co-channel interference. |
| CO3 | Familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas. |
| CO4 | Analyse advanced data communicating methods and networking protocols for wireless and mobile environments. |
| CO5 | Utilize and employ application frameworks for developing mobile applications including under disconnected and weakly connected environment. |
| CO6 | Critically analyze security issues of mobile and wireless computing systems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 18 | - | - | - | - | 23 |
| CO2 | 1 | 15 | - | - | - | - | 16 |
| CO3 | 5 | 15 | - | - | 6 | - | 26 |
| CO4 | 4 | - | - | - | 12 | - | 16 |
| CO5 | 12 | 12 | - | - | - | - | 24 |
| CO6 | 12 | - | - | 7 | - | - | 19 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **14EC2001/EC209/12EC205** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL ELECTRONICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Convert the binary number 101112 to the equivalent decimal number. | | | CO1 | A | | 1 |
| 2. | Find the 1’s complement of the binary number 1012. | | | CO1 | A | | 1 |
| 3. | Recall the logic gate that performs complement operation. | | | CO1 | R | | 1 |
| 4. | Identify the equivalency of A.A**’** using Boolean law. | | | CO1 | U | | 1 |
| 5. | Convert the given Gray code 1011 into equivalent binary code. | | | CO1 | A | | 1 |
| 6. | Tell the other name of demultiplexer. | | | CO2 | R | | 1 |
| 7. | Write the output of T flip flop when T=1. | | | CO2 | A | | 1 |
| 8. | Define latch. | | | CO2 | R | | 1 |
| 9. | Write the difference between RTL and DTL. | | | CO3 | A | | 1 |
| 10. | Indicate why ECL is faster than TTL. | | | CO3 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Construct an AND gate using NAND gate. | | | CO1 | | A | 3 |
| 12. | Compute the output (Y) of the logic circuit shown below. | | | CO1 | | A | 3 |
| 13. | Compare combinational circuit and sequential circuit. | | | CO2 | | U | 3 |
| 14. | Develop a T Flip Flop from a JK Flip Flop. | | | CO2 | | A | 3 |
| 15. | Explain race-around condition in flip flop and suggest a method to eliminate this race-around condition. | | | CO2 | | A | 3 |
| 16. | Describe the function a pull up resistor when it is used with an open-collector TTL output. | | | 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. | |  | Compute the simplified Boolean expressions for the following using Boolean laws.   1. AB+ABC+AB’C’+AC’ 2. ABC+A’B+ABC’ 3. AB+AB’C+AB’C 4. BAC’+B’AC’+BC’ | CO1 | | A | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Construct K-map and find the simplified expression for the given Boolean function using K-map.  F(A,B,C,D) = Σ (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14) | CO1 | | A | 6 |
|  | | b. | Sketch the logic circuit of the given Boolean expression using NAND gates only.  F(A,B,C) = AB + A’C | CO1 | | A | 6 |
|  | |  |  |  | |  |  |
| 19. | |  | Sketch the symbols, truth tables and output expressions of all the basic logic gates. | CO1 | | A | 12 |
|  | |  |  |  | |  |  |
| 20. | |  | Design a full adder circuit and mention the necessity of full adder circuit. | CO2 | | A | 12 |
|  | |  |  |  | |  |  |
| 21. | |  | Design a 4x1 Multiplexer and indicate the differences between multiplexer and demultiplexer. | CO2 | | A | 12 |
|  | |  |  |  | |  |  |
| 22. | |  | Explain a 2-bit magnitude comparator in detail. | CO2 | | U | 12 |
|  | |  |  |  | |  |  |
| 23. | |  | Discuss the operation of 2-bit asynchronous up counter with necessary diagrams. | CO2 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Summarize the different types of programmable logic devices. | CO3 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand number systems, binary codes and the basic postulates of Boolean algebra. |
| CO2 | Acquire knowledge to design various combinational and sequential circuits. |
| CO3 | Gain better understanding in the implementation of digital circuits in programmable logic devices and about different logic families. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 45 | - | - | - | 47 |
| CO2 | 2 | 27 | 31 | - | - | - | 60 |
| CO3 | - | 16 | 1 | - | - | - | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **14EC2008/EC211/12EC208** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **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 important components inside IC741 op amp. | | | | CO1 | R | | 1 |
| 2. | Define CMRR. | | | | CO1 | R | | 1 |
| 3. | Review the significance of ideal differentiator circuit. | | | | CO1 | U | | 1 |
| 4. | Recall the precision rectifier circuit and calculate the input voltage of a precision rectifier with cut in voltage 0.7v and assuming ideal op amp characteristics. | | | | CO1 | R | | 1 |
| 5. | Observe the output voltage in the below circuit:  http://www.indiabix.com/_files/images/electronic-devices-and-circuit-theory/mcq11_00300.gif | | | | CO1 | U | | 1 |
| 6. | Compare inverting and non-inverting op amp. | | | | CO1 | U | | 1 |
| 7. | Examine the output voltage for this circuit with a sinusoidal input of 2.5 mV.  http://www.indiabix.com/_files/images/electronic-devices-and-circuit-theory/mcq11_00100.gif | | | | CO1 | R | | 1 |
| 8. | What is the type of feedback used in oscillator? | | | | CO1 | R | | 1 |
| 9. | Define PLL. | | | | CO3 | R | | 1 |
| 10. | Recall the applications of 555 timer. | | | | CO2 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Explain the frequency response of the basic and practical differentiator. | | | | CO1 | | U | 3 |
| 12. | Explain the working of half wave rectifier. | | | | CO3 | | U | 3 |
| 13. | Compute the input voltage if the final output is 10.08 V.  http://www.indiabix.com/_files/images/electronic-devices-and-circuit-theory/mcq11_00800.gif | | | | CO3 | | A | 3 |
| 14. | Summarize the working of voltage regulator. | | | | CO1 | | A | 3 |
| 15. | Analyze: In the schmitt trigger R2=100Ω, R1=50k Ω Vref=0V,vi=1Vpp,Vsat=±14V.Determine VUT and VLT | | | | CO1 | | An | 3 |
| 16. | Draw the circuit diagram to generate a triangular wave. | | | | 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. | |  | Explain and design an adder-subtractor circuit using op-amp to get the outputV0= (V3+V4 )-(V1+V2). | | CO1 | | U | 12 |
| 18. | |  | Discuss Inverting and Non-inverting amplifier using op-amp circuit and derive the expression for output voltage with a diagram. | | CO1 | | A | 12 |
| 19. | |  | Give the functional description of a 555 timer and also explain how it works as an astable multivibrator. Derive the value of T | | CO2 | | A | 12 |
| 20. | |  | Explain the functional modules of a Phase locked loop with the necessary diagrams. | | CO3 | | A | 12 |
| 21. | |  | With a neat circuit diagram explain the methods used in weighted resistor, R-2R digital to analog converter. | | CO1 | | U | 12 |
| 22. | |  | Explain monostable multivibrator and discuss its timing diagram. | | CO1 | | U | 12 |
| 23. | |  | Discuss the steps involved in designing a low pass filter using op amp. | | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | |  | Summarize the steps involved in the basic planar process in chip fabrication. | | CO3 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design circuits using IC741. |
| CO2 | Acquire knowledge on IC 555 and its applications. |
| CO3 | Understand ICs used in voltage regulators, PLL, ADC & DAC & to acquire knowledge on IC fabrication. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 57 | 15 | 3 |  |  | 80 |
| CO2 | 1 |  | 12 |  |  |  | 13 |
| CO3 | 1 | 15 | 15 |  |  |  | 31 |
|  | | | | | | | **124** |

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| **Course Code** | **14EC2009/17EC2056** | **Duration** | **3hrs** |
| **Course Name** | **MICROPROCESSOR AND INTERFACING 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. | Explain the features of 8085 microprocessor with a neat architecture. | CO1 | A | 10 |
|  | b. | Develop an Assembly language program to perform addition of two 8 bit numbers in 8085 microprocessor. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Interpret the various addressing modes of 8085 microprocessor. | CO1 | U | 10 |
|  | b. | Discuss about any five arithmetic Instructions of 8085 Microprocessor with examples. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. |  | Explain the architecture of 8086 microprocessor in detail. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Identify the 8086 addressing modes in the following instructions.  (i) MOV AL, BL (ii) MOV AX, 124CH  (iii) MOV [DI], AX(iv) MOV DI, [SI]+1234H | CO3 | R | 8 |
|  | b. | Discuss the maximum mode of 8086 Microprocessor. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 5. | a. | Illustrate and explain the control word format of 8255 along with its operating modes. | CO4 | U | 10 |
|  | b. | Illustrate the block diagram of 8251 USART peripheral used for serial communication. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Identify the features of 8253 programmable interval timerwith a neat architecture and explain the modes of operation. | CO5 | R | 20 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the functions of 8257 DMA controller with necessary diagrams. | CO5 | U | 10 |
|  | b. | Sketch the pin configuration of 8279 Programmable Keyboard/display interface. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain the block diagram of 8275 CRT display controller with a neat diagram of its functional blocks. | CO5 | An | 20 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Appraise the interfacing technique of stepper motor with 8085 microprocessor. Use the required interfacing peripheral device and explain the technique with necessary diagrams. | CO6 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the architecture of 8085 microprocessor. |
| CO2 | Describe the architecture of 8086 microprocessor and minimum /maximum modes of operation. |
| CO3 | Discuss 8086 assembly language programs for the given applications. |
| CO4 | Apply the memory and I/O interfacing concepts for any microprocessor design. |
| CO5 | Develop microprocessor and Microcontrollers based systems. |
| CO6 | Select the Microprocessor with proper specifications for various applications. |

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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 | - | 12 | 20 | - | - | - | 32 |
| CO3 | 8 | - | - | - | - | - | 8 |
| CO4 | - | 20 | 10 | - | - | - | 30 |
| CO5 | 20 | 10 | - | 20 | - | - | 50 |
| CO6 | - | - | - | - | 20 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **14EC3002** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED EMBEDDED SYSTEMS** | **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. |  | Outline briefly about processor technology with an overview of Embedded systems in detail with necessary illustration.What are the design challenges faced while designing an embedded system? | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Extend your perception about automation, synthesis and verification techniques with reference to modern embedded systems. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Summarize the basic principle and elements of general-purpose processor-software methodologies with appropriate illustrations. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Classify and interpret the programmer’s view in designing an embedded system. Provide the addressing modes involved in the system. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 5. | a. | Interpret on the memory types of application-specific instruction set processor. | CO2 | E | 10 |
|  | b. | Extend your perception about I/O interfacing and addressing in detail. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Outline briefly about advanced RAM technologies. | CO2 | U | 10 |
|  | b. | Elaborate briefly about integrated development environment. | CO2 | C | 10 |
|  |  |  |  |  |  |
| 7. |  | Appraise on the various arbitration methods of an embedded system network. | CO3 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain in detail about multilevel bus architecture and relevant protocols. | CO2 | E | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain in detail about standard single purpose processor’s peripherals with necessary illustrations. | CO2 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Construct embedded system hardware. |
| CO2 | Develop software programs to control embedded system. |
| CO3 | Outline validation and testing methodologies for embedded system. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 30 |  | 20 |  |  | 50 |
| CO2 |  | 30 |  |  | 50 | 10 | 90 |
| CO3 |  | 20 |  |  | 20 |  | 40 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **16EC2004/18EC2032/17EC2072** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRON DEVICES AND CITCUITS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Calculate the value of collector current IC, if a transistor has a β of 200 and a base current IB, of 20 μA. | | CO1 | An | | 1 |
| 2. | Define diffusion current. | | CO1 | R | | 1 |
| 3. | Write the dopants in semiconductor materials. | | CO1 | A | | 1 |
| 4. | Define Avalanche breakdown. | | CO1 | R | | 1 |
| 5. | List the applications of Gunn Diode. | | CO6 | R | | 1 |
| 6. | Give the materials used in semiconductor devices. | | CO1 | U | | 1 |
| 7. | Quote the main difference between center tapped and Bridge fullwave rectifier. | | CO2 | R | | 1 |
| 8. | State the frequency determining elements in phase shift oscillator. | | CO3 | R | | 1 |
| 9. | Create the block diagram of regulated power Supply. | | CO4 | C | | 1 |
| 10. | Write the IC number of Negative fixed voltage regulator. | | CO5 | C | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare silicon and Germanium materials. | | CO1 | | E | 3 |
| 12. | State the differences in NPN and PNP transistor. | | CO1 | | R | 3 |
| 13. | Define Varactor Diode. | | CO2 | | R | 3 |
| 14. | Design half wave rectifier with filter circuit diagram. | | CO2 | | E | 3 |
| 15. | Give the advantages of multistage amplifier. | | CO4 | | A | 3 |
| 16. | Define the RC phase shift oscillator with the circuit diagram. | | 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. |  | Explain in detail the Generation and recombination process with suitable diagram. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain the input and output characteristics of CE and CC configurations of a transistor. | CO1 | | An | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Solve the common base transistor amplifier that has an input resistance of 20 Ω and output resistance of 100 kΩ. The collector load is 1 kΩ. If a signal of 500 mV is applied between emitter and base, find the voltage amplification. Assume αac to be nearly one. | CO1 | | C | 6 |
|  | b. | Explain forward bias and reverse bias in a PN junction and also VI characteristics of PN junction. | CO1 | | A | 6 |
|  |  |  |  | |  |  |
| 20. |  | Explain the VI characteristics of Zener diode and Schottky Barrier Diode. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain in detail the various configurations of Full wave rectifier with Capacitor and Inductor filters. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Examine the RC coupled amplifier with neat sketch. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 23. |  | Describe in detail the Feedback and Differential Amplifiers. | CO4 | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate on Hartley and Colpitts oscillator with the circuit diagram. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic properties of solid state devices like diode, transistor and FET. |
| CO2 | Identify and differentiate rectifiers, amplifiers and oscillators. |
| CO3 | Analyze the amplitude and frequency response of general amplifier circuits. |
| CO4 | Describe the types of power amplifiers and their transfer characteristics. |
| CO5 | Classify the power amplifiers to meet certain specifications. |
| CO6 | Distinguish between amplifiers and oscillators. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 1 | 19 | 13 | 3 | 6 | 47 |
| CO2 | 4 | - | 12 | - | 3 | - | 19 |
| CO3 | 1 | - | 12 | - | - | - | 13 |
| CO4 | 12 | - | 3 | - | - | 1 | 16 |
| CO5 | 3 | - | - | 12 | - | 1 | 16 |
| CO6 | 1 | - | 12 | - | - | - | 13 |
|  | | | | | | | **124** |



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| **Course Code** | **16EC3005** | **Duration** | **3hrs** |
| **Course Name** | **MACHINE LEARNING METHODS** | **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. |  | Extend your perception about machine learning. Explain in detail about the various types of machine learning methods. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Outline briefly about the concepts of Gaussian mixture models of probabilistic learning. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Interpret on the k- nearest neighborhood algorithm in detail with necessary illustrations. | CO2 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Elaborate briefly about support vector machine algorithm and optimal separation with neat illustrations. | CO2 | C | 20 |
|  |  |  |  |  |  |
| 5. |  | Appraise your perception about kernel. Explain in detail on the various kernels. | CO2 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Classify and interpret the learning algorithmic process involved with trees. Explain the concepts of decision trees in detail. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain in detail about the concepts of ensemble learning. Classify and brief about the types of ensemble learning. | CO1 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Infer on reinforcement learning. Illustrate the process involved in reinforcement learning methodology. | CO3 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Interpret the various search and optimization techniques involved in machine learning methodologies. | CO3 | E | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Exhibit knowledge about machine learning. |
| CO2 | Comprehend and analyze the performance of machine learning algorithms. |
| CO3 | Apply machine learning concepts for real world problems. |

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

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **17EC2015** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **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 the gain of inverting amplifier? | | | CO1 | U | | 1 |
| 2. | Tell the first stage of op amp. | | | CO1 | R | | 1 |
| 3. | Predict the output of an Op amp differentiator, when the input is a square wave. | | | CO5 | R | | 1 |
| 4. | What do you mean by precision diode? | | | CO5 | R | | 1 |
| 5. | Name some commonly used active filters. | | | CO2 | U | | 1 |
| 6. | Define PLL. | | | CO2 | R | | 1 |
| 7. | How many comparators required for 3 bit flash type ADC? | | | CO3 | U | | 1 |
| 8. | What is the disadvantage of binary weighted type DAC? | | | CO3 | R | | 1 |
| 9. | Tell the alternate name for Astable Multivibrator. | | | CO5 | U | | 1 |
| 10. | What is IC723? | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Solve the output voltage Vo in thegiven circuit. | | | CO1 | | An | 3 |
| 12. | Model a circuit using an op-amp to get the output expression as V0= Vi | | | CO1 | | U | 3 |
| 13. | Define Clipper and Clamper. | | | CO3 | | An | 3 |
| 14. | Determine the value of feedback resistor(Rf) in first order high pass filter if the gain Ao is 5 and input resistance Ri is 1Kohm. | | | CO2 | | U | 3 |
| 15 | Show the functional diagram of successive approximation type Analog to digital converter. | | | CO3 | | An | 3 |
| 16. | State Barkhausen criterion. | | | 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. | |  | Show with the help of circuit diagram an op-amp that can be used as,  a) Inverting Amplifier b) Non-Inverting Amplifier | CO1 | | U | 12 |
| 18. | | a. | Find the expression of basic differentiator. What are the limitations? | CO1 | | An | 6 |
|  | | b. | Explain the working of Schmitt trigger circuit using op-amp with necessary diagram and equations. | CO5 | | A | 6 |
| 19. | | a. | Produce an expression for the transfer function of a first order low pass filter. Also derive the expression for frequency response. | CO2 | | An | 8 |
|  | | b. | List out the application of PLL. | CO4 | | U | 4 |
| 20. | |  | With a neat circuit diagram explain the methods used in weighted resistor R-2R digital to analog converter. | CO3 | | E | 12 |
| 21. | |  | Construct the circuit diagram of the RC phase shift oscillator and derive an equation to find the frequency of oscillations of the oscillator. | CO5 | | U | 12 |
| 22. | |  | Give the functional description of a 555 timer and also explain how it works as an Astable multivibrator. Derive the value of T. | CO4 | | C | 12 |
| 23. | |  | Discuss the working of the flash type Analog to Digital Converter with neat diagram. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Interpret the principle of IC723 regulator with neat diagram. Also discuss the limitations of linear voltage regulators. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design linear and non linear applications of op-amps. |
| CO2 | Design Filters using op-amp. |
| CO3 | Design ADC & DAC using op-amps. |
| CO4 | Design Timer circuits using 555 IC. |
| CO5 | Generate waveforms using op-amp circuits. |
| CO6 | Analyze performance of special function ICs. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 16 | - | 9 | - | - | 26 |
| CO2 | 1 | 4 | - | 8 | - | - | 13 |
| CO3 | 1 | 1 | 12 | 6 | 12 | - | 32 |
| CO4 | - | 4 | - | - | - | 12 | 16 |
| CO5 | 2 | 13 | 6 | - | - | - | 21 |
| CO6 | - | 4 | 12 | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **17EC2033** | **Duration** | **3hrs** |
| **Course Name** | **CELLULAR MOBILE COMMUNICATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Express the Aperture area in symbol. | | | CO4 | U | | 1 |
| 2. | What is the data rate of 1G cellular network? | | | CO3 | R | | 1 |
| 3. | Write the usage of main lobe. | | | CO6 | U | | 1 |
| 4. | Define Cell splitting in cellular mobile communication. | | | CO2 | R | | 1 |
| 5. | What is the impact of frequency reuse technique? | | | CO1 | U | | 1 |
| 6. | How is the capacity in cellular technology improved? | | | CO3 | R | | 1 |
| 7. | Draw the shape of cell structure. | | | CO1 | R | | 1 |
| 8. | Mention the technology used in 3G network. | | | CO4 | R | | 1 |
| 9. | Determine the coverage of isotropic antenna. | | | CO5 | A | | 1 |
| 10. | Give few examples for cluster. | | | CO2 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Define the term frequency hopping spread spectrum. | | | CO1 | | R | 3 |
| 12. | Identify the role of base station controller in mobile communication. | | | CO2 | | U | 3 |
| 13. | List the various functions of mobile switching centre. | | | CO3 | | R | 3 |
| 14. | Define the term handoff procedure and write the types of it. | | | CO4 | | R | 3 |
| 15. | Justify how packet switching is better than circuit switching? | | | CO5 | | E | 3 |
| 16. | List the types of signal propagation in wireless communication | | | 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 in detail the truncking and grade of service in mobile computation. | CO1 | | A | 12 |
|  | |  |  |  | |  |  |
| 18. | |  | Discuss in detail the cell sectoring with an appropriate example. | CO2 | | U | 12 |
|  | |  |  |  | |  |  |
| 19. | |  | Paraphrase about various antennas used in cellular communication. Also discuss its parameter. | CO3 | | U | 12 |
|  | |  |  |  | |  |  |
| 20. | |  | Explain various diversity techniques with an appropriate figures and block diagrams. | CO4 | | An | 12 |
|  | |  |  |  | |  |  |
| 21. | |  | Illustrate the concept of basic cellular system with necessary block diagrams. | CO5 | | U | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Write the limitations of conventional mobile system? | CO3 | | A | 6 |
|  | | b. | List the types of diversity technique used in mobile computing. | CO4 | | R | 6 |
|  | |  |  |  | |  |  |
| 23. | |  | Enumerate any five applications of 4G mobile Technology. Why fading occurs in wireless signal transmission? | CO6 | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Discuss in detail the middleware technology with appropriate block diagram. | CO5 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the state of art techniques in wireless communication. |
| CO2 | Distinguish the various wireless protocol architectures. |
| CO3 | Compare and contrast various generation of cellular system. |
| CO4 | Choose proper multiple accessing methods depending on channel model. |
| CO5 | Combine traffic channels for call processing. |
| CO6 | Assess key performance metrics of a cellular system. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 3 | 12 |  |  | 17 |
| CO2 | 4 | 1 |  | 12 |  |  | 5 |
| CO3 | 11 | 12 |  |  |  |  | 23 |
| CO4 | 7 | 13 | 3 |  |  |  | 23 |
| CO5 |  | 3 | 3 |  | 12 | 12 | 30 |
| CO6 |  | 13 | 13 |  |  |  | 26 |
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| **Course Code** | **17EC3006** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED RADIATION SYSTEMS** | **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 concept of radiation in terms of isotropic, directional and omni directional pattern with relevant diagrams. | CO1 | U | 10 |
|  | b. | Explain the gain, efficiency and radiation pattern in far field with respect to radiated power. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Determine the mathematical expression for array factor of 2-element array both in broad side and end- fire cases. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss about N- element linear array with uniform amplitude and spacing. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | State and articulate Babinet’s principle for slot antennas. Show that slots and dipoles are complementary antennas. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Illustrate the working principle of horn antenna, and give the steps followed for the designing of horn antenna and compare pyramidal, conical and corrugated horns. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Classify different feeding methods and explain in detail the rectangular patch transmission line model. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Summarize the construction and characteristics of micro-strip antennas for mobile phone application. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Compute the design parameters width (W), effective permittivity, incremental length, length and effective length for rectangular patch antenna having substrate with dielectric constant of 2.2,  h= 0.1588cm, should resonate at 10GHz. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the concept of polarization and explain its types. Assess the stokes parameters and it’s relation with polarization ellipse. | CO6 | U | 10 |
|  | b. | Sketch the block diagram of radiation measurement instruments and discuss its working principle. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Upon completion of the course, student will able to Employ various numerical techniques for analysis of different antennas. |
| CO2 | Analyze the radiation system using linear and planar array elements. |
| CO3 | Extend the knowledge of aperture concept for efficient antenna design |
| CO4 | Evaluate the desired parameters for application specific antenna design. |
| CO5 | Design and simulate any type of antenna using simulation software tools. Ex. FEKO. |
| CO6 | Perform measurement of antenna parameters for antenna designs. |

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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 | - | - | - | 40 |
| CO4 | - | 20 | - | 20 | - | - | 40 |
| CO5 | - |  | 20 | - | - | - | 20 |
| CO6 | - | 10 | 10 | - | - | - | 20 |
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| **Course Code** | **17EC3021** | **Duration** | **3hrs** |
| **Course Name** | **RF SYSTEM DESIGN** | **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. | Explain about low IF architectures with necessary diagrams. | CO1 | An | 10 |
|  | b. | Analyze the importance of CMOS physics and its various noise theories. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Describe about phase noise and its specification distribution over a communication link transceiver architecture. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss about S Parameters with Smith Chart and Impedance matching Network Amplifier. Explain how impedance matching is achieved in common Gate amplifier. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss about Low Noise Amplifiers and its types in detail. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 5. |  | Summarize the general models of class A, B and AB amplifiers in detail. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain about stability, gain and phase margins in feedback systems. | CO4 | U | 10 |
|  | b. | Discuss about root locus techniques. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Explain about tuned oscillators and negative resistance oscillators in detail. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Outline the features of nonlinear mixers and explain about quadratic mixer in detail. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss about RFIC Transceiver architecture and its design issues in detail. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Distinguish the RF system design parameters for various subsystem blocks level modeling. |
| CO2 | Interpret Smith chart measurements related to impedance matching techniques. |
| CO3 | Apply knowledge of basic RF Electronics for realizing RF System design and implementation. |
| CO4 | Analyze the given specifications defined by wireless system standard in physical layer. |
| CO5 | Transform the system specification into the requirements for the RF front end blocks for creating a new architecture. |
| CO6 | Design and simulate a new RF front end as per given system specification for the required performance using software tools. |

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



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| **Course Code** | **17EC3023** | **Duration** | **3hrs** |
| **Course Name** | **RF MEMS** | **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 about wireless standards, systems and architectures in detail. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Analyze the importance of skin effect in transmission lines on thin substrates and also summarize about impedance mismatch effects in RF MEMS. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Describe about micro fabrication techniques in detail. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss about different types of actuation mechanism in MEMS. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 5. |  | Summarize the general features of RF MEMS-relays and switches. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Explain about modeling and design issues of planar inductors and capacitors. | CO4 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Explain about microstrip reconfigurable antennas in detail. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Outline the features of RF MEMS phase shifters and explain about its use for RADAR applications in detail. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss about RF MEMS filters in detail. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the advantages and limitations of RF-MEMS technology. |
| CO2 | Apply the Fabrication methods for MEMS for specific applications. |
| CO3 | Illustrate the working principles of the state-of-the-art RF-MEMS devices. |
| CO4 | Evaluate the merits and drawbacks of an RF-MEMS design. |
| CO5 | Design high-performance circuits and sub-systems using RF MEMS components. |
| CO6 | Design practical RF MEMS devices using analytical and numerical techniques.. |

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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 |  | 20 |  |  |  |  | 20 |
| CO5 |  |  | 20 |  |  |  | 20 |
| CO6 |  |  | 40 |  |  |  | 40 |
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| **Course Code** | **17EC3074** | **Duration** | **3hrs** |
| **Course Name** | **MEDICAL IMAGE PROCESSING** | **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. |  | | Summarize image acquisition methods using various medical imaging systems. | CO1 | E | 20 |
|  |  | | **(OR)** |  |  |  |
| 2. |  | | Illustrate the reconstruction of image from projections in 2-Dimensions. | CO2 | An | 20 |
|  |  | |  |  |  |  |
| 3. |  | | Explain the construction and operation of MRI machine in acquisition of medical images. | CO3 | A | 20 |
|  |  | | **(OR)** |  |  |  |
| 4. | a. | | Distinguish between PET and SPECT. | CO4 | An | 8 |
|  | b. | | Discuss the image acquisition and brightness control in digital fluoroscopy. | CO4 | U | 12 |
|  |  | |  |  |  |  |
| 5. |  | | Analyse spin echo, inversion recovery and gradient echo regarding tissue contrast in MRI. | CO5 | An | 20 |
|  |  | | **(OR)** |  |  |  |
| 6. | a. | | Define Doppler shift principle and explain how the blood flow in a human body can be detected. | CO5 | A | 16 |
|  | b. | | List the limitations of Doppler systems. | CO5 | R | 4 |
|  |  | |  |  |  |  |
| 7. |  | | Describe how optimal threshold is selected using Otsu’s algorithm for image segmentation. | CO4 | U | 20 |
|  |  | | **(OR)** |  |  |  |
| 8. |  | | Elaborate how Maximum Likelihood Method is used in selection of optimal threshold for image segmentation. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. | a. | | Enumerate the principle and types of image registration. | CO6 | U | 12 |
|  | b. | | Summarize the method of rigid registration technique. | CO4 | A | 8 |
|  | | **COURSE OUTCOMES** | | | | |
| CO1 | | Analyze the physiological events associated with the human system. | | | | |
| CO2 | | Describe the influences of artifacts in image quality. | | | | |
| CO3 | | Identification of new developments in health care system. | | | | |
| CO4 | | Employ reconstruction and segmentation algorithms. | | | | |
| CO5 | | Interpret medical imaging devices. | | | | |
| CO6 | | Relate the concepts with its practical uses. | | | | |

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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 |  |  |  | 20 |
| CO4 |  | 32 | 8 | 8 |  |  | 48 |
| CO5 | 4 |  | 16 | 20 |  |  | 40 |
| CO6 |  | 12 | 20 |  |  |  | 32 |
|  | | | | | | | **180** |



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| **Course Code** | **17EE3008** | **Duration** | **3hrs** |
| **Course Name** | **DSP BASED CONTROL OF POWER CONVERTERS AND DRIVES** | **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. | Explain in detail the architecture of a TMS320C2812 Digital Signal Processor with neat block diagram. | CO1 | U | 15 |
|  | b. | What are the advantages and disadvantages of digital control? | CO1 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What do you mean by pipeline? How does it improve the computational speed of the processor? | CO2 | U | 10 |
|  | b. | Explain the steps used to convert Analog input signals Vdc and Idc to Digital signal using TMS320C2812 Processor. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. |  | Elaborate in detail how a Peripheral Interrupt Expansion (PIE) of TMS320F2812 DSP handles aperipheral interrupt. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Describe in detail about the operation of a General Purpose timer, timer registers and its counting modes. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Brief the steps to generate the two symmetric PWM signal of 10kHz with duty cycle of 50%. Input clock pre-scaling of x/64 and a dead-band of 2μs which would trigger an H bridge inverter circuit. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Evaluate the performance of a Field Oriented Induction Motor controlled by a DSP Processor. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | Develop a digital control for cascaded type three phase multilevel inverter with SPWM of switching frequency 5kHz using TMS320F2812. Choose appropriate clock input pre-scaler and dead-time for the above. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain in detail, how TMS320F2812 can be used to control the output voltage of a Boost Converter. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Describe the DSP Implementation of stepper motor based speed control using TMS320F2812. | CO6 | A | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | List the architectural functionalities of the DSP. |
| CO2 | Illustrate the working of Event Manger and its various functions. |
| CO3 | Configure the GPIO, ADC, Timer, compare unit, Capture unit and QEPcircuit. |
| CO4 | Perform the mathematical computation with DSP such asParke’s transformation, Clarke’s transformation, creationof lookup table etc. |
| CO5 | Implement the Open loop/closed loop control with DSP based Control fora power converter circuit. |
| CO6 | Implement the DSP based Control for the selected drive. |

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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 | 10 |  |  |  | 20 |
| CO3 |  | 40 |  |  |  |  | 40 |
| CO4 |  |  | 20 | 20 |  |  | 40 |
| CO5 |  |  | 40 |  |  |  | 40 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2003** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SYSTEM 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. | List any two Weighted Codes. | | CO1 | R | | 1 |
| 2. | State the Gray Code equivalent of the Binary number (10110)2 | | CO1 | R | | 1 |
| 3. | State the application of De Morgan’s Theorem | | CO2 | R | | 1 |
| 4. | State the Duality principle of Boolean Algebra. | | CO2 | R | | 1 |
| 5. | Define Data Selector. | | CO3 | R | | 1 |
| 6. | Visualize a 2 input AND gate using NOR gate. | | CO3 | R | | 1 |
| 7. | List the basic components of ASM Chart. | | CO4 | R | | 1 |
| 8. | Recall the Excitation Table of a T- flip flop. | | CO4 | R | | 1 |
| 9. | Define the basic configuration of PLA. | | CO5 | R | | 1 |
| 10. | List the difference between Net and Register in Verilog. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the differences between the conversion of a decimal number to binary and the binary coding of a decimal number. | | CO1 | | U | 3 |
| 12. | Develop the canonical expression for F(A,B,C) = AB + AB’C | | CO2 | | A | 3 |
| 13. | Design a Half-adder using a Decoder. | | CO3 | | C | 3 |
| 14. | Explain how Race around condition is overcome in a JK -Flip-Flop. | | CO4 | | U | 3 |
| 15. | Define Fan-in and Propagation delay. | | CO5 | | R | 3 |
| 16. | State the dataflow statement of 2 x 4 Decoder using Verilog HDL. | | 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. | Rewrite the following Boolean functions to a minimum number of literals | CO1 | | U | 6 |
|  | b. | Develop a logic circuit to implement with NOR gates. | CO1 | | A | 6 |
|  |  |  |  | |  |  |
| 18. |  | Solve the given Boolean expression  in (i) Sum of Products and (ii) Product of Sums. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Design a 4-bit Shift Right Barrel Shifter. | CO3 | | C | 9 |
|  | b. | Compare the Multiplexer method with the Decoder method for implementing a combinational circuit. | CO3 | | U | 3 |
|  |  |  |  | |  |  |
| 20. | a. | Develop a 3- bit Ripple Up-Counter. Explain its operation with a Timing Diagram. | CO4 | | A | 8 |
|  | b. | Sketch the circuit of a 3 - bit Twisted Ring Counter. | CO4 | | A | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Discuss the Classification of Memory. | CO5 | | U | 6 |
|  | b. | Explain the operation of a 2 -Input CMOS NOR gate with a neat diagram. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Design a Full Adder using PROM | CO5 | | C | 6 |
|  | b. | Develop the given Boolean function using PLA  F1(A,B,C) =Σ(0,1,2,4)  F2(A,B,C) = Σ(0,5,6,7) | CO5 | | A | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Design a 3 bit Synchronous Down Counter using T-FFs. | CO4 | | C | 8 |
|  | b. | Develop a reduced State table from the State Table given below.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Present state | Next State | | Output | | |  | x = 0 | x = 1 | x = 0 | x = 1 | | a | f | b | 0 | 0 | | b | d | c | 0 | 0 | | c | f | e | 0 | 0 | | d | g | a | 1 | 0 | | e | d | c | 0 | 0 | | f | f | b | 1 | 1 | | g | g | h | 0 | 1 | | h | g | a | 1 | 0 | | CO4 | | A | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Develop the Verilog HDL code for   1. 8 x 1 MUX 2. 4 bit Serial-in Serial Out Shift Register. | CO6 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the basic postulates of Boolean algebra and the operation of logic gates. |
| CO2 | Choose an optimal method for simplification of Boolean expressions. |
| CO3 | Design and distinguish various combinational logic circuits. |
| CO4 | Design and compare various sequential logic circuits |
| CO5 | Illustrate different logic families; classify memory devices and identify methods for implementation  of logic circuits. |
| CO6 | Design simple logic circuits using HDL codes. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 9 | 6 | - | - | - | 17 |
| CO2 | 2 | - | 15 | - | - | - | 17 |
| CO3 | 2 | 3 | - | - | - | 12 | 17 |
| CO4 | 2 | 3 | 16 | - | - | 8 | 29 |
| CO5 | 4 | 12 | 6 | - | - | 6 | 28 |
| CO6 | 4 | - | - | - | - | 12 | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2006** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG AND DIGITAL COMMUNICATION** | **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 AM type if modulation index ma> 1. | | | CO1 | U | | 1 |
| 2. | Calculate modulation index of an FM signal in which the modulating frequency is 2kHz and maximum deviation is 10kHz. | | | CO1 | A | | 1 |
| 3. | Identify the power spectral density of white noise. | | | CO2 | U | | 1 |
| 4. | Recall an example of random process in communication. | | | CO2 | R | | 1 |
| 5. | State Nyquist theorem. | | | CO3 | R | | 1 |
| 6. | Which circuit used to generate flat top samples? | | | CO3 | R | | 1 |
| 7. | Name the linear filter providing maximum SNR. | | | CO4 | R | | 1 |
| 8. | Identify the cause of bit error rate. | | | CO4 | R | | 1 |
| 9. | Show the ASK waveform for binary data stream 010101. | | | CO5 | R | | 1 |
| 10. | Name the modulation scheme which conveys data by changing the phase of a constant frequency reference signal. | | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Determine the approximate bandwidth of the FM signal if a 40 MHz carrier is frequency modulated by a sinusoidal signal such that peak frequency deviation is 20KHz and the frequency of the modulating sinusoid is 2 KHz. | | | CO1 | | A | 3 |
| 12. | List out and explain any three noises. | | | CO2 | | R | 3 |
| 13. | Explain sampling theorem. | | | CO3 | | U | 3 |
| 14. | Examine the reason for ISI and draw the interpretation of eye pattern. | | | CO4 | | R | 3 |
| 15. | Recall any three tradeoffs in digital communication. | | | CO5 | | R | 3 |
| 16. | Examine carrier recovery in digital modulation. | | | 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. | |  | Illustrate and explain the FM and PM signals. | CO1 | | C | 12 |
|  | |  |  |  | |  |  |
| 18. | |  | Formulate the output signal to noise ratio of SSB-SC system. | CO2 | | C | 12 |
|  | |  |  |  | |  |  |
| 19. | |  | Discuss the noises in Delta modulation and describe the DM transmitter and receiver. | CO3 | | C | 12 |
|  | |  |  |  | |  |  |
| 20. | |  | Illustrate and explain the frequency shift keying in detail. | CO4 | | R | 12 |
|  | |  |  |  | |  |  |
| 21. | |  | Explain minimum shift keying with waveforms for the following data stream 10110101. | CO5 | | U | 12 |
|  | |  |  |  | |  |  |
| 22. | |  | Formulate the expression for amplitude modulation using square law modulator. | CO1 | | C | 12 |
|  | |  |  |  | |  |  |
| 23. | |  | Explain the working of pulse code modulator with block diagram. | CO3 | | U | 12 |
|  | |  |  |  | |  |  |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Elaborate equalization techniques. | CO6 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Distinguish different analog modulation schemes for their efficiency and bandwidth. |
| CO2 | Predict the behavior of a communication system in presence of noise. |
| CO3 | Investigate pulsed modulation system and analyze their system performance. |
| CO4 | Recognize various optimal detection schemes. |
| CO5 | Analyze different digital modulation schemes and can compute the bit error performance. |
| CO6 | Relate different digital demodulation techniques. |

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

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2008** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG CIRCUITS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Recall the ripple factor for Full Wave Rectifier. | | CO1 | R | | 1 |
| 2. | Identify a circuit that adds positive or negative dc voltage to an input sine wave. | | CO1 | R | | 1 |
| 3. | Tell the factor that indicates the degree of change in operating point due to temperature variation | | CO2 | R | | 1 |
| 4. | Recall the other name for trans-resistance amplifier. | | CO2 | R | | 1 |
| 5. | Tell the phase-shift between input and output voltages of CE amplifier. | | CO3 | R | | 1 |
| 6. | Estimate the total voltage gain if G1, G2, G3 are the individual voltage gains of a three-stage amplifier. | | CO3 | U | | 1 |
| 7. | Write the type of power amplifier that is biased for operation at 360 degree of the cycle. | | CO4 | A | | 1 |
| 8. | Tell the type of capacitance that affects the high frequency response. | | CO4 | R | | 1 |
| 9. | Write the expression of closed loop voltage gain (AF) in terms of open loop gain (A) and feedback factor (β). | | CO5 | A | | 1 |
| 10. | **Name the circuit which has** employed with positive feedback. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Show the output of the clipper circuit shown for a sinusoidal input of 20V peak to peak amplitude. The reference voltage, VR = -5V. Assume that the diode is an ideal diode. | | CO1 | | U | 3 |
| 12. | State the purpose of trans-conductance and trans-resistance amplifier. | | CO2 | | R | 3 |
| 13. | Calculate the value of collector current IC in CE amplifier if IB=2mA and β =100. | | CO3 | | An | 3 |
| 14. | Sketch the structure of Class C power amplifier. | | CO4 | | A | 3 |
| 15. | Compute the voltage gain with feedback for voltage series feedback having A = -150, Zi = 20KΩ, Zo = 50kΩ for feedback of β = -0.2. | | CO5 | | A | 3 |
| 16. | Predict the frequency of oscillator for RC phase shift oscillator if R= 68kΩ and C=2.4nF. | | CO6 | | E | 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 working principle of half wave rectifier with a neat circuit diagram and waveforms. Also estimate its efficiency and ripple factor. | CO1 | | U | 12 |
| 18. | a. | Analyze and calculate the value of IBQ, ICQ, and VCEQ from the given circuit. | CO2 | | An | 8 |
| b. | Compare the characteristics of Common Emitter, Common Base and Common Collector transistor configuration | CO2 | | U | 4 |
| 19. |  | Sketch the low frequency re model of CE amplifier and determine the input impedance, output impedance, voltage gain and current gain. | CO3 | | A | 12 |
| 20. |  | Discuss the principle and working of Class A amplifier with relevant circuit diagram and estimate its efficiency. | CO4 | | U | 12 |
| 21. |  | Construct the voltage shunt feedback system and explain its effect on gain, input impedance and output impedance. | CO5 | | A | 12 |
| 22. |  | Sketch the single stage CE amplifier with frequency response and infer the reason for reduction in gain at low frequency and high frequency. | CO2 | | A | 12 |
| 23. |  | Develop the current shunt feedback system and explain its effect on gain, input impedance and output impedance. | CO5 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the working principle of RC phase shift Oscillator with a neat circuit diagram. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the application of diodes. |
| CO2 | Classify the characteristics of BJT and JFET amplifiers. |
| CO3 | Design and construct various amplifier circuits. |
| CO4 | Describe the function of power amplifier. |
| CO5 | Construct the differential amplifier for a given specification. |
| CO6 | Identify sinusoidal and non-sinusoidal oscillators. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 15 | - | - | - | - | 18 |
| CO2 | 5 | 4 | 12 | 8 | - | - | 29 |
| CO3 | 1 | 1 | 12 | 3 | - | - | 17 |
| CO4 | - | 12 | 4 | - | - | - | 16 |
| CO5 | - | - | 28 | - | - | - | 28 |
| CO6 | 1 | 12 | - | - | 3 | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2010** | **Duration** | **3hrs** |
| **Course Name** | **Microcontrollers** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Bloom’s level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Write two register that consists of 16 bit. | CO1 / R | 1 |
| 2. | Name few general purpose registers | CO1 / R | 1 |
| 3. | What is the need for interfacing? | CO2 / U | 1 |
| 4. | Write a program to swap two numbers using 8051? | CO2/ A | 1 |
| 5. | What are SFR? | CO3 / R | 1 |
| 6. | List the steps involved in programming? | CO4 / U | 1 |
| 7. | Define Pointer. | CO5 / R | 1 |
| 8. | What is array? | CO5 / R | 1 |
| 9. | Give few applications of stepper motor. | CO6 / U | 1 |
| 10. | Write the abbreviation of LCD. | CO6 / R | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Define LABEL, OPCODE, OPERAND and COMMENT? | CO1 / R | 3 |
| 12. | Write a program to perform the multiplication of 2 nos using 8051. | CO2 / C | 3 |
| 13. | Write about PIC 18 Microcontroller Addressing modes? | CO3 / R | 3 |
| 14. | How PWM is used to control the speed of the DC motor? | CO4 / U | 3 |
| 15. | Write about Storage Classes? | CO5 / R | 3 |
| 16. | Draw ADC Interface block diagram. | 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. | Draw the block diagram and pin diagram of 8051 microcontroller. | CO1 / U | 12 |
|  |  |  |  |  |
| 18. | a. | Explain in detail I/O Ports. | CO2 / U | 6 |
| b. | Explain in detail Serial communication. | CO2 / R | 6 |
|  |  |  |  |  |
| 19. | a. | Explain in detail PIC 18 Microcontroller Architecture. | CO3 / R | 12 |
|  |  |  |  |  |
| 20. | a. | List and explain the various instructions available in 8051 microcontroller. | CO3 / U | 12 |
|  |  |  |  |  |
| 21. | a. | Explain in detail Watch Dog Timers. | CO4 / R | 12 |
|  |  |  |  |  |
| 22. | a. | Explain in detail Operators and Expressions. | CO5 / U | 12 |
|  |  |  |  |  |
| 23. | a. | Draw the circuit diagram of Stepper motor interfacing and its program code. | CO6 / A | 12 |
|  |  | **Compulsory** | | |
| 24. | a. | Explain in detail about 8051 addressing modes with example. | CO1/ An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the architecture of 8051 microcontroller. |
| CO2 | Discus 8051 assembly language programs for the given applications |
| CO3 | Illustrate the memory and I/O interfacing concepts for any microcontroller design. |
| CO4 | Illustrate the architectures of PIC microcontroller. |
| CO5 | Develop Microcontrollers based systems using C. |
| CO6 | Select the Microcontroller with proper specifications for various applications |

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

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2012** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Label some applications of op-amp. | | CO1 | R | | 1 |
| 2. | Define CMRR. | | CO1 | R | | 1 |
| 3. | Which parameter determines the clipping level in an op-amp. | | CO2 | R | | 1 |
| 4. | Identify the gain for Butterworth second order low pass filter. | | CO2 | A | | 1 |
| 5. | Name some of the non-linear applications of op-amp. | | CO3 | R | | 1 |
| 6. | Which filter performs exactly the opposite of band pass filter? | | CO3 | R | | 1 |
| 7. | List out any two applications of PLL. | | CO4 | R | | 1 |
| 8. | Show the functional diagram of successive approximation type Analog to digital converter. | | CO6 | R | | 1 |
| 9. | List the features of IC723 voltage regulator. | | CO5 | U | | 1 |
| 10. | What are the applications of IC 555 timer. | | CO5 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List out the characteristics of an ideal Op-amp. | | CO1 | | R | 3 |
| 12. | Define Precision rectifier. | | CO2 | | R | 3 |
| 13. | What are the conditions for Oscillations? | | CO3 | | R | 3 |
| 14. | List out commonly used active filters. | | CO4 | | R | 3 |
| 15. | Compare Schmitt trigger and comparator. | | CO5 | | U | 3 |
| 16. | What are the disadvantages of binary weighted type DAC? | | 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. |  | Show with the help of circuit diagram an op-amp that can be used as,  a) Inverting Amplifier b) Non-Inverting Amplifier | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Analyze the working of a circuit which provides an output voltage which is proportional to the time integral of the input. | CO2 | | An | 6 |
|  | b. | Explain the working of Schmitt trigger circuit using op-amp with necessary diagram and equations. | CO3 | | A | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Write short notes on Astable multivibrator using op- amp. Find the expression for frequency of oscillation. | CO3 | | R | 7 |
|  | b. | Explain the working of Wien’s bridge oscillator with neat diagram. | CO3 | | E | 5 |
|  |  |  |  | |  |  |
| 20. |  | Design a Wide-band pass filter having fl=400Hz, fh=2KHz and pass band gain of 4.Find the value of Q of the filter. | CO4 | | C | 12 |
|  |  |  |  | |  |  |
| 21. |  | Draw the functional block diagram of 555 IC timer and explain how it is used for generating accurate time delay or oscillation. | CO5 | | E | 12 |
|  |  |  |  | |  |  |
| 22. |  | With a neat schematic block diagram, explain the operating principle of Phase Locked Loop. Also define (i) Lock-in range (ii) Capture range and (iii) Pull-in time. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Construct the schematic functional diagram and explain the functioning of ADC and DAC. | CO6 | | C | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss in detail the steps involved in basic planar process with neat diagrams. | CO6 | | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of OP-AMP and its characteristics. |
| CO2 | Use OP-AMP to design circuits such as Amplifiers, differentiator and Integrator. |
| CO3 | Infer the significance of OP-AMP in Multivibrators and Oscillators. |
| CO4 | Design filters using OP-AMP. |
| CO5 | Explore the usefulness of IC555 timer and Phase Locked Loop |
| CO6 | Design ADC, DAC and understand the IC fabrication. |

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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 | 4 | - | 1 | 6 | - | - | 11 |
| CO3 | 12 | - | 6 | - | 5 | - | 23 |
| CO4 | 4 | - | - | - | - | 12 | 16 |
| CO5 | - | 17 | - | - | 12 | - | 29 |
| CO6 | 1 | 3 | - | - | - | 24 | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18EC2015/17EC2010** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SIGNAL 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. | Compare linear and circular convolution. | | CO1 | U | | 1 |
| 2. | Test whether the given function y[n] = x[n] - x[n+4] is memory or memory less. | | CO1 | R | | 1 |
| 3. | Define twiddle factor of FFT. | | CO2 | R | | 1 |
| 4. | Observe the number of multiplications required to compute 4-point DFT using radix 2 FFT. | | CO2 | R | | 1 |
| 5. | Express the equation to obtain the cut-off frequency Ωc of Butterworth filter. | | CO3 | U | | 1 |
| 6. | Recall the Impulse invariant method’s mapping equation which gives relationship between s-plane and z plane. | | CO3 | R | | 1 |
| 7. | Associate the window(s)which has the main lobe width Δω = 8π/ N. | | CO4 | U | | 1 |
| 8. | State Gibb’s phenomenon. | | CO4 | R | | 1 |
| 9. | Indicate the DSP errors due to finite word length effects. | | CO5 | U | | 1 |
| 10. | Define adaptive filtering. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compute the circular convolution of the sequences x1(n)= {2,1,2,1} and x2(n)={1,2,3,4}. | | CO1 | | An | 3 |
| 12. | Show the radix-2 DIF-FFT &DIT-FFT butterfly diagram for N=4. | | CO2 | | U | 3 |
| 13. | Estimate the digital filter transfer function of the analog filter(with sampling period T= 0.2 second) by using the Impulse invariant and Bilinear methods. | | CO3 | | An | 3 |
| 14. | Calculate the Hanning window coefficients for N=7 for causal condition. | | CO4 | | An | 3 |
| 15. | Report the advantages of floating point over fixed point number representation. | | CO5 | | U | 3 |
| 16. | Differentiate Von Neumann and Harvard architectures. | | 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 convolution of the following two sequences using   1. Circular convolution and 2. Linear convolution through circular convolution. &. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Determine 8-point DFT of the sequence using radix – 2 DIT FFT algorithm. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. |  | Design a digital Butterworth filter satisfying the following specifications using the Impulse Invariance technique. Assume T= 1 sec. | CO3 | | C | 12 |
|  |  |  |  | |  |  |
| 20. |  | Analyze designing of a linear phase FIR filter, given the ideal frequency response as    Determine the coefficients of 9 tap filter using Hamming window and find the Z- transform of h(n). | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Establish the zero-input limit cycle in fixed-point realization of first order digital IIR filter y(n)=a y(n-1) +x(n). Assume x[n] and y[n-1] are implemented by 4-bit registers (including Sign bit), x [0] =0.875& a=1/2. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Analyzeusing overlap add method, for the input sequence&impulse response . | CO1 | | An | 12 |
|  |  |  |  | |  |  |
| 23. |  | Find the coefficients h(n) of a linear phase FIR filter (given below) with length N=11 using the frequency sampling method. | CO4 | | E | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Examine the computational steps to implement the basic LMS algorithm and also draw the flowchart. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define signals and system mathematically in discrete time domain. |
| CO2 | Formulate the Discrete-Fourier Transform (DFT) and the FFT algorithms. |
| CO3 | Explain the various transformations for digital IIR filter design procedures. |
| CO4 | Design FIR digital filters for various applications. |
| CO5 | Demonstrate the signal processing concepts and the practical issues with the help of finite word length effects. |
| CO6 | Compare and select the DSP processor and techniques, suitable for the analysis of real-life signals |

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

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2017** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER NETWORK** | **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 topology that requires the most expensive cabling to form a network with 25 nodes. | | CO1 | R | | 1 |
| 2. | Name the network layer protocols. | | CO1 | R | | 1 |
| 3. | Name the switch that connects n inputs to m outputs in a grid. | | CO2 | R | | 1 |
| 4. | Calculate the number of crosspoints are needed in a single stage switch with 40 inputs and 50 outputs. | | CO2 | A | | 1 |
| 5. | Infer the significance of ARP on the internet. | | CO3 | U | | 1 |
| 6. | Interpret the information associated with 10 Base 5. | | CO3 | U | | 1 |
| 7. | Articulate the phases involved in virtual circuit communication. | | CO4 | A | | 1 |
| 8. | List the significance of cost function in routing. | | CO4 | R | | 1 |
| 9. | Indicate the two resources required for resource allocation. | | CO5 | U | | 1 |
| 10. | Define Leaky bucket. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List and define the key elements of a protocol. | | CO1 | | R | 3 |
| 12. | List the phases in a permanent virtual circuit. | | CO2 | | R | 3 |
| 13. | Infer your perception and elaborate on fast Ethernet. | | CO3 | | U | 3 |
| 14. | Summarize the three HDLC station types. | | CO4 | | U | 3 |
| 15. | Recall and write what is congestion window. | | CO5 | | R | 3 |
| 16. | Indicate the necessity of the Domain Name 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. |  | Sketch the ISO/OSI model and explain the responsibilities of user support layers. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Describe circuit switching and packet switching with necessary diagrams. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Explain the access method and frame format protocol specifications characteristics of IEEE 802.3. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Interpret the frame formats of HDLC in detail with necessary diagrams. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain the performance of link state routing to find the shortest path with appropriate diagrams. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain the congestion control mechanisms in TCP with necessary diagrams. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain the various topologies with a neat diagram and list its advantages and disadvantages. | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the internet service on electronic email to transfer the data through SMTP protocol. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate the functions of the different layers of the OSI protocol. |
| CO2 | Identify the performance of different kinds of switching in the network. |
| CO3 | Design a network for a particular application using IEEE standards. |
| CO4 | Interpret the concepts of networking thoroughly. |
| CO5 | Develop TCP/IP protocol for suitable application. |
| CO6 | Configure application layer protocol. |

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

**Graphical user interface, application

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| **Course Code** | **18EC2020** | **Duration** | **3hrs** |
| **Course Name** | **ANTENNA THEORY AND WAVE PROPAGATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Classify different types of radiation patterns. | | CO1 | U | | 1 |
| 2. | Construct the Thevenin’s equivalent of an antenna and name the terms used. | | CO1 | C | | 1 |
| 3. | List the different shapes of loop antenna. | | CO3 | R | | 1 |
| 4. | Write the unit of electric scalar potential. | | CO1 | U | | 1 |
| 5. | Express the formula for phase angle ψ of array of two point sources. | | CO2 | U | | 1 |
| 6. | Write the physical area of the parabolic reflector antenna. | | CO4 | A | | 1 |
| 7. | Visualize the pattern of spillover and backlobe with a diagram. | | CO4 | R | | 1 |
| 8. | Classify different types of special antennas. | | CO4 | An | | 1 |
| 9. | List any two antenn design tools. | | CO6 | R | | 1 |
| 10. | Define sky wave propagation. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Infer effective aperture of an antenna. | | CO1 | | U | 3 |
| 12. | Express Rr of current element whose overall length is λ/50? | | CO2 | | U | 3 |
| 13. | Write the relative amplitude of 5 elements arrays using Binomial distribution method. | | CO2 | | A | 3 |
| 14. | Calculate power gain in dB of a paraboloidal reflector of open mouth aperture 10λ. | | CO4 | | An | 3 |
| 15. | Define travelling wave antenna. | | CO4 | | R | 3 |
| 16. | Classify the modes of radio wave propagations. | | 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. | Discuss in detail and give related expressions,  i. HPBW ii. FNBW  iii. Antenna efficiency iv. Radiation intensity  v. Beam solid angle | CO1 | | C | 10 |
|  | b. | Determine the physical height of a half wave dipole having antenna Q of 30 and bandwidth of 10MHz. | CO1 | | E | 2 |
|  |  |  |  | |  |  |
| 18. | a. | Define reciprocity principle and formulate the condition for the current I2 inducing an emf E12 in antenna no. 1. | CO1 | | C | 10 |
|  | b. | A dipole having a length of 3cm is operated at 1GHz. The efficiency factor is k=0.6. Determine Rr and RL. | CO3 | | E | 2 |
|  |  |  |  | |  |  |
| 19. |  | Discuss the retarded vector potential of current carrying element with an expression. Determine field component of small current element. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Illustrate an array of two point source with equal amplitude and opposite phase with the radiation patterns. | CO2 | | U | 7 |
|  | b. | Distinguish the different types of antenna arrays with a neat sketch. | CO2 | | E | 5 |
|  |  |  |  | |  |  |
| 21. | a. | Describe Horn antenna and its various shapes & explain the construction of curved reflector antenna with a diagram. | CO4 | | R | 8 |
|  | b. | List out the various feed systems of reflector antennas and brief about the cassegrain feed with a neat sketch. | CO4 | | R | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Construct 6 elements Yagi-uda antenna with a folded antenna. Explain the working and general characteristics of Yagi antenna. | CO3 | | A | 8 |
|  | b. | Discuss the dependent parameters of mutual impedance of an antenna with justification. | CO6 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Explain in detail about any one smart antenna with a neat diagram. Draw its relative pattern also. | CO6 | | U | 6 |
|  | b. | Write short notes on working principle of adaptive antenna with a diagram. Give its design using simulation software. | CO6 | | C | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the structure of atmosphere and brief about the chemical components in each layer with a neat sketch. | CO5 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Examine the antenna basic parameters. |
| CO2 | Interpret the array factor for uniform and non-uniform arrays. |
| CO3 | Relate the fundamental concepts to obtain field distributions of broad band antennas. |
| CO4 | Infer the field characteristics of special types of antennas. |
| CO5 | Categorize the radio wave propagation regions. |
| CO6 | Design and analyze various types of antennas using simulation tools. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 5 |  | - | 2 | 21 | 28 |
| CO2 | - | 11 | 3 | - | 5 | - | 19 |
| CO3 | 1 | 12 | 8 | - | 2 | - | 23 |
| CO4 | 16 | - | 1 | 4 | - | - | 21 |
| CO5 | 1 | 15 | - | - | - | - | 16 |
| CO6 | 1 | 10 | - | - | - | 6 | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **18EC2021** | **Duration** | **3hrs** |
| **Course Name** | **MICROWAVE AND OPTICAL COMMUNICATION** | **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 meant by coaxial lines? | CO1/R | 1 |
| 2. | State the Application of tuning screws. | CO1/R | 1 |
| 3. | In what kind of applications attenuators are used? | CO2/A | 1 |
| 4. | Why the circulators are named so? | CO2/An | 1 |
| 5. | State the principle of operation of Kystron Oscillator. | CO3/R | 1 |
| 6. | Differentiate magnetron and TWT. | CO3/An | 1 |
| 7. | Briefly analyze the VI characteristics of Gunn diode. | CO4/An | 1 |
| 8. | What are the various applications of IMPATT diode? | CO4/An | 1 |
| 9. | List out any two advantages of Optical communications. | CO5/U | 1 |
| 10. | Covert 2 micro watts into dBm | CO5/E | 1 |

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|  | **PART – B (6 X 3 = 18 MARKS)** | |  |  |
| 11. | Why are matched terminations important in Microwave load  characteristics? Also analyze the effect of mismatched loads. | | CO1/An | 3 |
| 12. | Compare the performance of E plane T and H plane T. | | CO2/A | 3 |
| 13. | Enumerate the effects of High Frequency in Tubes. | | CO3/U | 3 |
| 14. | Briefly explain the concept of power measurement at Microwaves. | | CO4/R | 3 |
| 15. | Compare the performance optical and Electrical communication. | | CO5/A | 3 |
| 16. | Describe the principle of operation of LASER diodes. | | 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. | Write s detailed note on a) Coaxial Connectors b) waveguide corners c) Short circuit plungers, with necessary sketches. | | CO1/U | 12 |
|  |  |  |  |  |
| 18. | a. | Derive the S matrix of a three port circulator. | CO2/An | 6 |
| b. | Derive the S Matrix of Directional couplers and Power dividers. | CO2/An | 6 |
|  |  |  |  |  |
| 19. | a. | Analyze the operation of Reflex klystron Oscillator with necessary diagram. | CO3/An | 7 |
| b. | Analyze in detail the working principle of a Travelling wave Tube. | CO3/An | 5 |
|  |  |  |  |  |
| 20. | a. | How would you use the modern technique to measure the power at microwave frequencies? | CO4/A | 6 |
| b. | What procedures would you select to measure the impedance of a Load? | CO4/A | 6 |
|  |  |  |  |  |
| 21. | a. | Deduce the condition for total internal reflection with necessary supporting theory | CO5/An | 8 |
| b. | Compare Ray theory and Mode theory for fiber guiding | CO5/An | 4 |
|  |  |  |  |  |
| 22. |  | Explain in detail about RF and Microwave applications in Radar, Domestic, Industrial and Medical fields with examples. | CO1/U | 12 |
|  |  |  |  |  |
| 23. |  | Explain the schemes for measuring Low and High VSWR at microwave frequencies. | CO3/U | 12 |
|  |  | **COMPULSORY** | | |
| 24. |  | Derive expressions for the power coupled from a surface emitting LED into step index and graded index fibers. | CO6/E | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Recognize the operation of passive waveguide components. | | | | | | | |
| CO2 | Distinguish the limitations of existing vacuum tubes and solid state devices at microwave frequencies. | | | | | | | |
| CO3 | Predict the performance of specialized microwave tubes such as klystrons, reflex klystron, magnetron and  Travelling wave tube. | | | | | | | |
| CO4 | Classify microwave circuits using scattering parameters | | | | | | | |
| CO5 | Relate the characteristics of Optical Fiber components | | | | | | | |
| CO6 | Summarize optical source, Fiber and Detector operational parameters | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 2 | 24 |  | 3 |  |  | 29 |
| CO2 | |  |  | 4 | 13 |  |  | 17 |
| CO3 | | 1 | 15 |  | 13 |  |  | 29 |
| CO4 | | 3 |  | 12 | 2 |  |  | 17 |
| CO5 | |  | 1 | 3 | 12 | 1 |  | 17 |
| CO6 | |  | 3 |  |  | 12 |  | 15 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18EC2022** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED CONCEPTS USING 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. | State the purpose of using access specifiers. | | CO2 | R | | 1 |
| 2. | State the use of the break statement. | | CO1 | R | | 1 |
| 3. | Define - Type Conversion. | | CO4 | R | | 1 |
| 4. | Name any two operators that can be overloaded | | CO4 | R | | 1 |
| 5. | Name the exception handler. | | CO3 | R | | 1 |
| 6. | Define Friend Function. | | CO4 | R | | 1 |
| 7. | Interpret ‘seekg( )’. | | CO4 | U | | 1 |
| 8. | |  | | --- | | **Interpret the output:**  #include<iostream>  using namespace std;  int main()  {  int count=2;  cout<<count<<endl;  cout<<++ count<<endl;  cout<<count<<endl;  } | | | CO1 | U | | 1 |
| 9. | Discuss about ‘Data Structures’. | | CO5 | U | | 1 |
| 10. | List any 3 sorting Methods. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain Arrays with examples. | | CO2 | | U | 3 |
| 12. | Differentiate overloading and overriding member functions. | | CO3 | | U | 3 |
| 13. | Describe ‘this’ pointer. | | CO1 | | U | 3 |
| 14. | Write any four classes of file stream. | | CO4 | | A | 3 |
| 15. | Compare Arrays and Linked lists. | | CO5 | | U | 3 |
| 16. | List the different ways for getting formatted output data. | | CO1 | | 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. | Illustrate Structures and Classes with an example. | CO1 | | U | 6 |
|  | b. | Explain the different looping statements with suitable examples. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. |  | Discuss the following types of inheritance with suitable programs.  a. Hierarchical Inheritance b. Multilevel Inheritance.  c. Multiple Inheritance. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Discuss the tasks involved in exception handling. | CO6 | | U | 2 |
|  | b. | Discuss in detail the Virtual functions and Pure virtual functions highlighting the concept of polymorphism with a program. | CO4 | | U | 10 |
|  |  |  |  | |  |  |
| 20. | a. | Illustrate the operations of opening, writing and closing a file with an object-oriented program. | CO4 | | U | 8 |
|  | b. | Write a short note on Exceptions. | CO3 | | A | 4 |
|  |  |  |  | |  |  |
| 21. |  | Discuss the procedure of insertion of a node from the beginning, middle and end of the linked list. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Describe the following types of constructors that can be used within a class with suitable sample code.  a. Default Constructor b. Parameterized Constructor.  c. Copy Constructor. | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the concept of data type conversion in C++. | CO4 | | U | 4 |
|  | b. | Describe the method for overloading unary and binary operators with suitable examples. | CO4 | | R | 8 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain in detail about Merge sort with an example. | CO5 | | U | 6 |
|  | b. | Discuss in detail about Binary Search technique. | CO5 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Exhibit basic knowledge in object-oriented programming for developing programming skills. |
| CO2 | Recognize features of object-oriented design such as encapsulation, inheritance, and composition of systems based on object identity for appropriate applications. |
| CO3 | Illustrate the concept of polymorphism and exceptions using object-oriented approach. |
| CO4 | Specify simple data types and design implementations, using functions to document them. |
| CO5 | Identify the suitable data structure for the storage of data involved in the application and develop applications using various linear data structures. |
| CO6 | Choose the appropriate techniques in algorithmic design strategies for real time application  development. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 16 |  |  |  |  | 20 |
| CO2 | 1 | 15 |  |  |  |  | 16 |
| CO3 | 1 | 3 | 4 |  |  |  | 8 |
| CO4 | 23 | 23 | 3 |  |  |  | 49 |
| CO5 | 1 | 28 |  |  |  |  | 29 |
| CO6 |  | 2 |  |  |  |  | 2 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18EC2023** | **Duration** | **3hrs** |
| **Course Name** | **ELECTROMAGNETIC WAVES AND WAVEGUIDES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Relate the conversion of Spherical to Cartesian coordinate system. | | | CO1 | U | | 1 |
| 2. | What is displacement density? | | | CO1 | R | | 1 |
| 3. | Infer the work done on capacitor. | | | CO3 | U | | 1 |
| 4. | Write the value of relative permittivity of air. | | | CO2 | A | | 1 |
| 5. | Name the unit of energy stored in inductor. | | | CO4 | R | | 1 |
| 6. | Write the value of μ0 for free space condition. | | | CO4 | A | | 1 |
| 7. | Define wave propagation. | | | CO4 | R | | 1 |
| 8. | What is linear polarization? | | | CO4 | R | | 1 |
| 9. | Express the efficiency of transmission line. | | | CO5 | C | | 1 |
| 10. | What is the condition for no standing wave? | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Interpret | | | CO1 | | U | 3 |
| 12. | Sketch the field effects due to opposite charges and point charge. | | | CO2 | | A | 3 |
| 13. | Express the condition of inductance of solenoid. | | | CO4 | | C | 3 |
| 14. | Write the total work done for energy storage in inductor. | | | CO4 | | A | 3 |
| 15. | Indicate the VSWR in terms of reflection coefficient. | | | CO5 | | U | 3 |
| 16. | What are the types of Smith chart? | | | 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 Gauss law with a necessary condition. | CO1 | | U | 6 |
|  | | b. | Analyze and prove the given condition below, | CO2 | | An | 6 |
|  | |  |  |  | |  |  |
| 18. | | a. | Infer the compact form of energy stored in the system. | CO3 | | U | 4 |
|  | | b. | Express the condition for energy density and energy stored in the integral form of a capacitor. | CO3 | | C | 8 |
|  | |  |  |  | |  |  |
| 19. | | a. | Define Magnetic torque and express condition of magnetic torque on current loop. | CO4 | | R | 8 |
|  | | b. | Evaluate the force between two parallel conductors of length 1m separated by 50cm in air and carrying currents of 30 A in the same directions. | CO4 | | E | 4 |
|  | |  |  |  | |  |  |
| 20. | | a. | Express the condition for the magnetic field intensity due to infinitely long coaxial transmission line using Ampere’s circuital law with a neat sketch. | CO4 | | C | 8 |
|  | | b. | Interpret the vector magnetic potential of current loop with the suitable expression. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 21. | |  | Define Maxwell’s equation. Derive any two equations with justification. | CO5 | | R | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Describe the different types of transmission lines, line constants and its applications. | CO5 | | R | 6 |
|  | | b. | What is rectangular waveguide? Infer the condition of impossibility of TEM mode in waveguide. | CO6 | | C | 6 |
|  | |  |  |  | |  |  |
| 23. | | a. | State and prove Poynting vector with power flow equation. | CO5 | | R | 10 |
|  | | b. | Explain the concept of uniform plane waves. | CO5 | | U | 2 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Write a short note on VSWR. | CO5 | | A | 4 |
|  | | b. | Explain half and quarter wave transmission lines. | CO5 | | A | 4 |
|  | | c. | Discuss the Smith chart and its applications. | CO5 | | A | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate an ability to apply the co-ordinate systems and are familiar with the different vector operators. |
| CO2 | Formulate the electric flux density and define potential and potential gradient. |
| CO3 | Describe the current and current density from ohm’s law and design the capacitance using Poisson’s equations and Laplace’s equations. |
| CO4 | Design the magnetic flux density from the Biot Savart’s law and the Ampere’s circuital law. |
| CO5 | Differentiate the TE, TM and TEM – guided wave solutions. |
| CO6 | Evaluate TE and TM mode patterns of field distributions in a waveguides. |

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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 | - | - | 4 | 6 | - | - | 10 |
| CO3 | - | 4 | 1 | - | - | 8 | 13 |
| CO4 | 11 | 4 | 4 | - | 4 | 11 | 34 |
| CO5 | 23 | 5 | 12 | - | - | 1 | 28 |
| CO6 | 9 | - | - | - | - | 6 | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **18EC2028** | **Duration** | **3hrs** |
| **Course Name** | **MICROPROCESSOR AND MICROCONTROLLER** | **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 register to hold the address of memory of the next instruction. | | CO1 | U | | 1 |
| 2. | How many flags does 8085 have? | | CO1 | R | | 1 |
| 3. | Name the embedded systems which are designed with an 8-bit microcontroller. | | CO2 | R | | 1 |
| 4. | Which register is used for efficient power management of 8051 microcontroller? | | CO2 | R | | 1 |
| 5. | Write the oscillator frequency of 8051 microcontroller. | | CO2 | U | | 1 |
| 6. | Mention the register to enable or disable individual interrupts in 8051 microcontrollers. | | CO3 | R | | 1 |
| 7. | Write the instruction for an immediate addressing mode. | | CO3 | U | | 1 |
| 8. | Estimate the total counting steps for 8-bit timer. | | CO4 | E | | 1 |
| 9. | Identify the communication in which the data can be transmitted in both ways. | | CO5 | U | | 1 |
| 10. | Name the communication protocol which are designed by using DTE and DCE signals. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare the features of microprocessor and microcontroller. | | CO1 | | R | 3 |
| 12. | Differentiate Von Newman and Harvard architecture. | | CO2 | | U | 3 |
| 13. | Write the significance of compiler in 8051 microcontrollers. | | CO3 | | R | 3 |
| 14. | Write short notes on 8051 bus structure. | | CO4 | | U | 3 |
| 15. | What is synchronous serial data communication? | | CO6 | | An | 3 |
| 16. | Define step angle. | | 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 the different functional blocks of 8085 architecture with neat sketch. | CO1 | | U | 10 |
| b. | List the characteristics of an embedded systems. | CO1 | | U | 2 |
| 18. | a. | Draw the architecture of 8051 microcontroller. | CO2 | | R | 5 |
| b. | Summarize the pin configurations of 8051 microcontroller. | CO2 | | R | 7 |
| 19. |  | Describe the different types of 8051 Instruction sets with an example. | CO3 | | An | 12 |
| 20. | a. | Describe the interfacing methods of an input device with 8051 microcontrollers with neat sketch and write code for interfacing LCD with microcontroller. | CO5 | | A | 6 |
|  | b. | Explain the operation of 8051 timer and write embedded C code for a timer. | CO5 | | R | 6 |
| 21. | a. | Describe the functional blocks of successive approximation type ADC. | CO6 | | U | 8 |
|  | b. | Write short notes on different control signals used for external memory interfacing. | CO2 | | U | 4 |
| 22. | a. | Explain the steps involved for serial data transmission using I2C protocol. | CO6 | | U | 10 |
|  | b. | Draw the data format of RS232 communication. | CO5 | | A | 2 |
| 23. |  | Design a real time patient monitoring system with any one wireless communication devices. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Illustrate the interfacing methods of LEDs with 8051 microcontrollers with neat diagram. | CO6 | | U | 10 |
|  | b. | List the drive methods of stepper motor. | CO6 | | C | 2 |

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|  | **COURSE OUTCOMES** |
| CO1 | Discuss the microprocessor organization and its evolution. |
| CO2 | Describe the architecture of 8051 controllers. |
| CO3 | Express their knowledge in designing a system using 8051. |
| CO4 | Differentiate controller / processor architecture and features. |
| CO5 | Write processor / controller specific programs in Embedded C. |
| CO6 | Simulate the real time system using integrated development environment. |

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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 | 14 | 8 |  |  |  |  | 22 |
| CO3 | 4 | 1 | 12 | 12 |  |  | 29 |
| CO4 |  | 3 |  |  | 1 |  | 4 |
| CO5 | 6 | 1 | 8 |  |  |  | 15 |
| CO6 |  | 32 |  | 3 |  | 2 | 37 |
|  | | | | | | | **124** |

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| **Course Code** | **18EC2030** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL ELECTRONICS** | **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 Universal Gates. | | CO1 | R | 1 |
| 2. | Tell the base for the Hexadecimal number system. | | CO1 | R | 1 |
| 3. | Show the value of the Boolean Expression A+1= | | CO2 | U | 1 |
| 4. | Tell the expansion of BCD. | | CO2 | R | 1 |
| 5. | Identify the type of logic circuit whose output depends only on present inputs. | | CO3 | U | 1 |
| 6. | Name one combinational circuit used for the arithmetic operations. | | CO3 | R | 1 |
| 7. | List the types of triggering used in sequential circuits. | | CO4 | R | 1 |
| 8. | Name the type of sequential circuit in which all flip flops has a common clock. | | CO4 | U | 1 |
| 9. | Tell the expansion of PROM. | | CO5 | R | 1 |
| 10. | Report what happens to the speed of the circuit if its delay is less. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Show the truth table and symbol of Exclusive OR gate. | | CO1 | U | 3 |
| 12. | Solve A+AB. | | CO2 | A | 3 |
| 13. | Design a half-adder circuit. | | CO3 | A | 3 |
| 14. | Sketch the logic diagram of the Master-Slave JK flipflop. | | CO4 | U | 3 |
| 15. | Sketch the logic diagram of 3 bit Johnson Counter. | | CO5 | A | 3 |
| 16. | Classify the types of PLDs based on their gate array structure. | | 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 a circuit diagram and write a truth table for the following expression.  Q=AB+AC' | CO1 | C | 6 |
|  | b. | Express the equation J = f (A,B,C) = (A B'+A' C) in proper canonical form. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Determine the Boolean Expression using the Karnaugh map.  F (W, X, Y, Z) = € (1,4,6,7,8,9,10,11,15) d(3,5) | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Design a BCD to Excess3 code converter circuit. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Design a 3-bit binary up counter using T flipflop. | CO4 | A | 8 |
|  | b. | Differentiate synchronous and asynchronous counter. | CO4 | An | 4 |
|  |  |  |  |  |  |
| 21. | a. | Design a serial in parallel out shift register and explain its operation. | CO5 | A | 8 |
|  | b. | Differentiate ring and Johnson counter. | CO5 | An | 4 |
|  |  |  |  |  |  |
| 22. |  | Explain different types of non-weighted codes. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Design a Full subtractor circuit. | CO3 | A | 6 |
|  | b. | Design a 4-to-1 Multiplexer circuit. | CO3 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Construct F (A, B, C, D) = € (1,2,5,7) using PLA architecture. | CO6 | C | 6 |
|  | b. | Design a 2-input CMOS NAND gate with its truth table. | CO6 | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the Number System Conversions. |
| CO2 | Simplify the Boolean Expressions using various simplification techniques. |
| CO3 | Design various Combinational Circuits. |
| CO4 | Design various Sequential Circuits. |
| CO5 | Implement Combinational circuits using PLD. |
| CO6 | State and compare different Digital Logic families. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 9 | - | - | - | 6 | 17 |
| CO2 | 1 | 13 | 15 | - | - | - | 29 |
| CO3 | 1 | 1 | 27 | - | - | - | 29 |
| CO4 | 1 | 4 | 8 | 4 | - | - | 17 |
| CO5 | 1 | - | 11 | 4 | - | - | 16 |
| CO6 | - | 4 | 6 | - | - | 6 | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **18EC3014** | **Duration** | **3hrs** |
| **Course Name** | **PATTERN RECOGNITION AND 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. | Analyze the design cycle of pattern recognition system and also examine the computational complexity in the design. | CO1 | An | 12 |
|  | b. | Develop the discriminant function for Bayes classifier if the feature vector distribution is Gaussian with different means and a fixed diagonal covariance matrix. | CO1 | A | 8 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Examine the problem of testing for lack of fit in simple linear regression model. | CO2 | An | 10 |
|  | b. | Explain Locally Weighted Linear Regression. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the working of back propagation neural network with neat architecture. | CO3 | A | 10 |
|  | b. | Inspect the neural network model for discussing the process of sub-sampling of input data. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Identify the relationship of minimum squared error (MSE) to Fisher’s Linear Discriminant. | CO4 | A | 8 |
|  | b. | Explain the Key idea of the support vector machine (SVM). | CO4 | U | 12 |
|  |  |  |  |  |  |
| 5. | a. | Explain Minimum Description Length (MDL) principle and overfitting avoidance with reference to the lack of inherent superiority of any classifier. | CO5 | U | 10 |
|  | b. | Illustrate the full Jackknife approach for bias and variance estimate. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Interpret the conclusions of the Bayesian parameter estimation technique with necessary equations. | CO1 | E | 10 |
|  | b. | Identify the terminology for random forest tree and show the process of random forest tree or classification. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Examine the Backpropagation rule considering the training rule for output unit weights and training rule for hidden unit weights. | CO3 | An | 10 |
|  | b. | Dissect the working principle of Ho-Kashyap procedure in solving the linear discriminant function. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Illustrate the methods used to estimate the test error in resampling for classifier accuracy. | CO5 | U | 10 |
|  | b. | Explain the K – nearest neighbour algorithm for approximating a discrete – valued function f : Hn→ V with pseudo code. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Interpret the concept of Unsupervised Learning for Real-Life Applications. | CO6 | E | 10 |
|  | b. | Examine the different linkage methods used in the Hierarchical Clustering Algorithm. | CO6 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Explain the basics of pattern recognition and machine learning. |
| CO2 | Illustrate the linear models for classification. |
| CO3 | Select the neural network for classification. |
| CO4 | Summarize the concept of linear discriminant function. |
| CO5 | Design algorithm independent machine learning. |
| CO6 | Develop unsupervised learning techniques and clustering. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 8 | 12 | 10 | - | 30 |
| CO2 | - | 10 | 10 | 10 | - | - | 30 |
| CO3 | - | - | 10 | 20 | - | - | 30 |
| CO4 | - | 12 | 8 | 10 | - | - | 30 |
| CO5 | - | 30 | - | - | - | - | 30 |
| CO6 | - | 10 | - | 10 | 10 | - | 30 |
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| **Course Code** | **18EC3015** | **Duration** | **3hrs** |
| **Course Name** | **MIMO SYSTEMS** | **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. | Recite MIMO and Multi-antenna systems. | CO1 | R | 10 |
|  | b. | Distinguish Frequency selectivity, Coherence bandwidth, Delay spread in context with MIMO Communication. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Describe spatial multiplexing techniques in MIMO systems. | CO2 | R | 20 |
|  |  |  |  |  |  |
| 3. |  | Explain Alamouti Space Time Code for two transmit and one receive antenna with necessary mathematical expressions. Also, write important features of Alamouti scheme. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Analyze the need of linear precoding in MIMO. Considering perfect CSI, explain precoding with the help of block diagram. Also, comment on advantages and disadvantages of precoding. | CO3 | An | 10 |
|  | b. | Categorize Equalizers in MIMO systems. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. |  | Explain the concept of adaptive beamforming in detail with the help of any one adaptive beam forming algorithm. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Enumerate different MIMO technologies adopted by LTE? Using any one technology, describe the codeword-to-layer mapping for spatial multiplexing. | CO5 | R | 20 |
|  |  |  |  |  |  |
| 7. |  | Discuss the Maximum Ratio Combining (MRC) diversity scheme and Equal Gain Diversity (EGC). Comment on diversity gain for the same. | CO6 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain Singular Value Decomposition (SVD) architecture for MIMO communication. | CO6 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Give the detailed classification of channel estimation algorithms and explain any one in detail. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate mathematical modeling and analysis of MIMO systems. |
| CO2 | Explain channel modeling and propagation, MIMO Capacity, space-time coding techniques. |
| CO3 | Design and Distinguish code book-based MIMO beamforming. |
| CO4 | Distinguish the principle behind MIMO receivers Vs MIMO for multi-carrier systems (e.g. MIMO-OFDM). |
| CO5 | Illustrate the significance of multi-user MIMO communications. |
| CO6 | Compare and contrast various types of Channel estimation techniques in MIMO communications |

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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 | 20 | - | 20 | - | - | - | 40 |
| CO3 | - | - | -- | 20 | - | - | 20 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | 20 | - | - | - | - | - | 20 |
| CO6 | - | 60 | -- | - | - | - | 60 |
|  | | | | | | | **180** |



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| **Course Code** | **18EC3019** | **Duration** | **3hrs** |
| **Course Name** | **WIRELESS SENSOR NETWORKS** | **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 Sensor Network Architecture Elements. List down the functionality for each of the elements. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Enumerate the Background of Wireless Sensor Network Technology. | CO2 | R | 10 |
|  | b. | Compare Manet and WSN stating its merits and demerits. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. |  | Describe Hardware and Software need of WSN and all basic hardware Subsystem in detail. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | List down all the Network Layer Protocol for wireless sensor network. Explain FLOODING and LEACH in details. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 5. |  | Summarize the way MAC protocols in WSN are classified. Give example of at least one protocol for each group. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Describe the basics of Probability Based Routing Algorithm for WSN. | CO5 | U | 20 |
|  |  |  |  |  |  |
| 7. |  | Discuss on Angle of Arrival (AOA) and Time difference of Arrival (TDOA) based tracking mechanisms. | CO5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Determine packet level data aggregation and Geometric data aggregation. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Interpret Energy management and security levels followed in Bluetooth Technology. | CO6 | A | 10 |
|  | b. | Explain in brief about IEEE 802.11 protocols stack. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design wireless sensor network system for different applications under consideration. |
| CO2 | Understand the hardware details of different types of sensors and select right type of sensor for various applications. |
| CO3 | Understand radio standards and communication protocols to be used for wireless sensor network-based systems and application. |
| CO4 | Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms. |
| CO5 | Handle special issues related to sensors like energy conservation and security challenges. |
| CO6 | Students will be able to understand the concepts of sensor networks, applications and different types of protocols in WSN. |

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

Description automatically generated with medium confidence

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| **Course Code** | **18EC3024** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED COMMUNICATION NETWORKS** | **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. | Summarize the role of IETF in providing QoS solutions. | CO1 | U | 8 |
|  | b. | Distinguish the various switching techniques used in networks. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 2. | a. | Interpret the current state of Internet and the problems for real time communication. | CO1 | U | 8 |
|  | b. | Examine the Challenges in IntServ Flow specification, and describe the various Traffic shaping algorithms. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 3. | a. | Apply the max-min fair allocation for a set of four sources with demands {2, 2.6, 4, 4.5} when the resource has a capacity of 10. | CO2 | A | 8 |
|  | b. | Differentiate fluid model and packetized model. | CO2 | An | 8 |
|  |  |  |  |  |  |
| 4. | a. | Illustrate the role of finish time in weighted fair queuing with suitable arrival-departure curves of two flows. | CO2 | A | 8 |
|  | b. | Discuss the problems in queue management. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 5. |  | Apply Cross-product in the given classifier with a set of rules and two fields.    For the incoming packets P1=0011 and P2 = 1110, Find the best matching rule. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 6. | a. | Interpret the various methods of Measurement based admission control. | CO4 | U | 8 |
|  | b. | Illustrate Differentiated services architecture with a suitable diagram. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Create DSCP for AF medium drop precedence with minimum bandwidth of 8 Mbps. | CO5 | C | 8 |
|  | b. | Analyze the integration of IP and ATM. | CO5 | An | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Distinguish service and forwarding treatment. Give an example. | CO6 | An | 10 |
|  | b. | Discuss on MPLS traffic engineering. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the flow control and congestion control in Transmission control protocol. |
| CO2 | Demonstrate the challenges in packet classification and scheduling algorithm. |
| CO3 | Develop a framework based on IP network. |
| CO4 | Design and develop protocols for Communication Networks. |
| CO5 | Understand the mechanisms in Quality of Service in networking. |
| CO6 | Optimize the network design. |

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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 | - | 8 | 16 | 8 | - | - | 32 |
| CO3 | - | - | 16 | - | - | - | 16 |
| CO4 | - | 16 | - | - | - | - | 16 |
| CO5 | - | - | - | 8 | - | 8 | 16 |
| CO6 | - | 10 | - | 10 | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **18EC3026** | **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. | Relate the evolution of smart cities to IoT revolution. | CO1 | U | 10 |
|  | b. | Describe the global context of M2M towards IoT. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the application layer protocol MQTT and its architecture in IoT infrastructure. | CO2 | A | 10 |
|  | b. | Explain about the security and privacy in Fog computing with respect to IoT. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Distinguish the edge resource pooling and caching with respect to edge computing. | CO3 | An | 10 |
|  | b. | Discriminate the following IOT networkswith example.   * LAN, * PAN, and * WAN | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Assess the hardware and functionalities of smart objects or intelligent objects which are the building blocks for IoT. | CO4 | E | 14 |
|  | b. | Appraise the Embedded systems platforms for IoT. | CO4 | E | 06 |
|  |  |  |  |  |  |
| 5. | a. | Compose about the operating systems used in IoT environment. | CO5 | C | 10 |
|  | b. | “Unlike Contiki, RTOS provides real-time guarantees to applications”-Justify. | CO5 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Differentiate between IPv4 and IPv6. Justify its part in IoT revolution. | CO1 | U | 10 |
|  | b. | Illustrate the principles of EDGE /P2P computing with respect to IoT. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Express, “why network wide configuration is important for IoT systems with multiple nodes”. Explain with an illustration. | CO3 | C | 10 |
|  | b. | Tabulate the difference between multi-threaded and event-driven programming. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the purpose of smart parking in cities. | CO6 | A | 10 |
|  | b. | Describe how SDN can be used for various levels ofIoT. | CO2 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss about Smart HealthCare. | CO6 | U | 10 |
|  | b. | Explainabout Security and Legal considerations in IoT applications. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the evolution of IoT. |
| CO2 | Classify IoT technologies that are used now. |
| CO3 | Explain the requirement of IoT in certain scenarios. |
| CO4 | Choose appropriate technologies to tackle scenarios using experimental platform for  implementing prototypes. |
| CO5 | Use the types of technologies that are available to implement IoT solutions. |
| CO6 | Examine IoT applications. |

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



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| **Course Code** | **18EC3027** | **Duration** | **3hrs** |
| **Course Name** | **CMOS VLSI 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. |  | Explain in detail the various regions in a CMOS inverter DC characteristic. | CO2 | A | 16 |
|  |  |  |  |  |  |
| 2. | a. | Analyze Gradual Channel Approximation (GCA) method find the derivation of ID Cutoff, Non-Saturation and Saturation region and draw the Drain voltage Vs Drain current characteristics. | CO1 | An | 8 |
|  | b. | Design the basic Boolean functional unit using CMOS transistor logic with the stick diagram.  Y = ((A.B.C)+D) and Y= (A (B.C + D)) | CO2 | C | 8 |
|  |  |  |  |  |  |
| 3. |  | Estimate the propagation delay of an first order analysis and evaluate propagation delay of a 0.25 µm CMOS Inverter for a supply voltage of 2.5 V, the normalized on-resistances of NMOS and PMOS transistors equal 13 kΩ and 31 kΩ, respectively and determine the (W/L) ratios of the transistors to be 1.5 for the NMOS and 4.5 for the PMOS. | CO2 | E | 8 |
|  |  | Explain the generals rules to describe the color codes used in stick diagram also brief the step by step procedure to draw the Euler’s Path algorithm with suitable example Z = AB + (C + D)(E + F) | CO3 | A | 8 |
|  |  |  |  |  |  |
| 4. |  | With neat diagram explain in detail about clocked CMOS logic (C2MOS) and design 3-input NAND gate using clocked CMOS (C2MOS) logic. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 5. |  | Design the structure of a mirror adder and explain its working principle. | CO5 | C | 16 |
|  |  |  |  |  |  |
| 6. |  | Develop 4-by-4-barrel shifter and explain its shifting operation. | CO6 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | Design transmission gate adder and explain its operation with its truth table. | CO5 | C | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Design the structure logic of 5\*4 Tree Multiplier and illustrate its function. | CO6 | C | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the MOS transistor theory. |
| CO2 | Sketch the Stick Diagram and Layout of CMOS Logic Gates, analyze the DC Characteristics of NMOS and CMOS Inverters and predict timing issues. |
| CO3 | Compute various CMOS Logic styles to construct Logic Circuits. |
| CO4 | Illustrate the performance of Sequential logic design. |
| CO5 | Determine and develop the various Arithmetic logic blocks based on CMOS design. |
| CO6 | Design various high speed building blocks based on CMOS design. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  |  | 8 |  |  | 8 |
| CO2 |  |  | 16 |  | 8 | 8 | 32 |
| CO3 |  |  | 8 |  |  |  | 8 |
| CO4 |  |  | 16 |  |  |  | 16 |
| CO5 |  |  |  |  |  | 32 | 32 |
| CO6 |  |  | 16 |  |  | 20 | 36 |
|  | | | | | | | **132** |



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| **Course Code** | **18EC3028** | **Duration** | **3hrs** |
| **Course Name** | **SOLID STATE DEVICE MODELING AND SIMULATION** | **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. | Interpret the impact on flow of charge carriers in a semiconductor by deriving the continuity & Poisson’s equation. | CO1 | U | 12 |
|  | b. | Explain the drift and diffusion current components of a semiconductor. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 2. | a. | Derive the equation to identify resistivity of a semiconductor using an experimental setup. | CO2 | R | 12 |
|  | b. | Describe avalanche Process with necessary diagrams. | CO2 | R | 4 |
|  |  |  |  |  |  |
| 3. | a. | Explain the basic operation of BJT and assess the Ideal IC–VCE Characteristics using necessary expressions. | CO3 | An | 12 |
|  | b. | Correlate the effect of base collector voltage on collector current in an NPN transistor. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 4. | a. | Interpret the electrostatic potential and charge distribution of silicon in a MOS capacitor by solving Poisson’s equation. | CO4 | U | 10 |
|  | b. | Compute the poly Silicon work function and depletion effects of a MOS capacitor by using appropriate band diagrams. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 5. | a. | Illustrate the drain current model of a long-channel MOSFET using gradual channel approximation method and discuss the substrate sensitivity. | CO5 | A | 16 |
|  |  |  |  |  |  |
| 6. | a. | Derive the expression for Ids-Vg characteristics of a MOSFETandsummarize its sub-threshold characteristics. | CO5 | E | 12 |
|  | b. | Sketch the energy band diagram of a Common Emitter based NPN transistor. | CO3 | A | 4 |
|  |  |  |  |  |  |
| 7. | a. | Examine the channel mobility of a MOSFET using necessary expressions and diagrams. | CO5 | A | 10 |
|  | b. | Discuss Charge Control theory and derive Small Signal Model of a PN junction diode. | CO2 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Apply constant field scaling rules to the long channel MOSFET and narrate the effect of scaling on circuit parameters with necessary expressions. | CO6 | A | 10 |
|  | b. | Discussthe discrete dopant effect on MOSFET threshold voltage. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the Mathematical Techniques for Device Simulations. |
| CO2 | Predict the various Quantum Mechanical Concepts. |
| CO3 | Categorize the Bipolar Device Models. |
| CO4 | Compute the effects in MOS Capacitors. |
| CO5 | Illustrate the performance and characterize MOS Devices. |
| CO6 | Determine and develop CMOS design. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 12 | - | 4 | - | - | 16 |
| CO2 | 16 | 6 | 4 | - | - | - | 26 |
| CO3 | - | - | - | 16 | - | - | 16 |
| CO4 | - | - | 16 | - | - | - | 16 |
| CO5 | - | - | 26 | - | 12 | - | 38 |
| CO6 | - | 10 | 10 | - | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **DEC322 / 18EC3029** | **Duration** | **3hrs** |
| **Course Name** | **ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS** | **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. | Interpret the source follower amplifier with resistiveload and active load and derive the large signal analysiswith merits and demerits. | CO1 | A | 12 |
|  | b. | Infer the non-linear operation of the amplifier and obtain the small signal gain of the amplifier. | CO1 | C | 4 |
|  |  |  |  |  |  |
| 2. |  | Categorize in detail the common source amplifier and analyze the parameters for the Large Signal Model. | CO2 | An | 16 |
|  |  |  |  |  |  |
| 3. |  | Interpret the feedback amplifier and derive the various types of parameters for the amplifiers with its merits and demerits. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. |  | Categorize in detail the frequency response of amplifier and analyze the various modes of operations. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | Estimate the small signal model of single stage operational amplifier and derive the gain of the OPAMP. | CO5 | E | 16 |
|  |  |  |  |  |  |
| 6. |  | Interpret the feedback amplifier and derive the various types of amplifiers with merits and demerits. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 7. |  | Categories the need of response of amplifier and analyze the various modes of analysis in detail.   1. Time domain Analysis. 2. Frequency Domain Analysis. | CO6 | An | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Estimate the small signal model of single stage operational amplifier and derive the gain of the OPAMP. | CO6 | E | 10 |
|  | b. | Interpret the PLL and derive the transfer characteristics of PLL with merits and demerits. | CO5 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the single stage amplifier. |
| CO2 | Identify various Differential amplifiers and current mirror circuits. |
| CO3 | Demonstrate the noise characteristics in amplifiers. |
| CO4 | Illustrate different types of feedback concepts in amplifiers. |
| CO5 | Determine the characteristics of operational amplifiers. |
| CO6 | Design various analog circuits for different applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 12 | - | - | 4 | 16 |
| CO2 | - | - | - | 16 | - | - | 16 |
| CO3 | - | - | 16 | - | - | - | 16 |
| CO4 | - | - | - | 16 | - | - | 16 |
| CO5 | - | - | 26 | - | 16 | - | 42 |
| CO6 | - | - | - | 16 | 10 | - | 26 |
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| **Course Code** | **18EC3040** | **Duration** | **3hrs** |
| **Course Name** | **VLSI TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q.**  **No.** |  | **Questions** | **Course Outcome** | **Bloom’s level** | **Marks** |
| **PART-A (4X20=80 MARKS)**  **Answer all the Questions** | | | | | |
| 1. |  | Describe in detail about the epitaxial process in Molecular Beam Epitaxy. | CO1 | R | 20 |
| **(OR)** | | | | | |
| 2. |  | Explain the Silicon shaping operations with necessary diagrams. | CO1 | U | 20 |
|  | | | | | |
| 3. | a. | Examine the oxide stress associated with the film. | CO2 | A | 10 |
| b. | Interpret the thermal oxidation process of poly-Si which is employed in inter level dielectric for multi-layer structures. | CO2 | U | 10 |
| **(OR)** | | | | | |
| 4. |  | Enumerate the oxide properties in terms of masking properties of SiO2 and oxide charges. | CO2 | R | 20 |
|  | | | | | |
| 5. | a. | Explain in detail about the methods of Optical lithography technique with schematic representation. | CO3 | U | 10 |
| b. | Summarize the diffusion process in SiO2. | CO4 | E | 10 |
| **(OR)** | | | | | |
| 6. | a. | Analyze in detail about the diffusivities of B, P.As and Sb. | CO4 | An | 10 |
| b. | Identify and elaborate the process that is adopted to form conductors and buried insulators. | CO4 | R | 10 |
|  | | | | | |
| 7. | a. | Analyze the effect of oxidizing ambient and lateral enhancement of diffusivity in narrow oxide windows. | CO4 | An | 12 |
| b. | Formulate the post metal processing steps in detail. | CO5 | C | 8 |
| **(OR)** | | | | | |
| 8. |  | With a neat diagram explain in detail about the Physical Vapour Deposition Method. | CO5 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Summarize the Thermal and Mechanical considerations in VLSI Design rules. | CO6 | E | 14 |
| b. | Calculate the Junction-to-ambient thermal resistance for a device dissipating 550mW into an ambient of 70°C and operating at a junction temperature of 125°C? | CO6 | A | 6 |

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| **COURSE OUTCOMES** | |
| CO1 | Use the VLSI fabrication steps in detail. |
| CO2 | Illustrate various oxidation techniques followed in the industry for every fabrication process. |
| CO3 | Explain various fabrication steps to fabricate VLSI Devices. |
| CO4 | Choose the various mechanisms for Diffusion and Ion Implantation process. |
| CO5 | Select proper metallization techniques in VLSI Technology. |
| CO6 | Explore the application of technology customization for the chip design economically. |

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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 | 10 | 10 | - | - | - | 40 |
| CO3 | - | 10 | - | - | - | - | 10 |
| CO4 | 10 | - | - | 22 | 10 | - | 42 |
| CO5 | 20 | - | - | - | - | 8 | 28 |
| CO6 | 14 | - | 6 | - | - | - | 20 |
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Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **18EC3047** | **Duration** | **3hrs** |
| **Course Name** | **HARDWARE DESIGN VERIFICATION 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. | Distinguish directed testing and methodology basics. | CO1 | An | 4 |
|  | b. | Explain what factors to be randomized while generating constrained random stimulus. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 2. | a. | Determine the value of my\_array in the below code and justify the same.  bit [3:0] [7:0] my\_array = 32'hCAFE\_DEAD;  initial begin  my\_array[1] = 8'h44;  $display("my\_array=0x%0h", my\_array);  end | CO2 | A | 6 |
|  | b. | Determine the output for the below code.  module test;  class abc;  function void display(input int a, input int b=0);  $display("Value of a=%0d,b=%0d",a,b);  end function  end class  initial begin  abc obj;  obj = new();  obj.display(6);  end  endmodule | CO2 | A | 4 |
|  | c. | Determine what happens to threads A() and B() if C() finishes first in the following code?  fork  A();  B();  C();  join\_any | CO2 | A | 6 |
| 3. | a. | Determine the output for the below code.  module tb\_top  event event A;  initial begin  fork  wait for trigger (event A);  #15 ->event A;  join  end  task wait for trigger (event event A);  $display (“ [%0t] Waiting for Event A to be triggered “,$time);  @ event A;  $display (“ [%0t] Event A has triggered “,$time);  end task  end module | CO3 | A | 4 |
|  | b. | Explain with necessary System Verilog code, object assignment, shallow copy, deep copy and class inheritance. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 4. | a. | Show the request and response flow between master and slave in testbench fundamentals. | CO4 | U | 2 |
|  | b. | Illustrate the testbench construction between memory master and slave pin connections using a non-pipelined HFPB protocol with the necessary timing diagram. | CO4 | A | 14 |
|  |  |  |  |  |  |
| 5. | a. | Distinguish OVM and UVM. | CO5 | E | 4 |
|  | b. | Discuss in detail UVM test and UVM Components. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 6. | a. | Determine the output for the below code.  module test;  class abc;  static int sum;  function int calc(input int a, input int b);  this.sum=a + b;  return sum;  end function  end class  initialbegin  abcobj1,obj2;  obj1 = new();  obj2= new();  obj1.sum = obj1.calc(10,20);  obj2.sum=obj2.calc(50,40);  $display("obj1sum=%0d,obj2sum=%0d",obj1.sum,obj2.sum);  end  endmodule | CO2 | A | 2 |
|  | b. | Develop a System Verilog Code for connecting the testbench with Arbiter (DUT) using simple interfaces and combine them with Top module. | CO2 | C | 14 |
|  |  |  |  |  |  |
| 7. | a. | Explain Upcasting and Downcasting for the members given in Fig.1 and justify which is legal?    Fig 1 | CO3 | U | 4 |
|  | b. | Explain the types of Coverage metrics in System Verilog with necessary examples. | CO3 | U | 12 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Develop a verification methodology for softcore processor verification. | CO6 | C | 10 |
|  | b. | Explain the methods of hardware/software Co-verification. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the various functional design verification. |
| CO2 | Generalize the basics of system Verilog. |
| CO3 | Utilize the advanced system Verilog in digital design. |
| CO4 | Illustrate the open verification methodology. |
| CO5 | Evaluate about Universal Verification Methodology. |
| CO6 | Perform verification in various digital design circuits |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | - | 16 | - | - | 16 |
| CO2 | - | - | 18 | - | - | 14 | 32 |
| CO3 | - | 16 | 16 | - | - | - | 32 |
| CO4 | 2 | - | 14 | - | - | - | 16 |
| CO5 | - | 12 | - | - | 4 | - | 16 |
| CO6 | - | 10 | - | - | - | 10 | 20 |
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| **Course Code** | **18EC3050** | **Duration** | **3hrs** |
| **Course Name** | **SOLID STATE DEVICE MODELING AND SIMULATION-MOS MODEL** | **Max. Marks** | **100** |

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| **Q.**  **No** | **Sub Div.** | **Questions** | **Course Outcome** | **Bloom’s level** | **Marks** |
| **PART-A (4X20=80 MARKS)**  **Answer all the Questions** | | | | | |
| 1. | a. | Describe the effects of interface states and oxide traps. | CO1 | R | 10 |
| b. | Illustrate the drain current model of a long-channel MOSFET using gradual channel approximation method and discuss the substrate sensitivity. | CO1 | U | 10 |
| **(OR)** | | | | | |
| 2. |  | Explain Surface Potential, Accumulation, Depletion and Inversion of MOS Capacitor in detail. | CO1 | A | 20 |
|  | | | | | |
| 3. |  | Interpret High Field Effect and Short Channel Effect in MOSFET. | CO2 | U | 20 |
| **(OR)** | | | | | |
| 4. | a. | Describe the high frequency behavior of parasitic capacitance. | CO2 | C | 10 |
|  | b. | Explain non-quasi static behavior of a MOSFET. | CO2 | U | 10 |
|  | | | | | |
| 5. |  | Describe in detail about semiconductor noise and recite the different noise sources that accumulates in MOSFET. | CO3 | U | 20 |
| **(OR)** | | | | | |
| 6. |  | Identify CMOS circuit noise and explain in detail about non-linearities in CMOS devices and modeling. | CO3 | U | 20 |
|  | | | | | |
| 7. | a. | Explain RF Model and Noise Model in MOSFET. | CO4 | U | 14 |
|  | b. | Discuss the charge control theory and derive Small Signal Model of a PN junction diode. | CO4 | U | 6 |
| **(OR)** | | | | | |
| 8. |  | Analyze MOSFET’s Threshold voltage model with required equations | CO4 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Demonstrate required simulation of MOSFET with models, Non-quasi-static model, Noise model, Temperature effects, MOS device mismatch for Analog/RF applications. | CO5 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute new mathematical models for various devices. |
| CO2 | Demonstrate the physics behind the semiconductor devices. |
| CO3 | Illustrate various noise modeling and non-linearities in CMOS Devices. |
| CO4 | Summarize various BSIM4 MOSFET Models. |
| CO5 | Choose EKV MOSFET Models. |
| CO6 | Develop various SPICE models for MOS devices. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO/P** | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 | 20 | - | - | - | 40 |
| CO2 | - | 30 | - | - | - | 10 | 40 |
| CO3 | - | 40 | - | - | - | - | 40 |
| CO4 | - | 20 | - | 20 | - | - | 40 |
| CO5 | - | 20 | - | - | - | - | - |
| CO6 | - | - | - | - | - | - | 20 |
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| **Course Code** | **18EC3052** | **Duration** | **3hrs** |
| **Course Name** | **NANOSCALE FET** | **Max. Marks** | **100** |

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| **Q.**  **No.** | **Sub Div.** | **Questions** | **Course Outcome** | **Bloom’s level** | **Marks** | |
| **PART-A (4X20=80 MARKS)**  **Answer all the Questions** | | | | | | |
| 1. |  | Describe in detail about the construction, working and I-V characteristics of MOSFET with necessary diagrams. | CO1 | U | 20 | |
| **(OR)** | | | | | | |
| 2. | a. | Explain the Capacitance-Voltage characteristics. | CO1 | An | 10 | |
| b. | Derive the Current Voltage relationship of long channel MOSFET and infer the characteristics. | CO1 | U | 10 | |
|  | | | | | | |
| 3. | a. | Explain MOSFET Scaling and narrate the effect of scaling on circuit parameters with necessary expressions. | CO2 | U | 12 | |
| b. | Compare SiO2 versus High-k gate dielectrics. | CO2 | U | 8 | |
| **(OR)** | | | | | | |
| 4. |  | Describe Channel Length modulation. | CO2 | R | 20 | |
|  | | | | | | |
| 5. |  | Define SOI and explain PDSOI, FDSOI and Ultrathin body SOI with necessary diagram. | CO3 | R | 20 | |
| **(OR)** | | | | | | |
| 6. |  | Design a FinFET and explain its operation. | CO3 | C | 20 | |
|  | | | | | | |
| 7. | a. | List the advantages of Germanium over Silicon and justify why Silicon preferred over Germanium? | CO4 | R | 10 | |
| b. | Appraise Compound Semiconductors and its characteristics. List any 5 commonly used compound semiconductors with its properties. | CO 4 | An | 10 | |
| **(OR)** | | | | | | |
| 8. |  | Define Carbon Nano Tube and list the types of CNTFETs. Interpret its I-V Characteristics.Compare CNTFET with MOSFET. | CO5 | U | 20 | |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. |  | Design a Single Electron Transistors sketch its constructional diagram and inspect its operation. List the advantages and disadvantages of SET compared with MOSFETs. | CO5 | C | 20 | |
|  |  |  |  |  |  | |
| **COURSE OUTCOMES** | | | | | | |
| CO1 | | Use the VLSI fabrication steps in detail. | | | | |
| CO2 | | Illustrate various oxidation techniques followed in the industry for every fabrication process. | | | | |
| CO3 | | Explain various fabrication steps to fabricate VLSI Devices. | | | | |
| CO4 | | Choose the various mechanisms for Diffusion and Ion Implantation process. | | | | |
| CO5 | | Select proper metallization techniques in VLSI Technology. | | | | |
| CO6 | | Explore the application of technology customization for the chip design economically. | | | | |

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

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC1001** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS 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. | Find the resistance of the current flowing through a 40 W filament lamp powered up by 240 V operating at normal operating temperature. | | | CO1 | U | | 1 |
| 2. | List the advantages of LED. | | | CO1 | R | | 1 |
| 3. | An electromechanical device which transforms electrical energy to mechanical energy is called as\_\_\_\_\_\_\_\_\_\_\_\_. | | | CO2 | R | | 1 |
| 4. | To make the coil keep rotating, the current is reversed after every half turn by a device called \_\_\_\_\_\_\_\_\_\_. | | | CO2 | R | | 1 |
| 5. | The electronic device which stores charges is known as \_\_\_\_\_\_\_\_\_\_. | | | CO3 | U | | 1 |
| 6. | Define doping. | | | CO3 | R | | 1 |
| 7. | Name the gate which produces high output only when both the inputs are high. | | | CO4 | U | | 1 |
| 8. | List the types of flip flops. | | | CO4 | R | | 1 |
| 9. | SIM is abbrevated as \_\_\_\_\_\_\_\_\_. | | | CO5 | R | | 1 |
| 10. | Which cell shape covers the maximum geographical area in cellular communication? | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | In the circuit below find the value of the current flowing  Find the current in the circuit | | | CO1 | | Ap | 3 |
| 12. | List the types of DC motors with its important characteristics. | | | CO2 | | U | 3 |
| 13. | Differentiate intrinsic and extrinsic semiconductor. | | | CO3 | | An | 3 |
| 14. | Give the comparison between combinational and sequential circuits. | | | CO4 | | U | 3 |
| 15. | What are the selection parameters for a sensor? | | | CO5 | | An | 3 |
| 16. | Sketch the general block diagram of a communication system. | | | 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 the working of Hydro Power Plant with neat diagram. | CO1 | | An | 12 |
| 18. | |  | With neat circuit diagram explain the construction and principle of operation of DC motor. | CO2 | | An | 12 |
| 19. | |  | Examine the operation of PN junction diode under forward bias and reverse bias condition with its characteristics. | CO3 | | An | 12 |
| 20. | |  | Discuss the basic logic gates AND, OR and NOT with suitable schematic sketch, truth table and characteristics. | CO4 | | U | 12 |
| 21. | |  | Illustrate an automatic irrigation system and explain in detail. | CO5 | | U | 12 |
| 22. | |  | Elaborate the imaging techniques involved in Ultrasound scanner using block diagram and working principle. | CO5 | | An | 12 |
| 23. | | a. | What are the colour bands on the following value of resistors all of which have a 5% tolerance?   1. 22 kΩ 2. 10 kΩ 3. 220 kΩ | CO1 | | A | 6 |
|  | | b. | Using the resistor colour coding, decode the value of the following resistors and indicate the tolerance   1. Brown, Black, Red, Gold 2. Yellow, Violet, Yellow, Gold 3. Orange white, Orange, Gold | CO1 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Explain briefly about the various blocks of satellite communication. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Recognize importance and judicious use of energy systems in everyday life. | | | | | | | |
| CO2 | Identify the types of electrical machines used for various applications. | | | | | | | |
| CO3 | Understand and apply the concept of electronics to design simple circuits. | | | | | | | |
| CO4 | Understand and relate various digital circuits. | | | | | | | |
| CO5 | Understand the various sensing and instrumentation applications. | | | | | | | |
| CO6 | Identify the various generations of wireless communications. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 1 | 15 | 12 | - | - | 29 |
| CO2 | | 2 | 3 | - | 12 | - | - | 17 |
| CO3 | | 1 | 1 | - | 15 | - | - | 17 |
| CO4 | | 1 | 16 | - | - | - | - | 17 |
| CO5 | | 1 | 12 | - | 15 | - | - | 28 |
| CO6 | | 3 | 13 | - | - | - | - | 16 |
|  | | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONICS FOR INTELLIGENT MACHINES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Infer how many years it took for Pokemon go to reach 100M users. | | CO1 | U | | 1 |
| 2. | Expand ANI, AGI, ASI. | | CO1 | R | | 1 |
| 3. | Compare Industry 1.0 and Industry 2.0. | | CO2 | A | | 1 |
| 4. | Infer the unfair advantage of KFC. | | CO6 | U | | 1 |
| 5. | Name a system of collaborating computational elements controlling physic entities. | | CO3 | A | | 1 |
| 6. | Name a robot with its body shape built to resemble the human body. | | CO3 | R | | 1 |
| 7. | List the different types of general IOT layers. | | CO4 | R | | 1 |
| 8. | Expand DBMS. | | CO4 | A | | 1 |
| 9. | Show an example for Big data. | | CO5 | R | | 1 |
| 10. | Illustrate data transformation. | | CO5 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the different phases of earlier three industrial evolution with an example. | | CO2 | | U | 3 |
| 12. | List the USP of Adidas and McDonald. | | CO2 | | R | 3 |
| 13. | List any 2 I/O devices connected to a smart phone. | | CO4 | | An | 3 |
| 14. | Differentiate Industry 3.0 and Industry 4.0. | | CO4 | | An | 3 |
| 15. | Explain the six design principle in industry 4.0. | | CO5 | | U | 3 |
| 16. | Distinguish the earlier taxi system and Ola system. | | CO1 | | 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. |  | Construct the block diagram of industry 4.0 and discuss the functions of each block. | CO1 | | U | 12 |
| 18. | a. | Construct the block diagram of an Intelligent machine and explain the functioning. | CO2 | | A | 8 |
|  | b. | Summarize the different machining operations in a manufacturing industry. | CO6 | | U | 4 |
| 19. | a. | Explain the 4 layer architecture of IoT and discuss the function of each layer. | CO3 | | U | 6 |
|  | b. | Analyze the function of an IoT based health monitoring system with respect to the IoT architecture. | CO6 | | A | 6 |
| 20. | a. | Infer the different types and characteristics of big data with examples. | CO4 | | A | 3 |
|  | b. | Explain the GSM interface with a neat sketch. | CO4 | | U | 9 |
| 21. | a. | Analyze the advantages and disadvantages of industry 4.0 standards. | CO1 | | An | 6 |
|  | b. | Model the working of OYO room booking system. | CO1 | | A | 6 |
| 22. | a. | Explain the working of GPS sensor. | CO4 | | U | 4 |
|  | b. | List the characteristics and benefits of Big data. | CO5 | | R | 8 |
| 23. | a. | Classify the different forms of data in Big data analytics. | CO5 | | An | 3 |
|  | b. | Explain the Data processing cycle in detail. | CO5 | | U | 9 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Analyze the different types of Cloud computing services. Explain the benefits of cloud computing. | CO5 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | To compare the different industry standards. |
| CO2 | To articulate the structure of an Intelligent machine. |
| CO3 | To illustrate the m2m interface needed in intelligent machining. |
| CO4 | To be able to categorize the sensors for various intelligent machines. |
| CO5 | To assess the data requirements for cloud storage. |
| CO6 | To be able to grade various types of Intelligent machines. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | 6 | 9 |  |  | 29 |
| CO2 | 3 | 3 | 9 |  |  |  | 15 |
| CO3 | 1 | 6 | 1 |  |  |  | 8 |
| CO4 | 1 | 13 | 4 | 6 |  |  | 24 |
| CO5 | 9 | 13 |  | 15 |  |  | 37 |
| CO6 | 1 | 13 | 6 | 9 |  |  | 29 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2005** | **Duration** | **3hrs** |
| **Course Name** | **FIBER OPTIC COMMUNICATION** | **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 Meridional ray. | | CO1 | R | | 1 |
| 2. | Recite the importance of repeater. | | CO1 | R | | 1 |
| 3. | Quote the formula for calculating refractive index difference. | | CO2 | R | | 1 |
| 4. | Name any one material used in making LED. | | CO3 | R | | 1 |
| 5. | Tell the maximum gain of semiconductor optical amplifier. | | CO4 | R | | 1 |
| 6. | Tabulate the type of switching used in optical networks. | | CO4 | R | | 1 |
| 7. | Give an example for one optical coupler. | | CO4 | R | | 1 |
| 8. | Enumerate the importance of polarizer in optical isolator. | | CO5 | R | | 1 |
| 9. | State the need for regenerator in optical communication lines. | | CO5 | R | | 1 |
| 10. | Recall the layers in OSI model. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Measure the critical angle for the light ray is incident from glass (whose refractive index is 1.5) to air (whose refractive index is 1). | | CO1 | | E | 3 |
| 12. | List the difference between micro bending& macro bending. | | CO2 | | R | 3 |
| 13. | Summarize the structure of PIN photodetector. | | CO3 | | U | 3 |
| 14. | Describe Raman Amplifier. | | CO4 | | R | 3 |
| 15. | List the data link layer in Sonnet. | | CO5 | | R | 3 |
| 16. | Differentiate virtual circuit and datagram approach in forwarding packets. | | 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 concept losses in optical fiber through intrinsic & extrinsic absorptions. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Describe in detail the different types of optical fibers based on its refractive index and its propagation. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Tabulate the difference between surface emitting and edge emitting LEDs. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Describe the working principle of Erbium Doped Fiber Amplifier. | CO4 | | R | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Justify the importance of APD. | CO3 | | E | 6 |
|  | b. | Summarize the working principle of optical circulator. | CO5 | | U | 6 |
|  |  |  |  | |  |  |
| 22. |  | Discuss the frame structure and network configuration of  SONET with neat sketch. | CO6 | | U | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Describe different types of couplers used in optical networks. | CO5 | | R | 6 |
|  | b. | Explain the working of semiconductor laser diode. | C04 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Explain the working of Li-Fi technology with its applications in current scenario. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Explain the basics of optical communication and to recognize the structures and types of optical fibre. |
| CO2 | Discuss the channel impairments, and parameters of different types of optical fibres. |
| CO3 | Classify the optical sources and detectors and to discuss their principles. |
| CO4 | Explain the working of optical couplers, modulators, amplifiers and analyse the performance of optical amplifiers. |
| CO5 | Design optical links, know the concept of WDM, and to discuss different optical components of WDM. |
| CO6 | Discuss various types of optical networks and to gain knowledge about standards regarding fibre optic systems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | - | - | - | 3 | - | 05 |
| CO2 | 4 | 27 | - | - |  | - | 31 |
| CO3 | 6 | 12 | - | - | 6 | - | 24 |
| CO4 | 15 | 6 | - | - | - | - | 21 |
| CO5 | 9 | 6 | - | - | - | - | 15 |
| CO6 | 1 | 27 | - | - | - | - | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2012** | **Duration** | **3hrs** |
| **Course Name** | **WIRELESS SENSOR 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. | Recall any two limitations of wireless sensor networks. | | CO1 | R | | 1 |
| 2. | Infer the principle of homogeneous nodes. | | CO1 | U | | 1 |
| 3. | Give an example of Transport protocol. | | CO2 | U | | 1 |
| 4. | Recall any one contention-based MAC protocol. | | CO2 | R | | 1 |
| 5. | Indicate the frequency of operation used in WPAN. | | CO3 | U | | 1 |
| 6. | Write an IEEE standard for Zigbee protocol. | | CO3 | A | | 1 |
| 7. | Tell the alternate name for pattern matching. | | CO4 | R | | 1 |
| 8. | Recall the algorithm used for similarity searching in Pattern matching. | | CO4 | R | | 1 |
| 9. | Give an example of cell based architecture. | | CO5 | R | | 1 |
| 10. | Write the advantage of honeypot. | | CO6 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the applications of wireless sensor networks. | | CO1 | | R | 3 |
| 12. | Recall the factors influencing the time synchronization in WSN. | | CO2 | | R | 3 |
| 13. | Illustrate hidden terminal problem with an example. | | CO3 | | An | 3 |
| 14. | Interpret trilateration method to estimate the position of the unknown object. | | CO4 | | A | 3 |
| 15. | Discuss the sensor network database challenges. | | CO5 | | U | 3 |
| 16. | Explain the cryptographic tools used for security purposes in WSN. | | 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. | Discuss the functional architecture of wireless sensor networks. | CO1 | | U | 8 |
|  | b. | Interpret the technical challenges in wireless sensor networks. | CO1 | | A | 4 |
| 18. | a. | Explain any two-transport layer protocols with diagrams. | CO2 | | U | 8 |
|  | b. | Describe about LEACH protocol with necessary design equations. | CO2 | | R | 4 |
| 19. |  | Estimate the distance between two objects using the following n techniques.   1. Time of Arrival (TOA). 2. Time different of Arrival (TDOA). 3. Angle of Arrival (AoA). 4. The Received Signal Strength Indictor (RSSI). | CO4 | | E | 12 |
|  |  |  |  | |  |  |
| 20. |  | Explain the characteristics of IEEE 802.15.4 WPAN in terms of  a. Protocol architecture b. Topology.  c. Data Transmission models d. Traffic types. | CO3 | | An | 12 |
| 21. | a. | Illustrate the different types of data aggregation methods in real life scenario with examples. | CO5 | | A | 8 |
|  | b. | Recall the design challenges in sensor network data base. | CO5 | | R | 4 |
| 22. |  | Sketch the architecture of sensor node and explain the functions of individual components. | CO1 | | A | 12 |
| 23. | a. | Enumerate the different types of power management in WSN. | CO6 | | R | 8 |
|  | b. | Describe multilateration method to estimate the position of an unknown object. | CO4 | | R | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Discuss any one of the Security Architecture of wireless sensor networks with neat sketch. | CO1 | | U | 6 |
|  | b. | Illustrate any one application of wireless sensor networks in agricultural domain. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concepts of sensor network architecture. |
| CO2 | Categorize the different types of protocols. |
| CO3 | Acquire knowledge in IEEE 802.15.4 standards for Wireless Sensor Networks. |
| CO4 | Understand different tracking techniques. |
| CO5 | Express the functions of sensor database. |
| CO6 | Analyze the energy management in WSN. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 16 | 15 | 4 |  |  |  | 35 |
| CO2 | 8 | 9 |  |  |  |  | 17 |
| CO3 |  | 1 | 1 | 15 |  |  | 17 |
| CO4 | 5 | 1 | 3 |  | 12 |  | 21 |
| CO5 | 5 | 3 | 8 |  |  |  | 16 |
| CO6 | 8 | 9 | 1 |  |  |  | 18 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2014** | **Duration** | **3hrs** |
| **Course Name** | **BASICS OF SATELLITE COMMUNICATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Relate centripetal and centrifugal forces concerning satellite communication. | | CO1 | U | 1 |
| 2. | List the two major elements of satellite communication. | | CO1 | R | 1 |
| 3. | Name the satellite subsystem that monitors satellite health conditions. | | CO2 | R | 1 |
| 4. | Define cross-polarization. | | CO2 | R | 1 |
| 5. | Recall the application of receive-only Earth station terminals. | | CO3 | R | 1 |
| 6. | Recite the amplifier which is one of the key components deciding the system noise temperature. | | CO3 | R | 1 |
| 7. | Identify the multiple access technique that allows multiple Earth stations to access the same carrier frequency and bandwidth at the same time at all times. | | CO4 | U | 1 |
| 8. | Classify the different types of multiple channels per carrier (MCPC) systems. | | CO4 | R | 1 |
| 9. | Tell the impact of ionosphere scintillation in a particular signal. | | CO5 | U | 1 |
| 10. | Name the satellite used for European communication purposes. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | A satellite is orbiting Earth in a uniform circular orbit at a height of 630 km from the surface of Earth. Assuming the radius and mass of Earth are 6370 km and 5.98 x 1024 kg respectively, determine the velocity of the satellite. (G = 6.67 x 10-11 Nm2/kg2). | | CO1 | A | 3 |
| 12. | Show the block diagram representation of the power control subsystem in the satellite. | | CO2 | U | 3 |
| 13. | List the major subsystems comprising an Earth station. | | CO3 | R | 3 |
| 14. | Illustrate a typical TDMA frame structure. | | CO4 | U | 3 |
| 15. | Show how the intermodulation distortion occurs in satellite communication. | | CO5 | U | 3 |
| 16. | Indicate the different satellite services provided by the Indian Space Research Organization(ISRO). | | 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 the orbital mechanics of LEO, MEO, and GEO with the necessary diagrams. | CO1 | U | 12 |
| 18. |  | Describe the function of satellite attitude control. With neat diagrams, explain the spinning satellite stabilization and momentum wheel stabilization. | CO2 | U | 12 |
| 19. |  | Discuss the major system parameters related to Earth station design. With neat block diagram explain the Earth station architecture. | CO3 | U | 12 |
| 20. |  | Explain the code division multiple access (CDMA) technique used simultaneously by multiple Earth stations with neat diagrams. | CO4 | U | 12 |
| 21. | a. | A 12 GHz receiver consists of an RF stage with gain G1 = 30 dB and noise temperature T1 = 20 K, a down converter with gain G2 = 10 dB and noise temperature T2 = 360K, and an IF amplifier stage with gain G3 = 15 dB and noise temperature T3 = 1000K. Compute the noise figure specifications of the three stages and then compute the overall noise figure from the individual noise figure specifications. | CO5 | A | 7 |
|  | b. | Summarize the link design procedure and link budget analysis in satellite communication. | CO5 | U | 5 |
| 22. | a. | An Earth station is located at 30◦W longitude and 60◦N latitude. Determine the Earth station’s azimuth and elevation angles to a geostationary satellite located at 50◦W longitude. The orbital radius is 42164 km. (Assume the radius of the Earth to be  6378 km.). | CO1 | A | 7 |
|  | b. | Write the various steps involved in launching satellites into orbits. | CO1 | A | 5 |
| 23. |  | Explain in detail on various antennae used for satellite applications with necessary diagrams. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss a typical VSAT network with a neat block diagram and illustrate different VSAT network topologies. | CO6 | U | 12 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the satellite orbits, elements of satellite and operation of satellite communication. | | | | | | | |
| CO2 | Interpret the concepts of space segment, propulsion, payload, and TTC. | | | | | | | |
| CO3 | Analyze the design requirements and the performance of earth station. | | | | | | | |
| CO4 | Develop the multiplexing techniques, modulation techniques, and multiple access techniques for satellite communication. | | | | | | | |
| CO5 | Illustrate the concepts of link design, rain fading and link availability and perform interference calculations. | | | | | | | |
| CO6 | Design various satellite applications. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 1 | 25 | 3 | - | - | - | 29 |
| CO2 | | 2 | 27 | - | - | - | - | 29 |
| CO3 | | 5 | 12 | - | - | - | - | 17 |
| CO4 | | 1 | 16 | - | - | - | - | 17 |
| CO5 | | - | 9 | 7 | - | - | - | 16 |
| CO6 | | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2015** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF DIGITAL IMAGE 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. | Infer the use of Weber’s ratio. | | | CO1 | U | | 1 |
| 2. | Define a pixel. | | | CO1 | R | | 1 |
| 3. | State the gray level transform used to convert dark image into a brighter one. | | | CO2 | R | | 1 |
| 4. | Recall the filter that preserve the edges while smoothening an image. | | | CO2 | R | | 1 |
| 5. | Indicate the use of probability density function in image restoration. | | | CO3 | U | | 1 |
| 6. | Name a degradation that can occur during image acquisition. | | | CO3 | R | | 1 |
| 7. | Infer the meaning of “fitting” with structuring element. | | | CO4 | U | | 1 |
| 8. | Tell the focus of image morphology. | | | CO4 | R | | 1 |
| 9. | Infer over segmentation. | | | CO5 | U | | 1 |
| 10. | Report the purpose of image representation and description. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Infer the Mach-band effect phenomenon in an image. | | | CO1 | | An | 3 |
| 12. | Report the purpose of pre-processing and post-processing in frequency domain filtering. | | | CO2 | | U | 3 |
| 13. | Appraise the astronomical application of image restoration. | | | CO3 | | An | 3 |
| 14. | Compare and contrast the use of closing and opening in image processing. | | | CO4 | | U | 3 |
| 15. | Appraise the properties of intensity value useful for image segmentation. | | | CO5 | | An | 3 |
| 16. | Report the choices of image representation. | | | 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 conversion of RGB color image to HSI image. | | CO1 | | An | 6 |
|  | b. | Report on various distance measures and its use in digital image processing. | | CO1 | | A | 6 |
| 18. | a. | Express the strategy of a filter in details that produce simultaneous contrast enhancement and gray level compression. | | CO2 | | U | 8 |
|  | b. | Criticize the occurrence of false contouring in images on smooth gray level areas. | | CO2 | | E | 4 |
| 19. | a. | Review the performance of inverse filtering and indicate the way to overcome its limitation. | | CO3 | | U | 6 |
|  | b. | Assess the effect of max and min statistical filters in image restoration. | | CO3 | | E | 6 |
| 20. | a. | Discuss the basics of gradient operator and show the masks for Prewitt and Sobel edge operators. | | CO4 | | U | 8 |
|  | b. | List the steps of Hit-or-Miss transform to find the origin of a shape in an image. | | CO4 | | E | 4 |
| 21. | a. | Show with suitable diagram the graph theoretic approach for edge linking. | | CO5 | | U | 8 |
|  | b. | Criticize the use of motion in segmentation. | | CO5 | | E | 4 |
| 22. | a. | Discuss the methods to estimate the degradation in an image. | | CO3 | | U | 9 |
|  | b. | Explain the probability density function of Gaussian noise. | | CO3 | | An | 3 |
| 23. | a. | Compare ideal, Butterworth and Gaussian filters in terms of ringing effect in an image and justify it. | | CO2 | | E | 6 |
|  | b. | Report on unsharp masking and Highboost filters with corresponding expression. | | CO2 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | a. | Illustrate how shape numbers works as a regional descriptor. | | CO6 | | U | 7 |
|  | b. | Discuss how principle components of an image are derived. | | CO6 | | U | 5 |

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|  | **COURSE OUTCOMES** |
| CO1 | Students will be able to grasp the basics of digital image acquisition and processing system. |
| CO2 | Students will be able to select methods for enhancing an image. |
| CO3 | Students will be able to estimate and restore the degraded images. |
| CO4 | Students will be able to detect object shapes using morphological operators. |
| CO5 | Students will be able to segment the object of interest and provide suitable representation and description. |
| CO6 | Students will be able to Analyze the image processing methods. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 | 6 | 9 |  |  | 17 |
| CO2 | 2 | 11 |  | 6 | 10 |  | 29 |
| CO3 | 1 | 16 |  | 6 | 6 |  | 29 |
| CO4 | 1 | 12 |  |  | 4 |  | 17 |
| CO5 |  | 9 |  | 3 | 4 |  | 16 |
| CO6 |  | 16 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2016** | **Duration** | **3hrs** |
| **Course Name** | **MULTIMEDIA COMPRESSION 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. | Name the types of multimedia data. | | | CO1 | R | | 1 |
| 2. | List the advantages of lossy compression methods. | | | CO1 | R | | 1 |
| 3. | List the types of text compression techniques. | | | CO2 | R | | 1 |
| 4. | List the types of Huffman coding methods. | | | CO2 | R | | 1 |
| 5. | Summarize the significance of synthesis filters in sub band coding. | | | CO3 | U | | 1 |
| 6. | Illustrate the steps of sub band coding algorithm. | | | CO3 | U | | 1 |
| 7. | Summarize the concept of level shifting in JPEG algorithm. | | | CO4 | U | | 1 |
| 8. | Name the compression algorithm used for still images. | | | CO4 | R | | 1 |
| 9. | Illustrate the significance of wavelet transform in SPIHT algorithm. | | | CO5 | U | | 1 |
| 10. | “Video data is predominantly used in lossy compression”. Justify this statement. | | | CO5 | E | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Distinguish between lossless and lossy compression techniques. | | | CO1 | | An | 3 |
| 12. | Compare LZ77 and LZ78 algorithms. | | | CO2 | | An | 3 |
| 13. | Summarize the significance of down sampling in sub band coding. | | | CO3 | | U | 3 |
| 14. | “Accuracy of EZW algorithm depends on the level of wavelet decomposition”. Justify this statement. | | | CO4 | | E | 3 |
| 15. | Summarize the importance of motion estimation in video compression techniques. | | | CO5 | | U | 3 |
| 16. | Illustrate the differences between MPEG and H.261. | | | 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. | Summarize the specific characteristic features of different multimedia data. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Illustrate the various necessities for compressing the multimedia data. Also, point out the various check points to be noted during the compression approaches. | CO1 | | U | 6 |
|  | | b. | Distinguish between text compression and video compression methods. | CO2 | | An | 6 |
|  | |  |  |  | |  |  |
| 19. | | a. | Estimate the code for the sequence A=[f, g, h, k, m, n] with the probability values [0.2, 0.1, 0.05, 0.1, 0.25, 0.3] using Huffman coding approach. | CO2 | | E | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Estimate the code for the sequence A=[a, b, c, d, e, f, g] with the probability values [0.3, 0.15, 0.1, 0.1, 0.1, 0.2, 0.05] respectively using Shannon-Fano coding technique. | CO2 | | E | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Estimate the code for the sequence ‘….cabracadababbaraca….’ using the LZ77 approach. Choose a suitable size for search buffer and look ahead buffer. | CO3 | | E | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Explain the G.722 coding algorithm for audio compression with a neat diagram. | CO4 | | U | 6 |
|  | | b. | Illustrate the JPEG methodology of compression for still images. | CO5 | | U | 6 |
|  | |  |  |  | |  |  |
| 23. | | a. | Describe the process of SPIHT algorithm with a numerical example. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | With neat block diagram, summarize the compression methodology of H.261 algorithm. Include mathematical equations wherever necessary | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the basic concepts of multimedia data. |
| CO2 | Demonstrate knowledge about the principles of various coding techniques. |
| CO3 | Assess lossy and lossless compression systems. |
| CO4 | Choose suitable compression algorithm for signal processing. |
| CO5 | Analyze the performance of various compression algorithms |
| CO6 | Apply the appropriate coding technique for real time applications |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 18 | - | 3 | - | - | 23 |
| CO2 | 2 | - | - | 9 | 12 | - | 23 |
| CO3 | - | 5 | - | - | 24 | - | 29 |
| CO4 | 1 | 7 | - | - | 3 | - | 11 |
| CO5 | - | 22 | - | - | 1 | - | 23 |
| CO6 | - | 15 | - | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2019** | **Duration** | **3hrs** |
| **Course Name** | **ASIC 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. | Label the components of ACTEL FPGA. | | CO1 | R | | 1 |
| 2. | Define the length of an identifier. | | CO2 | R | | 1 |
| 3. | Draw the logic symbol of NOR1-1 | | CO1 | U | | 1 |
| 4. | Tell the number of metal layers used in full custom ASIC design. | | CO2 | R | | 1 |
| 5. | List the types of Antifuses used in programmable ASIC. | | CO3 | R | | 1 |
| 6. | Write the advantages of expander logic. | | CO4 | A | | 1 |
| 7. | Predict the colour code used for polysilicon. | | CO3 | U | | 1 |
| 8. | Recall the concept “transistor sizing”. | | CO4 | R | | 1 |
| 9. | Write the syntax of EDIF file. | | CO6 | U | | 1 |
| 10. | Define λ-rules in layout design rules. | | CO1 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List few advantages of XC3000 over XC2000. | | CO1 | | R | 3 |
| 12. | Show the block diagram of AND cascade chain. | | CO1 | | U | 3 |
| 13. | Compare full custom and semi custom ASIC design. | | CO2 | | U | 3 |
| 14. | Apply the transistor sizing in CMOS NAND gate. (PMOS:4:1, NMOS:2:1) | | CO4 | | A | 3 |
| 15. | Distinguish between channeled gate array and structured gate array. | | CO3 | | U | 3 |
| 16. | Design the latch circuit using CMOS multiplexer. | | 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. | Sketch the design flow of ASIC. | CO1 | | A | 5 |
|  | b. | Construct the transmission gate based CMOS circuit for the function F=(A.B’)+(B..E)+(C.D’.E)+(A.B’). | CO1 | | C | 7 |
|  |  |  |  | |  |  |
| 18. |  | Explain the procedure to read and write the data in EPROM and EEPROM Technology. | CO2 | | R | 12 |
|  |  |  |  | |  |  |
| 19. |  | Draw the diagram of ACT1 logic module and explain its function in detail. | CO3 | | R | 12 |
|  |  |  |  | |  |  |
| 20. |  | Represent the architecture of Altera 5000 and highlight its feature. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Represent the architecture of XC3000 and explain its feature. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Describe the working principle of different Antifuse technology. | CO5 | | R | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain in detail the schematic entry of ASIC design. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe the terms and definitions in ASIC placement algorithm. | CO4 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the types of ASICs, combinational and sequential logic cells, concepts of design rules and logical effort. |
| CO2 | Describe the programmable ASICs and programmable ASIC logic cells. |
| CO3 | Demonstrate programmable ASIC interconnect and programmable ASIC design software. |
| CO4 | Illustrate the goals and objectives of partitioning, floor planning and placement. |
| CO5 | Develop algorithms for various types of routing and explain the concepts of circuit extraction and DRC. |
| CO6 | Develop the HDL logic synthesis skills. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 4 | 5 |  |  | 7 | 21 |
| CO2 | 14 | 3 |  |  |  |  | 17 |
| CO3 | 13 | 28 | 12 |  |  |  | 53 |
| CO4 | 13 |  | 4 |  |  |  | 17 |
| CO5 | 12 |  |  |  |  |  | 12 |
| CO6 |  | 1 |  |  |  | 3 | 4 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2020** | **Duration** | **3hrs** |
| **Course Name** | **ANALYSIS AND DESIGN OF DIGITAL IC** | **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 threshold Voltage. | | CO1 | R | | 1 |
| 2. | Define body effect. | | CO1 | R | | 1 |
| 3. | State Propagation delay. | | CO2 | R | | 1 |
| 4. | State switching threshold. | | CO2 | R | | 1 |
| 5. | State the reason for the lack of full swing in pass transistor logic. | | CO3 | R | | 1 |
| 6. | List the difference between latch and flip-flop. | | CO5 | R | | 1 |
| 7. | State the classification of SRAM. | | CO4 | R | | 1 |
| 8. | Define the term Pipelining. | | CO4 | R | | 1 |
| 9. | State the use of Schmitt Trigger. | | CO5 | R | | 1 |
| 10. | List the timing classification in digital system. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List about empirical delay model. | | CO1 | | R | 3 |
| 12. | Discuss the term noise margin in CMOS Inverter. | | CO2 | | U | 3 |
| 13. | Describe about np- CMOS logic with neat diagram. | | CO3 | | R | 3 |
| 14. | Construct TSPCR based register circuit. | | CO4 | | A | 3 |
| 15. | State the difference between Dynamic and Static Latch | | CO5 | | R | 3 |
| 16. | Define clock skew. | | 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. |  | Determine the Ids for Cut-off, Non-Saturated and Saturated region of MOS transistor. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Determine the static characteristics of CMOS Inverter in five different operating regions. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Differentiate between Transmission Gate logic and Pass transistor Logic with neat diagrams. | CO3 | | An | 6 |
|  | b. | Design Z= (A.B)+ (C.D) using Dynamic CMOS Logic. | CO4 | | C | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Explain in detail about Multiplexer-based Latches. | CO4 | | A | 6 |
|  | b. | Explain in detail about Master-Slave –Edge Triggered Register. | CO5 | | A | 6 |
|  |  |  |  | |  |  |
| 21. |  | Illustrate in detail about NORA CMOS logic style for pipelined structures. | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Discuss about Monostable circuits. | CO5 | | U | 8 |
|  | b. | Design 2-input NAND gate using C2MOS Logic. | CO4 | | C | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Describe about signal integrity issues. | CO5 | | U | 8 |
|  | b. | Construct CMOS OR gate using Domino CMOS Logic. | CO4 | | C | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss Clock Synthesis and Synchronization using PLL. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of MOS transistor. |
| CO2 | Illustrate different second order effects in MOS transistor. |
| CO3 | Analyse static and dynamic behaviour of CMOS inverter |
| CO4 | Design combinational logic circuits in CMOS. |
| CO5 | Interpret different logic style to design sequential logic circuits and its optimisation. |
| CO6 | Comprehend the significance of timing issues in logic circuit design. |

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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 | 2 | 3 | 12 | 6 | - | - | 23 |
| CO3 | 4 | - | - | - | - | 14 | 18 |
| CO4 | 2 | - | 9 | - | - | - | 11 |
| CO5 | 5 | 16 | 6 | 12 | - | - | 39 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2021** | **Duration** | **3hrs** |
| **Course Name** | **LOW POWER TECHNIQUES IN VLSI 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 process of imitating the behavior of one or more pieces of hardware with another piece of hardware. | | | CO1 | R | | 1 |
| 2. | List the types of capacitances in Gate-level simulation. | | | CO1 | R | | 1 |
| 3. | List the two major sources of leakage current? | | | CO2 | U | | 1 |
| 4. | Identify the level at which signal gating techniques can be applied to the circuits. | | | CO2 | U | | 1 |
| 5. | List the role of the Inverter I0 for the feedback oscillator in clock generation circuits. | | | CO3 | R | | 1 |
| 6. | Define Opaque Latch. | | | CO4 | R | | 1 |
| 7. | Show the power dissipation equation with reduced voltage swing. | | | CO4 | U | | 1 |
| 8. | List the classification of RAMs. | | | CO5 | R | | 1 |
| 9. | State the normal mode of operation in SRAM. | | | CO5 | R | | 1 |
| 10. | Identify the circuit-level approach that has made it possible to realize the ultra-low-power computing applications without scaling the supply voltage. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | State about the Reverse biased PN junction current. | | | CO1 | | R | 3 |
| 12. | A 32 bit off-chip bus operating at 3.3V and 66MHz clock rate is driving a capacitance of 20pF/bit. Each bit is estimated to have a toggling probability of 0.26 at each clock cycle. Estimate the power dissipation in operating the bus? | | | CO2 | | E | 3 |
| 13. | Define about Power management. | | | CO3 | | R | 3 |
| 14. | Design using Dynamic CMOS Logic. | | | CO4 | | C | 3 |
| 15. | Determine the read operation in 6-T SRAM | | | CO5 | | A | 3 |
| 16. | Estimate the energy dissipated by the resistor at the time period of 0 to T in adiabatic charging. | | | 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. | Illustrate the Gate Reorganization technique in the gate-level network. | CO1 | | U | 8 |
|  | | b. | Summarize in detail about Network Reconstructing and Reorganization with suitable example. | CO2 | | U | 4 |
|  | |  |  |  | |  |  |
| 18. | | a. | Develop the Power dissipation of the system using the concept of charging and discharging capacitance. | CO2 | | A | 12 |
|  | |  |  |  | |  |  |
| 19. | | a. | Describe the CMOS floating node in low power CMOS chip design. | CO3 | | U | 8 |
|  | | b. | Examine the Parallel architecture concept with voltage reduction in high performance digital systems. | CO3 | | A | 4 |
|  | |  |  |  | |  |  |
| 20. | | a. | Explain in detail about the NOR A Pipeline Register with Ф and Фb block for all the possible conditions. | CO4 | | A | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Determine the Power dissipation measures in Pass transistor based negative edge triggered flip-flop and TSPC based positive edge triggered flip-flop. | CO4 | | A | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Illustrate the organization of a Static RAM with neat block diagram. | CO5 | | An | 6 |
|  | | b. | Design using C2MOS Logic. | CO4 | | C | 6 |
|  | |  |  |  | |  |  |
| 23. | | a. | Construct 4T SRAM and 6T SRAM cell. | CO5 | | A | 6 |
|  | | b. | Discuss about Adiabatic amplification in logic circuits. | CO6 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Illustrate in detail about the step-wise charging circuits in Adiabatic Logic. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the simulation based power analysis. |
| CO2 | Apply the various low power reduction techniques at circuit level and logic level. |
| CO3 | Demonstrate the various special techniques at architecture and system techniques. |
| CO4 | Design of low power latches & flip-flops. |
| CO5 | Design low power SRAM chips. |
| CO6 | Apply the of energy recovery concepts to design low power circuits. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 8 | - | - | - | - | 13 |
| CO2 | - | 6 | 12 | - | 3 | - | 21 |
| CO3 | 4 | 8 | 4 | - | - | - | 16 |
| CO4 | 1 | 1 | 24 | - | - | 9 | 35 |
| CO5 | 2 | - | 9 | 6 | - | - | 17 |
| CO6 | - | 7 | - | 15 | - | - | 22 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2022** | **Duration** | **3hrs** |
| **Course Name** | **NANOELECTRONICS** | **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 the fundamental material used in Nanoelectronics? | | CO1 | R | | 1 |
| 2. | What is the latest technology node used in nanofabrication process? | | CO1 | U | | 1 |
| 3. | Write Schrodinger wave equation used in nanoelectronics. | | CO2 | R | | 1 |
| 4. | Define Degeneracy in Nanotechnology? | | CO2 | R | | 1 |
| 5. | List the different types of transport mechanisms in semiconductor devices. | | CO3 | U | | 1 |
| 6. | Interpret the mobility in Ballistics transport mechanism. | | CO3 | A | | 1 |
| 7. | Justify velocity saturation and its effects in nanodevices. | | CO4 | E | | 1 |
| 8. | Classify the nanoscale materials & structures based on the dimensions. | | CO4 | U | | 1 |
| 9. | What is 2D material? | | CO5 | U | | 1 |
| 10. | Define Coulomb blockade. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write the expression for Schrodinger wave equation. | | CO1 | | R | 3 |
| 12. | Infer the impact of short channel effects that occurs in MOSFET. | | CO3 | | U | 3 |
| 13. | List the advantages of FinFET over traditional MOSFETs at nanoscale dimensions. | | CO3 | | An | 3 |
| 14. | List the examples for 1D nanoscale material. | | CO4 | | R | 3 |
| 15. | Write the steps involved in Nanofabrication process. | | CO5 | | R | 3 |
| 16. | What are the conditions to be maintained for Coulomb blockade? | | 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. |  | Explain in detail the various steps that are involved in NMOS fabrication process and its challenges. | CO1 | | An | 12 |
| 18. |  | Analyze the expression of Schrodinger wave time dependent equations and discuss its impact in Nano systems. | CO2 | | An | 12 |
| 19. | a. | Demonstrate the diagram of the vertical MOSFET and explain its operation in detail. | CO3 | | A | 7 |
|  | b. | Describe the characteristics of MOSFET with neat diagrams. | CO3 | | An | 5 |
| 20. | a. | Interpret the operation of Electro Deposition method in detail with an example. | CO6 | | A | 8 |
|  | b. | Write short notes on Sol gel method. | CO1 | | R | 4 |
| 21. |  | Sketch the constructional diagram of Single Electron Transistors. Inspect its operation. | CO4 | | An | 12 |
| 22. | a. | Develop a carbon based field effect transistor and discuss its operation with neat diagram. | CO5 | | A | 8 |
|  | b. | Compare CNTFET with MOSFET. | CO5 | | An | 4 |
| 23. |  | Examine the working of Resonant Tunneling Diode and its I-V characteristics with band diagram. | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | What is Crystal Growth process? Explain any one crystal growth technique method with neat diagram. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate the basic concepts of nanotechnology and the processes involved in making Nano  components and material. |
| CO2 | Use the fundamental concepts of Nano-electronics. |
| CO3 | Explore various structure and operation of various MOS Nano-devices. |
| CO4 | Compare Tunneling devices and SET transistors in Nano regime. |
| CO5 | Investigate the emerging Nano-devices and its applications. |
| CO6 | Choose various fabrication methods of Nano-devices. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 1 |  | 12 |  |  | 21 |
| CO2 | 2 |  |  | 12 |  |  | 14 |
| CO3 |  | 4 | 8 | 8 |  |  | 20 |
| CO4 | 3 | 4 |  | 24 | 1 |  | 32 |
| CO5 | 3 | 1 | 8 | 4 |  |  | 16 |
| CO6 | 1 |  | 20 |  |  |  | 21 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2024** | **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. | Mention the term on which the machine learning algorithms build a model based on sample data. | | CO1 | R | | 1 |
| 2. | Machine learning is a subset of \_\_\_\_\_\_\_\_\_. | | CO1 | R | | 1 |
| 3. | Judge whether feature vector is used an input to the machine learning model for training and prediction process. | | CO2 | U | | 1 |
| 4. | Name the curve that is a graph between the true positive rates against the false positive rate at various cut points. | | CO2 | R | | 1 |
| 5. | Define the process of dividing the decision node/root node into sub-nodes according to the given conditions. | | CO3 | R | | 1 |
| 6. | Write the relation between Information gain and Entropy. | | CO3 | A | | 1 |
| 7. | State whether the three input features leads to a hyperplane of 3-D plane. | | CO4 | R | | 1 |
| 8. | Name the nearest points from the optimal decision boundary that maximize the distance. | | CO4 | R | | 1 |
| 9. | Write the expression of Mean Square Error. | | CO5 | A | | 1 |
| 10. | Write the expression of ReLu activation function. | | CO6 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write the difference between Supervised and Unsupervised learning algorithm. | | CO1 | | A | 3 |
| 12. | Justify whether cross validation is necessary for ML. | | CO2 | | E | 3 |
| 13. | Write the difference between Linear and Logistic regression. | | CO3 | | A | 3 |
| 14. | Relate the need for kernel function in SVM. | | CO4 | | U | 3 |
| 15. | Define the following terms:   1. Precision. 2. Sensitivity. 3. Area under the curve (AUC). | | CO5 | | R | 3 |
| 16. | Write the advantage and disadvantage of multi-layer perceptron. | | 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. |  | Explain the application of Machine Learning techniques. | CO1 | | U | 12 |
| 18. | a. | Write the differences between Overfitting and Underfitting problems in ML. | CO2 | | A | 8 |
|  | b. | Summarize the Hypothesis and Hypothesis space in ML. | CO2 | | U | 4 |
| 19. | a. | Write the types of logistic regression with examples. | CO3 | | A | 4 |
|  | b. | Select a suitable regression which is used for the prediction of continuous/real or numeric variables and explain its different types. | CO3 | | An | 8 |
| 20. | a. | Explain the selection of best hyper plane in SVM. | CO4 | | U | 6 |
|  | b. | Describe the advantages and disadvantages of SVM. | CO4 | | U | 6 |
| 21. |  | Briefly explain the evaluation matrices for classification and regression algorithm. | CO5 | | A | 12 |
| 22. | a. | Explain the following:   1. ReLu Activation Function. 2. Sigmoid Activation Function. 3. Softmax Activation Function. | CO6 | | U | 9 |
|  | b. | Show the architecture of an artificial neural network. | CO6 | | U | 3 |
| 23. | a. | Sketch the confusion matrix for two way classification and explain each elements. | CO2 | | A | 7 |
|  | b. | Write the steps to split a decision tree using Information Gain. | CO3 | | A | 5 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the discrete and continuous Hopfield neural network. | CO6 | | U | 6 |
|  | b. | Explain the Kohonen neural network with neat diagrams. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the techniques, mathematical concepts of machine learning. | | | | | | | |
| CO2 | Select the appropriate machine learning algorithm to solve real time problems. | | | | | | | |
| CO3 | Compare the data and efficiently execute the algorithm to solve the problem. | | | | | | | |
| CO4 | Analyze and compare the results of different machine learning algorithms. | | | | | | | |
| CO5 | Comprehend the statistical techniques to analyze the results. | | | | | | | |
| CO6 | Acquire knowledge about the artificial neural networks. | | | | | | | |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | | |
| CO / P | | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | | 2 | 12 | 3 |  |  |  | 17 |
| CO2 | | 1 | 5 | 15 |  | 3 |  | 24 |
| CO3 | | 1 |  | 13 | 8 |  |  | 22 |
| CO4 | | 2 | 15 |  |  |  |  | 17 |
| CO5 | | 3 |  | 13 |  |  |  | 16 |
| CO6 | |  | 24 | 4 |  |  |  | 28 |
|  | | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2027** | **Duration** | **3hrs** |
| **Course Name** | **MATLAB PROGRAMMING FOR ENGINEERS** | **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 commands used to provide:  (i) heading to the graph, (ii) names for x-axis and y-axis | | CO1 | R | | 1 |
| 2. | Mention the command that is used to clear a command window. | | CO1 | R | | 1 |
| 3. | Differentiate the functions ceil (x) and floor (x). | | CO2 | U | | 1 |
| 4. | List the conditional statements used in MATLAB. | | CO2 | R | | 1 |
| 5. | Identify the function that calculates the value of a polynomial. | | CO3 | R | | 1 |
| 6. | Give examples of a row vector and a column vector. | | CO3 | R | | 1 |
| 7. | Indicate the function of product block in MATLAB Simulink. | | CO4 | U | | 1 |
| 8. | Name the tool boxes available in MATLAB Simulink. | | CO4 | R | | 1 |
| 9. | Identify the MATLAB functions that are used to make plots using logarithmic axes. | | CO5 | R | | 1 |
| 10. | List the principal elements that are required to create a MATLAB Graphical User Interface. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Show the working of subplot function in plotting graphs. | | CO1 | | R | 3 |
| 12. | Build a MATLAB code to perform the element-by-element multiplication operation between the following two vectors x and y  x = [1, -1, -2] and y = [3, 1, 2]. | | CO2 | | A | 3 |
| 13. | Determine C = A.\*B where  and | | CO3 | | E | 3 |
| 14. | Distinguish scope and spectrum analyzer in a Simulink model. | | CO4 | | An | 3 |
| 15. | Summarize the importance of histogram equalization. | | CO5 | | U | 3 |
| 16. | Compare toggle button and radio button. | | 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. |  | Discuss the MATLAB environment and how it is used as a scratch pad. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain the functions of following in-built functions in MATLAB with the help of a MATLAB code.  (i) stem(x), (ii) max(x), (iii) imread(x), (iv) plot(x), (v) input(x),  (vi) size(x). | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Explain the following MATLAB functions with an illustration.  (i) conv (ii) deconv (iii) polyder(p) (iv) polyder(a,b) (v) polyfit  (vi) ode45. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Create a model in MATLAB Simulink to generate an amplitude modulated signal. | CO4 | | C | 12 |
|  |  |  |  | |  |  |
| 21. |  | Illustrate the following with MATLAB examples.   1. Putting multiple plots on the same page. 2. Multiple figure windows. 3. Polar plots. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Discuss the different types of conditional statements and loop control statements with MATLAB examples. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain histogram in detail and the MATLAB functions that are used for a histogram with illustrations. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the steps required to create an efficient MATLAB GUI with an example. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the process of converting computational problems into a series of simple steps. |
| CO2 | Develop programs in the MATLAB language for engineering applications. |
| CO3 | Analyze numerical data and perform input and output operations on it. |
| CO4 | Illustrate the concept of toolboxes for practical applications. |
| CO5 | Summarize the concepts of various data visualization techniques. |
| CO6 | Design Graphical User Interfaces for practical applications. |

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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 | 1 | 25 | 3 | - | - | - | 29 |
| CO3 | 2 | 12 | - | - | 3 | - | 17 |
| CO4 | 1 | 1 | - | 3 | - | 12 | 17 |
| CO5 | 1 | 27 | - | - | - | - | 28 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2029** | **Duration** | **3hrs** |
| **Course Name** | **DATA SCIENCE AND DATA ANALYTICS** | **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 importance of machine learning in the field of data science. | | CO1 | U | | 1 |
| 2. | Define data science toolkit. | | CO1 | R | | 1 |
| 3. | Write an example for ordinal data. | | CO2 | A | | 1 |
| 4. | In an excel sheet, the **cell B2** has the following data :**846693**  Determine the output when the formula **=LEN(B2)** is typed. | | CO2 | A | | 1 |
| 5. | Define Machine Learning. | | CO3 | R | | 1 |
| 6. | Give an example for supervised machine learning algorithm. | | CO3 | U | | 1 |
| 7. | Compare primary data collection and secondary data collection. | | CO4 | U | | 1 |
| 8. | List the different types of clouds in data storage and management. | | CO4 | R | | 1 |
| 9. | Define visual encoding. | | CO5 | R | | 1 |
| 10. | Determine the output of the following code snippet:  **a= {‘a’: “ant”, ‘b’: “ball”, ‘c’: “car”}**  **print(type(a))** | | CO6 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Distinguish Data Analytics and Data Analysis with a practical example. | | CO1 | | An | 3 |
| 12. | Define Application Programming Interface (API) and list the types of API. | | CO2 | | U | 3 |
| 13. | Compare Type I Error and Type II Error of hypothesis testing. | | CO3 | | An | 3 |
| 14. | Indicate the characteristics of database management system. | | CO4 | | U | 3 |
| 15. | Write the benefits of data visualization tools. | | CO5 | | A | 3 |
| 16. | Consider j = 5 and k = 11. We change the values from j = 7 and k remains constant. Compute the output of print(j|k) before and after modification of value in variable j. | | 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. |  | Explain any six data science toolkits which are more popular in the field of data analytics. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Analyze the problems associated with data warehouse and data lake to store big data and identify the practical solutions offered by cloud services to store and handle big data. | CO2 | | An | 12 |
|  |  |  |  | |  |  |
| 19. |  | Apply Naïve Bayes theorem and predict the probability of playing tennis if weather condition is overcast for the given dataset.   |  |  | | --- | --- | | **Weather** | **Play** | | Sunny | No | | Overcast | Yes | | Rainy | Yes | | Sunny | Yes | | Sunny | Yes | | Overcast | Yes | | Rainy | No | | Rainy | No | | Sunny | Yes | | Rainy | Yes | | Sunny | No | | Overcast | Yes | | Overcast | Yes | | Rainy | No | | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Illustrate the data collection strategies to be carried out by the data analyst and discuss the practical advantages and disadvantages of the data collection strategies. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain the visual encoding variables with necessary illustrations. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Classify the different types of SQL commands and interpret the commands with suitable examples. | CO6 | | An | 12 |
|  |  |  |  | |  |  |
| 23. |  | Summarize the data exploration and data modelling phases of data science lifecycle with suitable examples. | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the data types of python with necessary examples. | CO6 | | U | 6 |
|  | b. | List the advantages of Python programming. | CO6 | | R | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the key concepts in data science, its applications and the toolkit used by data scientists. |
| CO2 | Realize 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 | Apply 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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | 12 | 3 | - | - | 29 |
| CO2 | - | 3 | 2 | 12 | - | - | 17 |
| CO3 | 1 | 1 | 12 | 3 | - | - | 17 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | 1 | 12 | 3 | - | - | - | 16 |
| CO6 | 6 | 6 | 4 | 12 | - | - | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2030** | **Duration** | **3hrs** |
| **Course Name** | **CLOUD 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. | Recall and write what is cloud computing? | | CO1 | R | | 1 |
| 2. | State the other name for hypervisor. | | CO1 | R | | 1 |
| 3. | List the types of cloud service model. | | List | U | | 1 |
| 4. | Interpret the purpose of horizon. | | CO2 | U | | 1 |
| 5. | Recite what is authentication in cloud computing. | | CO3 | R | | 1 |
| 6. | Cite the host level security issues in cloud computing. | | CO3 | U | | 1 |
| 7. | Name the standard that is targeted specifically to public cloud providers. | | CO4 | R | | 1 |
| 8. | State the availability management in platform as a service. | | CO4 | R | | 1 |
| 9. | Interpret grid computing. | | CO5 | U | | 1 |
| 10. | Recall and write what is cloud of things. | | CO5 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Represent the advantages of virtualization. | | CO1 | | U | 3 |
| 12. | Recite the characteristics of IaaS. | | CO2 | | R | 3 |
| 13. | List the types of network level security issues. | | CO3 | | R | 3 |
| 14. | Report the independent tactics for the security management in the cloud. | | CO4 | | U | 3 |
| 15. | Interpret the purpose of security assertion markup language. | | CO5 | | U | 3 |
| 16. | Identify the different types of users in amazon web services. | | 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. |  | Sketch the architecture of virtual machine and explain its types with advantages and disadvantages. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Illustrate the types of storage in open stack in detail. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Cite all the aspects of data security and explain them in detail. | CO3 | | U | 6 |
|  | b. | Paraphrase the types of data security control in detail. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Explain identity management and access control in cloud. | CO4 | | U | 8 |
|  | b. | Discuss the relevant IAM standards and protocols for cloud. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 21. |  | Describe the problems faced in cloud of things in detail. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain the different types of virtualization techniques in detail. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | List the application level infrastructure security issues and explain it in detail. | CO3 | | R | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Discuss the limitations of IoT- cloud integration. | CO6 | | U | 6 |
|  | b. | Sketch the architecture of AWS IoT cloud. | CO6 | | U | 6 |

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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 security aspects of each cloud model. |
| CO4 | Develop a risk-management strategy for moving to the Cloud. |
| CO5 | Infer the advantages of Cloud Services. |
| CO6 | Learn about optimization of cloud storage. |

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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 | 3 | 14 | - | - | - | - | 17 |
| CO3 | 16 | 13 | - | - | - | - | 29 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | 1 | 16 | - | - | - | - | 17 |
| CO6 | - | 15 |  | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2031** | **Duration** | **3hrs** |
| **Course Name** | **IOT EDGE 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. | Define Internet of Things. | | CO1 | R | | 1 |
| 2. | List the advantages of edge computing. | | CO1 | R | | 1 |
| 3. | Interpret hybrid cloud. | | CO2 | U | | 1 |
| 4. | Infer the role of cloud computing in connected cars. | | CO2 | U | | 1 |
| 5. | Interpret latency in terms of edge computing. | | CO3 | U | | 1 |
| 6. | Define edge analytics. | | CO3 | R | | 1 |
| 7. | Infer the four stages of IoT/Edge device life cycle. | | CO4 | U | | 1 |
| 8. | List the reliability issues in IoT systems. | | CO4 | R | | 1 |
| 9. | Define endpoint. | | CO5 | R | | 1 |
| 10. | List few applications of Edge Computing. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe fog computing. | | CO1 | | R | 3 |
| 12. | Compare private and public cloud. | | CO2 | | U | 3 |
| 13. | Compare field and cloud protocols. | | CO3 | | U | 3 |
| 14. | List any three invasive attacks. | | CO4 | | R | 3 |
| 15. | Define IDE. | | CO5 | | R | 3 |
| 16. | List the advantages of connected car. | | 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 the types of computing, its advantages and drawbacks. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Interpret the types of cloud with suitable examples. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Explain the components and protocols of edge architecture in detail. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Interpret the types of security controls and steps to improve the security. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Examine the use of Arduino and Raspberry Pi board in building IoT system with suitable example. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain the process involved in Reverse Engineering and its impacts. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Compare invasive and non-invasive attacks. | CO4 | | U | 6 |
|  | b. | Interpret the benefits of cloud computing. | CO2 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Illustrate the applications of edge computing in media streaming services with a case study example. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Infer the structure of IoT systems. |
| CO2 | Critically evaluate cloud services and edge computing. |
| CO3 | Implement software using standard open-source cloud and edge computing software for data analytics. |
| CO4 | Identify security issues of edge devices. |
| CO5 | Develop and execute a project related to data analytics and edge computing. |
| CO6 | Apply edge computing techniques for various applications. |

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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 | - | 17 | 6 | - | - | - | 23 |
| CO3 | 1 | 4 | 12 | - | - | - | 17 |
| CO4 | 4 | 19 | 12 | - | - | - | 35 |
| CO5 | 4 | - | 12 | - | - | - | 16 |
| CO6 | 4 | - | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **19EC2033** | **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. | Identify the cipher text :  Let P,C,K denote plaintext space, cipher text space and key space respectively. In shift cipher, P=C=K=Z26, the key for shift cipher is k=12 and plaintext is 21. | | CO1 | U | | 1 |
| 2. | Show the result of 27 mod 5. | | CO1 | U | | 1 |
| 3. | State the condition for two numbers a, b is multiplicative inverse of each other. | | CO2 | R | | 1 |
| 4. | List the prime numbers smaller than 10. | | CO2 | R | | 1 |
| 5. | Name the data block of 4 columns of 4 bytes in AES algorithm. | | CO3 | R | | 1 |
| 6. | Define Message Digest (MD). | | CO3 | R | | 1 |
| 7. | Identify the key size for AES algorithm. | | CO3 | U | | 1 |
| 8. | Express the full form HMAC. | | CO4 | U | | 1 |
| 9. | Recite any one approach of digital signature. | | CO5 | U | | 1 |
| 10. | Express the full form of TLS. | | CO5 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Recall and write the definition of Cryptanalysis. | | CO1 | | R | 3 |
| 12. | Construct a multiplicative inverse table for Z5 | | CO2 | | A | 3 |
| 13. | List the properties to be satisfied by Field. | | CO3 | | R | 3 |
| 14. | Predict the requirement of Digital Signature. | | CO4 | | U | 3 |
| 15. | List few block cipher techniques. | | CO5 | | U | 3 |
| 16. | Summarize the applications of IPsec. | | 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 the various security mechanisms provided by X.800. | CO1 | | U | 10 |
|  | b. | List out the different types of active attacks. | CO1 | | R | 2 |
|  |  |  |  | |  |  |
| 18. | a. | Predict the cipher text using Play fair Cipher for the given plaintext “EXAM”. | CO2 | | U | 6 |
|  | b. | Differentiate Cryptography and Steganography. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Report all the rules to be followed for Euler’s-phi function. | CO2 | | U | 4 |
|  | b. | Evaluate the expression 5-1 mod 23 using Fermet’s Little theorem. | CO2 | | An | 8 |
|  |  |  |  | |  |  |
| 20. |  | Describe the working of Data Encryption Standard. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. | a. | Interpret the Secret key to be shared using Diffie Hellman Key exchange technique.  Suppose that two parties A and B wish to set up a common secret key (D-H key). They agree on q= 7 as the modulus and g=3 as the primitive root. Party A chooses a=2 and party B chooses b=5 as their respective secrets. | CO5 | | U | 8 |
|  | b. | Discuss public key cryptosystems used for encryption and decryption. | CO5 | | U | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Describe the working of Secure Hash Algorithm (SHA-512). | CO4 | | U | 8 |
|  | b. | Express the application of hash function. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Explain the ITU-T recommendation X.509 Certificates. | CO1 | | U | 8 |
|  | b. | List the requirements of Kerberos for authentication services. | CO5 | | R | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Illustrate the working of Pretty Good Privacy (PGP) | CO6 | | A | 6 |
|  | b. | Summarize the components used in electronic mail. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | List and describe the various security risks and mechanisms for handling them. |
| CO2 | Understand the mathematical concepts involved in cryptography. |
| CO3 | Classify symmetric and asymmetric ciphers. |
| CO4 | Handle data integrity using hash functions and fulfil message authentication requirements. |
| CO5 | Describe key management and user authentication techniques. |
| CO6 | Apply algorithms to handle network security issues. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 26 | - | - | - | - | 33 |
| CO2 | 2 | 10 | 3 | 8 | - | - | 23 |
| CO3 | 5 | 1 | - | - | - | - | 5 |
| CO4 | - | 28 | - | - | - | - | 29 |
| CO5 | 4 | 17 | - |  |  |  | 21 |
| CO6 | - | 9 | 6 |  |  |  | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **19EC2036** | **Duration** | **3hrs** |
| **Course Name** | **NEURAL NETWORKS AND 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. | Compare artificial neural network and biological neural network. | | | CO1 | U | | 1 |
| 2. | List the characteristics of artificial neural networks. | | | CO1 | R | | 1 |
| 3. | Illustrate the need for activation functions in artificial neural networks. | | | CO3 | U | | 1 |
| 4. | Summarize the advantages of supervised learning methodologies. | | | CO2 | U | | 1 |
| 5. | List the drawbacks of back propagation neural networks. | | | CO2 | R | | 1 |
| 6. | Name the training methodology used in perceptron. | | | CO2 | R | | 1 |
| 7. | Summarize the specific features of Hopfield neural network. | | | CO3 | U | | 1 |
| 8. | Name the different passes used in the training process of BPN network. | | | CO2 | R | | 1 |
| 9. | Compare machine learning techniques and deep learning techniques. | | | CO5 | U | | 1 |
| 10. | List few pretrained Artificial Neural Network models used for practical applications. | | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Illustrate the operation of an artificial neuron with neat diagram. | | | CO1 | | U | 3 |
| 12. | Distinguish between supervised and unsupervised learning methodologies. | | | CO3 | | An | 3 |
| 13. | Estimate a solution for the X-OR problem of perceptron. | | | CO2 | | E | 3 |
| 14. | Summarize the temporal instability problem in back propagation neural network. | | | CO2 | | U | 3 |
| 15. | Compare the AlexNet and LeNet pretrained models with necessary diagrams. | | | CO6 | | U | 3 |
| 16. | Summarize the necessity for maxpooling layer in convolution neural networks | | | 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. | Illustrate the process of electrical communication and chemical communication inside human neuron with neat diagrams. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Summarize the functions of biological neuron with neat diagrams. | CO1 | | U | 6 |
|  | | b. | Distinguish between single layer networks and multi-layer networks with neat diagrams. | CO3 | | An | 6 |
|  | |  |  |  | |  |  |
| 19. | | a. | Explain the perceptron model with neat architecture and training algorithms. Include mathematical equations wherever necessary. | CO2 | | U | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Illustrate the architecture and training algorithm of back  propagation neural network with neat diagrams. Support your answer with necessary mathematical equations. | CO3 | | U | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Summarize the technical aspects of the following pretrained models.  (a) AlexNet, (b) GoogleNet and (c) ZFNet. | CO6 | | U | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Summarize the linear separable problem with an example using perceptron with neat graphical illustrations. | CO3 | | U | 6 |
|  | | b. | Estimate the weight values of a 2-input OR gate using perceptron after 2 iterations with initial weight values of 0 and  1. The learning rate is 0.5. | CO4 | | E | 6 |
|  | |  |  |  | |  |  |
| 23. | | a. | Explain the different types of activation functions with neat graphical illustrations. Include mathematical equations wherever necessary. | CO2 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Illustrate the functions of convolutional neural network with different layers of the architecture. Include neat diagrams and  mathematical equations wherever necessary. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compare and comprehend the functioning of human brain and ANN. |
| CO2 | Gain an understanding about training methodologies of neural networks. |
| CO3 | Summarize the pros and cons of different single layer ANN. |
| CO4 | Apply artificial neural networks for solving engineering problems. |
| CO5 | Outline the basic concepts and applications of deep learning. |
| CO6 | Make use of different Deep networks 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 | 1 | 22 | - | - | - | - | 23 |
| CO2 | 3 | 28 | - | - | 3 | - | 34 |
| CO3 | - | 20 | - | 9 | - | - | 29 |
| CO4 | 1 | - | - | - | 6 | - | 7 |
| CO5 | - | 4 | - | - | - | - | 4 |
| CO6 | - | 27 | - | - | - | - | 27 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20EC1001** | **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. | Infer the following code segment and identify what will be the output of a=1,b=1given Python code?  a = int(input("Enter an integer: "))  b = int(input("Enter an integer: "))  if a <= 0:  b = b +1  else:  a = a + 1 | | | | CO1 | U | | 1 |
| 2. | What will be the extension of python file? | | | | CO1 | R | | 1 |
| 3. | Identify the output of below Python code?  str1="Aplication"  str2=str1.replace('a','A')  print(str2) | | | | CO2 | U | | 1 |
| 4. | Which character is used in Python to make a single line comment? | | | | CO2 | R | | 1 |
| 5. | Examine the following Python code return?  str1="Stack of books"  print(len(str1)) | | | | CO3 | An | | 1 |
| 6. | Examine the datatype of the var in the below code snippet?  var = 10  print(type(var))  var = "Hello"  print(type(var)) | | | | CO3 | A | | 1 |
| 7. | What will be the output of the following code snippet?  ­­­­a = [1, 2, 3]  a = tuple(a)  a[0] = 2  print(a) | | | | CO4 | R | | 1 |
| 8. | What will be the output of the following code snippet?  a = [1, 2, 3, 4, 5]  sum = 0  for ele in a:  sum += ele  print(sum) | | | | CO4 | R | | 1 |
| 9. | Identify the output of the following code snippet?  def solve(a, b):  return b if a == 0 else solve(b % a, a)  print(solve(20, 50)) | | | | CO5 | A | | 1 |
| 10. | Define Inheritance in python program. | | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Develop an user-defined function, ind\_count\_vowels\_cons\_letters(first\_name, last\_name) which accepts your first name and last name. Include necessary logic to print number of vowels and consonants. | | | | CO1 | | A | 3 |
| 12. | Examine the output of the following code snippet?  myString = "pynative"  stringList = ["abc", "pynative", "xyz"]  print(stringList[1] == myString)  print(stringList[1] is myString) | | | | CO2 | | A | 3 |
| 13. | Select 10 integer numbers (including duplicate numbers) as input and store it in a list variable and find all the duplicate elements and print the same in list format and sort them in both ascending and descending order. | | | | CO3 | | C | 3 |
| 14. | Create a user defined function reverse\_digits (number) and read an integer number as input and reverse digits of the given using your function and display the same. | | | | CO4 | | An | 3 |
| 15. | What will be the output of the following code snippet?  count = 0  while(True):  if count % 3 == 0:  print(count, end = " ")  if(count > 15):  break;  count += 1 | | | | CO5 | | R | 3 |
| 16. | What will be the output of the following code snippet?  numbers = (4, 7, 19, 2, 89, 45, 72, 22)  sorted\_numbers = sorted(numbers)  odd\_numbers = [x for x in sorted\_numbers if x % 2 != 0]  print(odd\_numbers) | | | | 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. | |  | Create a Python program to implement ticket booking application. Get the name and age of the passenger to book the ticket. Check the age, if it is less than 6 years or greater than or equal to 60 years then apply 30% concession to the original ticket price (Rs. 1000). Otherwise simply print tickets booked with the original ticket price. | | CO1 | | C | 12 |
|  | |  |  | |  | |  |  |
| 18. | | a. | Develop a python program to print ‘n’ natural numbers using while loop statement. | | CO2 | | A | 6 |
|  | | b. | List the loop statement with suitable example program | | CO2 | | An | 6 |
|  | |  |  | |  | |  |  |
| 19. | |  | Build the code below and complete the following:  1. Add two more people to the dictionary people.  2. Modify the name of person 1 from John to Jonathan.  3. Delete person 2 from the dictionary.  4. Show all key values pairs from the dictionary using a for loop. Be sure to nicely format the output of the all of the key value pairs.  people = {1: {'name': 'John', 'age': '27', 'sex': 'Male'},  2: {'name': 'Marie', 'age': '22', 'sex': 'Female'}} | | CO3 | | A | 12 |
|  | |  |  | |  | |  |  |
| 20. | |  | Create a Python program that takes a text file as input and returns the number of words of a given text file Also, extract characters from various text files and puts them into a list and do the following operation: read first n lines of a file, read a file line by line and store it into a list, to count the number of lines in a text file, to remove newline characters from a file. | | CO3 | | C | 12 |
|  | |  |  | |  | |  |  |
| 21. | | a. | Construct the two arguments taken by the open() function? | | CO4 | | A | 6 |
|  | | b. | Create a Circle class and initialize it with radius. Make two methods getArea and get Circumference inside this class. | | CO4 | | C | 6 |
|  | |  |  | |  | |  |  |
| 22. | |  | Construct a python program using class named student that contains members: Student name (type char), Roll number (type int) and the marks obtained in 3 subjects (type float). Ask the user to fill in this data for three students, obtain the total mark and display the information along with the percentage for each student. | | CO5 | | A | 12 |
|  | |  |  | |  | |  |  |
| 23. | |  | Examine in detail about various types of inheritance of the Python with the illustration of employee database in details | | CO5 | | An | 12 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | | a. | | With illustration, examine in detail the various types of the data visualization Python plot. | CO6 | | An | 6 |
|  | | b. | | Justify polymorphism in python and give the types of polymorphism with an example. | CO6 | | E | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of programming using python. |
| CO2 | Write and execute python programs. |
| CO3 | Understand the concepts of using math library. |
| CO4 | Adopt different techniques using functions in the program. |
| CO5 | Formulate algorithms and write programs using modules, packages and strings. |
| CO6 | Apply python for real time application using object-oriented approach. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 1 | 3 |  |  | 12 | 16 |
| CO2 | 1 |  | 9 | 6 |  |  | 16 |
| CO3 | 1 | 1 | 12 |  |  | 15 | 29 |
| CO4 | 1 |  | 6 | 4 |  | 6 | 17 |
| CO5 | 3 |  | 14 | 12 |  |  | 29 |
| CO6 | 2 |  | 3 | 6 | 6 |  | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20EC1003** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING WITH 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. | List the steps in software development life cycle. | | CO1 | R | | 1 |
| 2. | Define algorithm. | | CO1 | R | | 1 |
| 3. | Review the significance of compilers. | | CO2 | U | | 1 |
| 4. | Recall the syntax of ‘if’ statement. | | CO2 | R | | 1 |
| 5. | Observe the bugs in the below source code:  #include &lt;stdio.h&gt;  {  int a, b;  a=10.5;  b=6;  printf(“A is” a b);  } | | CO3 | U | | 1 |
| 6. | Compare while loop and do-while loop. | | CO3 | U | | 1 |
| 7. | Examine the types of operators used in C language. | | CO4 | R | | 1 |
| 8. | State the purpose of using ‘break’. | | CO4 | R | | 1 |
| 9. | Define the syntax used in function declaration. | | CO5 | R | | 1 |
| 10. | Recall the significance of structures in C language, | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Write a C program to swap two numbers. | | CO1 | | U | 3 |
| 12. | Construct a C program to display the below tag line 20 times:  ‘Success is mine’ | | CO3 | | A | 3 |
| 13. | Write a C program to display the elements in an array. | | CO3 | | U | 3 |
| 14. | Construct a C program to concatenate two strings by adopting the library functions. | | CO4 | | A | 3 |
| 15. | Illustrate a C program using the concept of pointers to find the value stored in a variable. | | CO5 | | An | 3 |
| 16. | Write a C program to store the information of 10 students using structures. | | 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. | Explain in detail the ‘Program development cycle’. | CO1 | | U | 7 |
|  | b. | Construct a C program to identify whether the given number is odd or even. | CO1 | | A | 5 |
| 18. |  | Construct a C program to print any three multiplication tables using switch-case statement. | CO2 | | A | 12 |
| 19. |  | Construct a C program to perform Matrix addition. | CO2 | | A | 12 |
| 20. | a. | Construct a C program to   * Find the length of two strings. * Copy one string to another. | CO3 | | A | 4 |
|  | b. | Indicate 10 string library functions with suitable explanations. | CO3 | | U | 8 |
| 21. | a. | Write a C program to swap two numbers by adopting the concept of functions. | CO4 | | U | 8 |
|  | b. | Describe about Function declaration, Function call and Function  definition. | CO4 | | U | 4 |
| 22. |  | Explain with an example, how pointers are used in C Language. | CO5 | | U | 12 |
| 23. |  | Explain about structures. Write a C program to get the details of an employee and to display those using structures. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Summarize the operators used in C Language. Illustrate logical and bitwise operators using C program. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of computer and software development process. |
| CO2 | Understand the basics of programming skills using C language. |
| CO3 | Apply innovative ideas for the problem using arrays and strings |
| CO4 | Adopt different techniques for using functions in the program. |
| CO5 | Formulate algorithms and programs using arrays, pointers and structures. |
| CO6 | Create 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 | 12 | 5 |  |  |  | 19 |
| CO2 | 1 | 1 | 24 |  |  |  | 26 |
| CO3 |  | 10 | 7 |  |  |  | 17 |
| CO4 | 2 | 12 | 3 |  |  |  | 17 |
| CO5 | 1 | 27 |  | 3 |  |  | 31 |
| CO6 | 1 | 12 |  |  |  |  | 13 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20EC2002** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONIC DEVICES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Differentiate intrinsic semiconductor and Extrinsic semiconductor. | CO1 / R | 1 |
| 2. | Give the expression for Drift current density. | CO1 / R | 1 |
| 3. | Draw V-I characteristics of PN diode. | CO2 / U | 1 |
| 4. | Write the application of PN diode. | CO2 / U | 1 |
| 5. | Among CE, CB, CC which one is most popular. Why? | CO3 / A | 1 |
| 6. | In a CR connection, the value of IE is 6.28mA and the collector current Ic is 6.20mA. Determine D.C. current gain. | CO3 / A | 1 |
| 7. | Differentiate N and P channel FETs. | CO4 / R | 1 |
| 8. | Define the term threshold voltage. | CO4 / U | 1 |
| 9. | What is tunneling phenomenon? | CO5 / R | 1 |
| 10. | Give the symbol and structure of Schottky diode. | CO5 / U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Write notes on classification of semiconductors. | CO1 / R | 3 |
| 12. | Show the position of Fermi level in N type and P type semiconductors. | CO2 / R | 3 |
| 13. | The reverse leakage current of a transistor when connected in CB configuration is 0.2 µA and it is 18 µA when the same transistor is connected in CE configuration calculate α, β. | CO3 / R | 3 |
| 14. | Explain briefly the effect of temperature on MOSFET. | CO4 / A | 3 |
| 15. | A Zener voltage regulator circuit is to maintain constant voltage at 60V, over a current range from 5 to 50mA. The input supply voltage is 200V. Solve for the value of resistance R to be connected in the circuit, for voltage regulation from load current IL =0mA, the maximum possible value of IL. What is the value of IL max? | CO5 / A | 3 |
| 16. | Interpret the working of phototransistor and optocoupler. | CO 6 / 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. | Point out why silicon is always preferred than germanium? | CO1 / A | 2 |
| b. | What is Hall Effect? | CO1 / R | 2 |
| c. | Derive the expression for hall voltage and state what properties of the semiconductor can be determined from the hall effect experiment. | CO1 / A | 8 |
|  |  |  |  |  |
| 18. | a. | Illustrate the break down in PN junction diode. | CO2 / U | 5 |
| b. | Explain the limiting values of PN junction diodes. | CO2 / U | 5 |
| c. | List the types of recovery time and define it. | CO2 / R | 2 |
|  |  |  |  |  |
| 19. | a. | Develop the input and output characteristics of a transistor in CC configuration. | CO3 / R | 5 |
| b. | Formulate the relationship among α, β, γ. | CO3 / R | 4 |
| c. | Built the conversion formula of h parameter from CE to CB. | CO3 / A | 3 |
|  |  |  |  |  |
| 20. | a. | Explain the concept of threshold voltage in a MOSFET. | CO4 / U | 5 |
| b. | Describe some applications of JFET. | CO4 / U | 5 |
| c. | Elaborate Channel length modulation. | CO4 / A | 2 |
|  |  |  |  |  |
| 21. | a. | Outline tunnel diode and varactor diode using energy band diagrams. | CO5 / U | 5 |
| b. | Outline the operation of conventional p-n junction diode. | CO5 / U | 5 |
| c. | Describe the negative resistance of tunnel diode. | CO5 / R | 2 |
|  |  |  |  |  |
| 22. | a. | Justify transistor as an amplifier. | CO3 / U | 4 |
| b. | Develop the comparison of CE, CC, CB configuration. | CO3 / U | 4 |
| c. | Describe early effect. | CO3 / R | 4 |
|  |  |  |  |  |
| 23. | a. | Illustrative the V-I characteristic curve and explain the operation of Zener diode. | CO5 / R | 7 |
| b. | Compare Avalanche and Zener breakdown. | CO5 / R | 3 |
| c. | Conclude the applications of Zener diode. | CO5 / A | 2 |
|  |  | **Compulsory:** | | | |
| 24. | a. | Give a brief note on CCD. | CO6 / U | 5 |
| b. | Write short notes on modes of operation of LCD. | CO6 / U | 5 |
| c. | Assess the characteristics of the material used in LED. | CO6 / A | 2 |

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|  | **COURSE OUTCOMES** |
| CO1 | Demonstrate the flow of charge carriers in semiconductor and interpret the VI relations. |
| CO2 | Understand the physical and functional properties of diode. |
| CO3 | Compare the properties of different configurations of bipolar junction transistors. |
| CO4 | Apply the semiconductor concepts to construct MOS devices. |
| CO5 | Categorize the special semiconductor devices based on their applications. |
| CO6 | Infer the knowledge of power devices and display devices |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | - | 10 | - | - | - | 17 |
| CO2 | 5 | 12 | - | - | - | - | 17 |
| CO3 | 16 | 8 | 5 | - | - | - | 29 |
| CO4 | 1 | 11 | 5 | - | - | - | 17 |
| CO5 | 13 | 11 | 5 | - | - | - | 29 |
| CO6 | - | 10 | 5 | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20EC2003** | **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. | Determine the even and odd components of the signal x(t) = ejt | | CO1 | A | | 1 |
| 2. | Sketch the waveform δ(t – 2) + δ(t + 2). | | CO1 | A | | 1 |
| 3. | Define Impulse response. | | CO2 | R | | 1 |
| 4. | Determine whether the signal is causal or non-causal: x(t) = 2cost | | CO2 | A | | 1 |
| 5. | State Parseval’s Theorem. | | CO3 | U | | 1 |
| 6. | Write the CTFT of the unit step signal. | | CO3 | A | | 1 |
| 7. | Identify the effect of undersampling. | | CO4 | R | | 1 |
| 8. | Tell the relationship between Fourier Transform and Laplace Transform. | | CO4 | R | | 1 |
| 9. | Compute discrete-time Fourier transform of the signal x(n) =δ[n-k] | | CO5 | A | | 1 |
| 10. | Determine the Z transform of the sequence x (n) ={1, 2, 3,-1} | | CO6 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Examine whether the given signal is periodic or not. If periodic, find the fundamental period: x(t)=2\*cos(3πt) + 7\*cos(9t) | | CO1 | | A | 3 |
| 12. | Show commutative and distributive properties in convolution integral. | | CO2 | | U | 3 |
| 13. | List the conditions for the existence of Fourier series. | | CO3 | | R | 3 |
| 14. | For the analog signal x(t)=3cos(500πt)+15sin(800πt), determine the minimum sampling rate required to avoid aliasing. Also,compute the Nyquist interval. | | CO4 | | A | 3 |
| 15. | Compute the inverse fourier transform of the following X(ejω) =1+2e-jω -3e-2jω + 2e-3jω + 4e-4jω | | CO5 | | A | 3 |
| 16. | Apply Z-transform for the following signal and depict the ROC: | | 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 continuous time signal x(t) is shown in figure, Sketch(i) x(t+1) (ii) x(-t+2) (iii) x(2t-1) (iv) x(-t-1) (v) x(t/3) | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Using graphical procedure, solve convolution h(t) e-3tu(t) and x(t)= u(t-3)-u(t-5) | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. |  | Consider a stable LTI system characterized by the differential equation .  Determine the frequency response and the impulse response of thesystem. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Explain the reconstruction of CT signals from its samples. Sketch the spectrum of a sampled signal and explain aliasing. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Compute the impulse response and step response for the following system | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Given y[n] = x[n+5] cos100πn. Determine whether the system is memoryless, causal, linear, and time-invariant. | CO2 | | A | 5 |
|  | b. | Compute linear convolution for the following two sequences x(n) and h(n) to get y(n). Also, give the illustration.  x(n) = {1, -1, 1, -1} and h(n) = {2, -2}. | CO2 | | A | 7 |
|  |  |  |  | |  |  |
| 23. |  | For a system with a transfer functionDetermine the output when the input is x(t) = e-3tu(t). | CO4 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | By using the Long Division method, Compute the inverse Z transform of X(z)=(1+5z-1)/(1-5z-1+z-2) whena) x(n) is causal (b) x(n) in anti-causal. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Analyze different types of signals for mathematical modeling. |
| CO2 | Realize the system properties to build basic model |
| CO3 | Represent continuous time system using fourier series and fourier transform. |
| CO4 | Investigate the sampling process and Laplace Transform. |
| CO5 | Signify discrete time system using fourier series and fourier transform. |
| CO6 | Familiarize the frequency analysis of discrete time system using Z transform. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 17 | - | - | - | 17 |
| CO2 | 1 | 3 | 25 | - | - | - | 29 |
| CO3 | 3 | 1 | 13 | - | - | - | 17 |
| CO4 | 2 | 12 | 15 | - | - | - | 29 |
| CO5 | - | - | 16 | - | - | - | 16 |
| CO6 | - | - | 16 | - | - | - | 16 |
|  | | | | | | | **124** |

Graphical user interface, application

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| **Course Code** | **20EC2004** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER 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. | In Register Transfer Language (RTL), represent the transfer of register contents from R1 to R2. | CO1 | R | 1 |
| 2. | The memory has 64k words in it. How many bits of the address bus are required to select a word in the memory? | CO1 | A | 1 |
| 3. | In which part of the 8086 microprocessor does the actual fetching of instructions take place during processing operations? | CO2 | U | 1 |
| 4. | Identify the type of processor which has hardwired control unit. | CO2 | U | 1 |
| 5. | In a micro programmed control unit the transformation from instruction code bits to an address is referred to as \_\_\_\_\_\_\_\_\_. | CO3 | R | 1 |
| 6. | BUN instruction is an example of \_\_\_\_\_\_\_\_\_\_\_ branching. | CO3 | U | 1 |
| 7. | What is the size of the register queue of 8086 in the Bus Interface Unit which prefetches the instruction from memory? | CO3 | R | 1 |
| 8. | In the 8086 microprocessor, memory is divided into how many segments? | CO4 | U | 1 |
| 9. | Which is the only port of 8255 which can be operated in BSR mode? | CO5 | R | 1 |
| 10. | Mention the mode of communication in 8251. | CO5 | U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | State the different buses required for interfacing 8086 microprocessor and memory. | CO1 | U | 3 |
| 12. | Illustrate with a neat sketch how the basic computer differentiates direct and indirect addressing modes from the instruction. | CO2 | R | 3 |
| 13. | Outline and brief the microinstruction format of control memory. | CO3 | An | 3 |
| 14. | List out the various addressing modes of 8086. | CO4 | R | 3 |
| 15. | Brief on USART and give its features. | CO5 | U | 3 |
| 16. | Comment on the importance of cache memory. | CO6 | E | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. |  | Construct a 4-bit arithmetic circuit and explain the various micro operations with the help of output expression derived from the circuit. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Sketch the hardwired control unit and show with the timing diagrams: D3T4: SC🡨 0 & SC is incremented for the states T1, T2, T3. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Write an assembly language program for the 8086 microprocessor to exchange 5 numbers stored in the memory locations 4500h and 4600h. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss in detail the architecture of the Intel 8086 microprocessor. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Demonstrate the interfacing of 8251 USART with an 8086 microprocessor with neat diagrams. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the I/O modes of 8255 Programmable peripheral Interface (PPI). | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Sketch the functional blocks and control word format of 8254 Programmable Interval Timer and summarize the modes of operation. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Design a memory system for the microprocessor such that it should contain 8 Kbyte of EPROM and 8 Kbyte of RAM. | CO6 | C | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the basics of computer organization. |
| CO2 | Compute Arithmetic and Logic Unit. |
| CO3 | Categorize the performance of memory systems. |
| CO4 | Illustrate and Implement programs on 8086 microprocessor. |
| CO5 | Compute I/O and Memory circuits and 8086 ALP. |
| CO6 | Formulate Memory Interfacing circuits. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | 13 | - | - | - | 17 |
| CO2 | 3 | 14 | - | 12 | - | - | 29 |
| CO3 | 2 | 1 | 12 | 3 | - | - | 18 |
| CO4 | 3 | 1 | 12 | - | - | - | 16 |
| CO5 | 1 | 16 | 12 | - | - | - | 29 |
| CO6 | - | - | - | - | 3 | 12 | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20EC2018** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF PRINTED CIRCUIT AND ARDUINO BOARD 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. | Infer the significance of penstock. | | CO1 | U | | 1 |
| 2. | Name an electro-mechanical switch. | | CO1 | R | | 1 |
| 3. | List the types of biasing in diodes. | | CO2 | R | | 1 |
| 4. | Identify a semiconductor material used in diode manufacturing. | | CO2 | R | | 1 |
| 5. | Describe OR gate with its truth table. | | CO3 | U | | 1 |
| 6. | Name the sensor that is used in remote control. | | CO3 | R | | 1 |
| 7. | Classify the types of PCB. | | CO4 | U | | 1 |
| 8. | Define Netlist. | | CO4 | R | | 1 |
| 9. | Recognize the tool used to convert high-level source code to a machine code. | | CO5 | U | | 1 |
| 10. | List few applications of an embedded system. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the order of energy conversion in a thermal power plant. | | CO1 | | E | 3 |
| 12. | Describe the evolution of microprocessors. | | CO2 | | U | 3 |
| 13. | Differentiate combinational and sequential circuit. | | CO3 | | An | 3 |
| 14. | Infer the challenges in modern PCB design. | | CO4 | | U | 3 |
| 15. | Interpret the importance of Arduino IDE. | | CO5 | | A | 3 |
| 16. | Summarize the various sensors used in traffic light controlling system. | | CO6 | | E | 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 process of power generation in a Thermal power plant. | CO1 | | U | 12 |
| 18. | a. | Construct the working principle of PN junction diode with a neat diagram and mention its applications. | CO2 | | A | 8 |
|  | b. | Calculate the value of resistance of a resistor with color rings as follows: orange, white, brown, and gold. | CO2 | | An | 4 |
| 19. | a. | Examine the architecture of microcontroller with a neat block diagram. | CO3 | | A | 8 |
|  | b. | Illustrate the logic diagram of Half adder with its truth table. | CO3 | | U | 4 |
| 20. | a. | Classify PCB and explain the significance of multi-layered PCB. | CO4 | | U | 8 |
|  | b. | Classify the different types of IC packages. | CO4 | | U | 4 |
| 21. | a. | Develop a schematic layout to interface a 2x2 keyboard with a microcontroller and develop a C program to execute the same. | CO5 | | A | 8 |
|  | b. | Explain Arduino Programming and Design flow with an example. | CO5 | | An | 4 |
| 22. | a. | Explain the principle of a smart electrical measuring instrument which is used to calculate the monthly electricity bill. | CO1 | | An | 8 |
|  | b. | Interpret the importance of universal gates in digital systems. | CO3 | | A | 4 |
| 23. | a. | Interpret the function of various digital logic gates with its symbol and truth table. | CO3 | | U | 8 |
|  | b. | Analyze the total energy consumption for 30days of a 60W bulb which operates continuously 5 hours per day and 40W fan which operates 8 hours per day. | CO1 | | An | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Develop an automatic control system in a door, which senses the human entry at the doorstep and turns open/close the door automatically. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of electro mechanical systems in everyday life. |
| CO2 | Understand the properties of semiconductor devices. |
| CO3 | Understand and relate various digital concepts and circuits. |
| CO4 | Acquire the knowledge about the packages of Electronic components, types of PCBs and history of PCBs. |
| CO5 | Understand the design and programming of Arduino boards. |
| CO6 | Acquire the knowledge and skills to implement various smart systems application. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | - | 12 | 3 | - | 29 |
| CO2 | 2 | 3 | 8 | 4 | - | - | 17 |
| CO3 | 1 | 13 | 12 | 3 | - | - | 29 |
| CO4 | 1 | 16 | - | - | - | - | 17 |
| CO5 | - | 1 | 8 | 7 | - | - | 16 |
| CO6 | - | 1 | 12 | - | 3 | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20EC3001** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SYSTEM DESIGN USING HDL** | **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. | Design a 2-bit Magnitude Comparator Circuit. | CO1 | C | 10 |
|  | b. | Design a Hazard free circuit to implement the following Boolean Function F(A,B,C,D) = Σm(1,3,6,7,13,15). | CO1 | C | 6 |
|  |  |  |  |  |  |
| 2. | a. | Design an asynchronous MoD – 10 Counter. | CO2 | C | 7 |
|  | b. | Justify the Combinational circuit is defined by the functions.  F1 = Σm(3,5,7)  F2 = Σm(4,5,7)  Implement the circuit with a PLA having 3 inputs, 3 product terms and 2 outputs. | CO2 | E | 9 |
|  |  |  |  |  |  |
| 3. | a. | Describe in detail about concurrent signal assignment statement and selected signal assignment statement with an example. | CO3 | R | 8 |
|  | b. | Explain different Loop statements in VHDL with an example. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 4. | a. | Sketcha neat diagram write a VHDL Program for four bit full adder, using structural description. | CO5 | A | 10 |
|  | b. | Show the syntax for function and procedure. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Select appropriate example, explain the various Operators in Verilog HDL. | CO4 | An | 9 |
|  | b. | Write the Verilog HDL gate level description of the priority encoder. | CO4 | A | 7 |
|  |  |  |  |  |  |
| 6. | a. | Explain about Scalar and Composite data types in VHDL. | CO3 | U | 10 |
|  | b. | Write the VHDL code for 4 to 1 Multiplexer by using CASE statement. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 7. | a. | Design the following circuit using Verilog HDL.  C:\Users\Office\Downloads\combinational.jpg | CO4 | C | 7 |
|  | b. | Explain Briefly about the Gate delays in Verilog HDL. | CO4 | U | 9 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Design 4 bit up-down counter using Verilog HDL. | CO6 | C | 8 |
|  | b. | Develop a Switch-Level Verilog Description of 2-to-l Multiplexer. | CO6 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Design Digital circuits. |
| CO2 | Construct ASM chart and Design Circuits using PLDs. |
| CO3 | Develop Combinational and sequential circuits using VHDL statements. |
| CO4 | Build Combinational and sequential circuits using in Verilog HDL statements. |
| CO5 | Create Test bench ,VHDL packages and sub programs in VHDL. |
| CO6 | Illustrate the switch level design of Digital circuits in Verilog HDL |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | - | - | - | 16 | 16 |
| CO2 | - | - | - | - | 9 | 7 | 16 |
| CO3 | 8 | 10 | 14 | - | - | - | 32 |
| CO4 | - | 9 | 7 | 9 | - | 7 | 32 |
| CO5 | - | 6 | 10 | - | - | - | 16 |
| CO6 | - | - | 12 | - | - | 8 | 20 |
|  | | | | | | | **132** |

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| **Course Code** | **20EC3002** | **Duration** | **3hrs** |
| **Course Name** | **LOW POWER VLSI 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. | a. | Develop the power dissipation of the system using the concept of charging and discharging capacitance. | CO1 | A | 12 |
|  | b. | Explain in detail the equivalent Pin Ordering. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 2. | a. | Express the basic concepts of Static probability, Conditional probability and frequency. | CO2 | U | 12 |
|  | b. | Summarize in detail the short circuit current in CMOS Inverter. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate in detail the Logic encoding of a digital circuit. | CO3 | A | 10 |
|  | b. | Estimate the Transition analysis of State encoding. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 4. | a. | Explain in detail the Self-gating Flip-flop. | CO4 | A | 6 |
|  | b. | Illustrate in detail the transistor and gate sizing. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. |  | Estimate the various techniques involved in switching activity reduction in CMOS digital systems. | CO4 | U | 16 |
|  |  |  |  |  |  |
| 6. |  | Describe the CMOS floating node in low power CMOS chip design. | CO5 | U | 16 |
|  |  |  |  |  |  |
| 7. |  | Design the architecture of Array multiplier and compose the concepts in Delay balancing technique. | CO5 | C | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Explain in detail the efficient charge recovery in adiabatic logic. | CO6 | A | 10 |
|  | b. | Evaluate the performance of positive feedback adiabatic logic circuits. | CO6 | E | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the various sources of power dissipation. |
| CO2 | Acquire the knowledge on simulation power analysis and Probabilistic power analysis Techniques. |
| CO3 | Learn the various low power reduction techniques at circuit and logic level. |
| CO4 | Analyze the various low power techniques at Architecture and system level. |
| CO5 | Design low power clock Networks, bus and low power SRAM circuits. |
| CO6 | Design various adiabatic logic circuits. |

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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 | - | 12 | - | - | - | - | 12 |
| CO3 | - | 10 | 10 | - | - | - | 20 |
| CO4 | - | 16 | 16 | - | - | - | 32 |
| CO5 | - | 16 | - | - | - | `16 | 32 |
| CO6 | - | - | 10 | - | 10 | - | 20 |
|  | | | | | | | **132** |

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| **Course Code** | **20EC3003** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG VLSI 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. | a. | Explain in detail the dc BJT model and also discuss the forward and reverse active regions of operation. | CO1 | U | 8 |
|  | b. | Obtain the non-zero small signal model parameter for MOSFET model. | CO1 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Explain in detail the High frequency BJT Model. | CO2 | U | 8 |
|  | b. | With block diagram explain about D/A converter and also illustrate about dynamic performance of the same. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | With neat block diagram explain the self-calibrating A/D Converter. | CO2 | U | 8 |
|  | b. | Explain in detail about data conversion process in SAR ADC. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Design a parallel switched capacitor realization of a resistor. | CO3 | C | 8 |
|  | b. | Explain in detail the Parallel A/D Converters. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | Design a cascade amplifier with relevant expressions. | CO4 | A | 8 |
|  | b. | With relevant expression explain in detail the current amplifiers. | CO4 | E | 8 |
|  |  |  |  |  |  |
| 6. | a. | Draw the circuit diagram of differential amplifier with current source as active load. | CO5 | R | 8 |
|  | b. | Explain the characteristics of differential amplifier and explain the condition to make the transistor to work in saturation region for differential amplifier with current mirror as active load. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | With neat diagram explain in detail the high gain amplifiers. | CO5 | U | 8 |
|  | b. | Explain in detail about Voltage Controlled Oscillators. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Explain in detail the High-speed comparator | CO6 | U | 10 |
|  | b. | Explain in detail the discrete time comparator. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compute the characteristics of MOS transistors and analyse the circuit characteristics  through device modelling. |
| CO2 | Utilize the analog design concepts in data converters. |
| CO3 | Illustrate different types of filters and switched capacitor circuits. |
| CO4 | Perform analysis in CMOS amplifiers. |
| CO5 | Solve the issues in output amplifiers. |
| CO6 | Design and develop various comparators and illustrate the performance of analog circuits using EDA tools. |

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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 |  | 32 |  |  |  |  | 32 |
| CO3 |  | 8 |  |  | 8 | 8 | 24 |
| CO4 |  | 8 | 8 |  | 8 |  | 24 |
| CO5 | 8 | 24 |  |  |  |  | 32 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **148** |

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| **Course Code** | **21EC1001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONICS FOR EVERYDAY LIFE** | **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 two examples for electricity generation methods. | | CO1 | U | | 1 |
| 2. | Identify two devices to control the flow of electrons. | | CO1 | U | | 1 |
| 3. | Interpret directivity in the context of microphones. | | CO2 | U | | 1 |
| 4. | Define signal to noise ratio. | | CO2 | R | | 1 |
| 5. | Paraphrase aspect ratio in displays. | | CO3 | U | | 1 |
| 6. | Tell the frequency bands used in Direct to Home TV systems. | | CO3 | R | | 1 |
| 7. | Identify the carrier signal used in fiber optic cables. | | CO4 | R | | 1 |
| 8. | Recall the microwave frequency used in microwave ovens. | | CO5 | R | | 1 |
| 9. | List two refrigerants. | | CO5 | R | | 1 |
| 10. | State the basic principle behind pulse oximetry. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Show the Hierarchy of Electronics. | | CO1 | | U | 3 |
| 12. | Compare and contrast woofers, tweeters, and squawkers. | | CO2 | | U | 3 |
| 13. | Describe the process of recording content onto a VCD. | | CO3 | | U | 3 |
| 14. | Indicate the different access methods used in mobile communication. | | CO4 | | U | 3 |
| 15. | Articulate how a divide by 60 circuit can be configured to act as a 1 second timer. | | CO5 | | A | 3 |
| 16. | Discuss the working of a finger-tip pulse oximeter. | | 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. | Classify the various sectors of the electronics industry. | CO1 | | U | 6 |
|  | b. | Discuss the components and working of a DTH system. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 18. | a. | Report the principle, construction, and working of a carbon microphone. | CO2 | | U | 6 |
|  | b. | Show the working of a moving coil cone type loudspeaker. | CO2 | | U | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Illustrate the working of a television transmitter with a neat block diagram. | CO3 | | U | 6 |
|  | b. | Express the working of a television receiver with a neat block diagram. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | Review the elements of a digital PBX. | CO4 | | U | 6 |
|  | b. | Explain how a cell phone call works. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 21. |  | Examine the working of a barcode scanner and a flatbed scanner. | CO5 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Illustrate the block diagram of a microwave oven and explain its working. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Explain the two methods by which blood pressure can be measured. | CO6 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the components of an ECG machine in detail. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the components in an electronic system. |
| CO2 | Understand the working of audio systems. |
| CO3 | Explain the various standards and technology in video systems. |
| CO4 | Understand the telephone network and mobile phone systems. |
| CO5 | Demonstrate the working of office and domestic appliances. |
| CO6 | Comprehend the functioning of medical equipments. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 11 | - | - | - | - | 11 |
| CO2 | 1 | 16 | - | - | - | - | 17 |
| CO3 | 1 | 22 | - | - | - | - | 23 |
| CO4 | 1 | 15 | - | - | - | - | 16 |
| CO5 | 2 | 12 | 15 | - | - | - | 29 |
| CO6 | 1 | 27 | - | - | - | - | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21EC1003** | **Duration** | **3hrs** |
| **Course Name** | **PROBLEM SOLVING AND ALGORITHMIC THINKING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **Course Outcome** | **Bloom’s Level** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | |
| 1. | Infer your perception on Logical reasoning. | | | CO5 | U | | 1 |
| 2. | Analyze the bugs and correct them.  #include <stdio.h>  {  int a, b;  a=10.5;  print(“A is” a); | | | CO6 | An | | 1 |
| 3. | Construct a C Program to display “Be bold and confident”. | | | CO3 | A | | 1 |
| 4. | **Identify the category (Sequencing/Selection/Iteration):**  firstname = INPUT ("What is your firstname?")  lastname = INPUT ("What is your lastname?")  PRINT ("Hello " + firstname + " " + lastname + "!") | | | CO1 | U | | 1 |
| 5. | **Identify the category (Sequencing/Selection/Iteration):**  FOR number FROM 1 TO 10:  PRINT 7 \* number | | | CO1 | U | | 1 |
| 6. | Extend your perception on Arrays. | | | CO2 | U | | 1 |
| 7. | Infer: Dynamic Binding. | | | CO2 | U | | 1 |
| 8. | Infer: Spanning tree. | | | CO4 | U | | 1 |
| 9. | Name a sorting method that adopts ‘Divide and Conquer’ rule. | | | CO2 | R | | 1 |
| 10. | Relate LIFO to an example. | | | CO2 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Explain the Cause – Effect relationship with an example. | | | CO1 | | U | 3 |
| 12. | Extend your perception about the Problem solving methods. | | | CO1 | | U | 3 |
| 13. | Infer Decomposition. | | | CO1 | | U | 3 |
| 14. | Compare Linear and nonlinear data structure. | | | CO2 | | U | 3 |
| 15. | Infer: Modularization. | | | CO1 | | U | 3 |
| 16. | Explain about Time complexity. | | | 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. | |  | Construct an algorithm for building a simple calculator and write a C program for the same. | CO3 | | A | 12 |
|  | |  |  |  | |  |  |
| 18. | |  | Interpret a crime scene investigation in the form of a flowchart. | CO3 | | A | 12 |
|  | |  |  |  | |  |  |
| 19. | | a. | Infer on the ‘problem tree’ and ‘objective tree’ with suitable example. | CO1 | | U | 8 |
|  | | b. | Distinguish Sequence, Selection and Repetition. | CO1 | | U | 4 |
|  | |  |  |  | |  |  |
| 20. | |  | Explain in detail the various types of linked lists. | CO2 | | U | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Explain Bubble sort with an example. | CO1 | | U | 6 |
|  | | b. | Infer: Linear search. Implement the same using C programming. | CO2 | | U | 6 |
|  | |  |  |  | |  |  |
| 22. | |  | Apply Kruskal’s algorithm to find the minimum spanning tree for the following graph.  Random graph | CO4 | | A | 12 |
|  | |  |  |  | |  |  |
| 23. | |  | Construct a C program to get the information like Name, Reg. no, Marks for 5 subjects from the user for 10 students and display the total percentage. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Construct a C program to Perform a 2x2 matrix subtraction using the concept of arrays. | CO3 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Apply algorithmic thinking to understand, define and solve problems. |
| CO2 | Design and implement algorithm(s) for a given problem. |
| CO3 | Apply the basic programming constructs for problem solving. |
| CO4 | Understand an algorithm by tracing its computational states. |
| CO5 | Identifying bugs in algorithms. |
| CO6 | Analyze the bugs and correct them. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 32 |  |  |  |  | 32 |
| CO2 |  | 27 |  |  |  |  | 27 |
| CO3 |  |  | 49 |  |  |  | 49 |
| CO4 | 1 | 1 | 12 |  |  |  | 14 |
| CO5 |  | 1 |  |  |  |  | 1 |
| CO6 |  |  |  | 1 |  |  | 1 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **21EC1004** | **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. | | What will be the output of the following code snippet?  print(type(5 / 2))  print(type(5 // 2)) | | | CO1 | | U | 1 |
| 2. | | What will be the output of below Python code?  str1="Information"  print(str1[2:8]) | | | CO1 | | R | 1 |
| 3. | Identify the output of below Python code?  str1="Aplication"  str2=str1.replace('a','A')  print(str2) | | | CO2 | | | R | 1 |
| 4. | Identify the output of the following code snippet?  def func():  global value  value = ‘Local’;  value = ‘Global’;  func()  print(value) | | | CO2 | | | R | 1 |
| 5. | Examine the following Python code return?  str1="Stack of books"  print(len(str1)) | | | CO3 | | | U | 1 |
| 6. | Examine the output of the following code snippet?  def check(a):  print(‘Even’; if a % 2 == 0 else & ‘Odd’;)  check(12) | | | CO3 | | | R | 1 |
| 7. | | What will be the output of the following code snippet?  a = [1, 2, 3]  a = tuple(a)  a[0] = 2  print(a) | | | CO4 | | U | 1 |
| 8. | | What will be the output of the following code snippet?  example = [‘Sunday’, ‘Monday’, ‘Tuesday’, ‘Wednesday’];  del example[2]  print(example) | | | CO4 | | R | 1 |
| 9. | | What will be the output of the following code snippet?  a = [1, 2, 3, 4, 5]  sum = 0  for ele in a:  sum += ele  print(sum) | | | CO5 | | U | 1 |
| 10. | | Show the declaration of the constructor defined in the class with syntax. | | | CO6 | | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | | Develop an user-defined function, find\_count\_vowels\_cons\_letters(first\_name, last\_name) which accepts your first name and last name. Include necessary logic to print number of vowels and consonants. | | | CO1 | An | | 3 |
| 12. | | Select the number is prime or not using prime number using python program. | | | CO2 | U | | 3 |
| 13. | | Create a user defined function reverse\_digits (number) and read an integer number as input and reverse digits of the given using your function and display the same. | | | CO3 | An | | 3 |
| 14. | | What will be the output of the following code snippet?  count = 0  while(True):  if count % 3 == 0:  print(count, end = " ")  if(count > 15):  break;  count += 1 | | | CO4 | U | | 3 |
| 15. | | Analyze the output of the following code snippet?  def outer\_fun(a, b):  def inner\_fun(c, d):  return c + d  return inner\_fun(a, b)  return a | | | CO5 | An | | 3 |
| 16. | | What will be the output of the following code snippet?  numbers = (4, 7, 19, 2, 89, 45, 72, 22)  sorted\_numbers = sorted(numbers)  odd\_numbers = [x for x in sorted\_numbers if x % 2 != 0]  print(odd\_numbers) | | | 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. | |  | Develop a Python program to check the eligibility of a candidate  appearing for military selection. Get the age and height (cms) from the user. If the candidate age is 18 and above, and if the height is 180cms and above print “Eligible for Selection” otherwise print “Not Eligible”. | | CO1 | C | | 12 |
|  | |  |  | |  |  | |  |
| 18. | | a. | Develop a Python program to check the eligibility of a candidate appearing for military selection. Get the age and height (cms) from the user. If the candidate age is 18 and above, and if the height is 180cms and above print “Eligible for Selection” otherwise print “Not Eligible”. | | CO2 | A | | 6 |
|  | | b. | Construct the following dictionary:  inventory = {  'gold' : 500,  'pouch' : ['flint', 'twine', 'gemstone'],  'backpack' : ['xylophone', 'dagger', 'bedroll', 'bread loaf']  }  Try to do the followings:   1. Add a key to inventory called 'pocket'. 2. Set the value of 'pocket' to be a list consisting of the strings 'seashell', 'strange berry', and 'lint'. 3. sort () the items in the list stored under the 'backpack' key. 4. Then remove('dagger') from the list of items stored under the 'backpack' key.   Add 50 to the number stored under the 'gold' key. | | CO2 | A | | 6 |
|  | |  |  | |  |  | |  |
| 19. | |  | Create a Python program that takes a text file as input and returns the number of words of a given text file Also, extract characters from various text files and puts them into a list and do the following operation: read first n lines of a file, read a file line by line and store it into a list, to count the number of lines in a text file, to remove newline characters from a file. | | CO3 | An | | 12 |
|  | |  |  | |  |  | |  |
| 20. | |  | Build the code below and complete the following:  1. Add two more people to the dictionary people.  2. Modify the name of person 1 from John to Jonathan.  3. Delete person 2 from the dictionary.  4. Show all key values pairs from the dictionary using a for loop. Be sure to nicely format the output of the all of the key value pairs.  People={1:{‘name’:’John’, ‘age’: ‘27’, ‘sex’ : ‘Male’},  2:{‘name’: ‘Monica’, ‘age’: ‘27’, ‘sex’ : ‘Female’}} | | CO4 | C | | 12 |
|  | |  |  | |  |  | |  |
| 21. | |  | Create a Python program that takes a text file as input and returns the number of words of a given text file Also, extract characters from various text files and puts them into a list and do the following operation: read first n lines of a file, read a file line by line and store it into a list, to count the number of lines in a text file, to remove newline characters from a file. | | CO5 | A | | 12 |
|  | |  |  | |  |  | |  |
| 22. | |  | Construct a python program using class named student that contains members: Student name (type char), Roll number (type  int) and the marks obtained in 3 subjects (type float). Ask the user to fill in this data for three students, obtain the total mark and display the information along with the percentage for each student. | | CO5 | An | | 12 |
|  | |  |  | |  |  | |  |
| 23. | |  | Build a python code to create a class called STRING and implement the following operations.  i) STRING s1=”VTU”; ii) STRING s2=”BELGAUM”;  iii) STRING s3=S1+S2; | | CO6 | An | | 12 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | |  | Develop a python application using Inheritance as per the following. Create a super class called Cash Tree which demonstrate any ATM Machine. Have attributes like name, codeno, location, etc. Add functionalities like View Balance, WithDraw and Deposit in super class. Derive two sub classes SBI\_Bank, and HDFC\_Bank with additional properties such as customer\_name, balance and redefine those super class  functionalities according to the nature of specified bank (differenciate via service\_charges, interest rate, and maximum withdraw limit etc). Complete the above scenario using Inheritance with Menu driven options. | | CO6 | C | | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of programming using python. |
| CO2 | Write and execute python programs. |
| CO3 | Understand the concepts of using math library. |
| CO4 | Adopt different techniques using functions in the program. |
| CO5 | Formulate algorithms and write programs using modules, packages and strings. |
| CO6 | Apply python for real time application using object-oriented approach. |

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

**Graphical user interface, application

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| **Course Code** | **21EC1007** | **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. | Compare action and task in a software process. | | CO1 | U | | 1 |
| 2. | List the activities in a software process. | | CO1 | R | | 1 |
| 3. | Recall the uses of analysis pattern. | | CO2 | R | | 1 |
| 4. | Name a few examples for scenario-based models used in software requirements. | | CO2 | R | | 1 |
| 5. | Define Fitt’s law. | | CO3 | R | | 1 |
| 6. | Distinguish between transform flow and transaction flow. | | CO3 | An | | 1 |
| 7. | Indicate the role of an independent test group (ITG). | | CO4 | U | | 1 |
| 8. | List the testing strategies that are used in software engineering. | | CO4 | R | | 1 |
| 9. | Recognize MOI model of leadership. | | CO5 | R | | 1 |
| 10. | Differentiate direct measures and indirect measures. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the umbrella activities in software engineering. | | CO1 | | U | 3 |
| 12. | Identify the task sets for requirements gathering. | | CO2 | | A | 3 |
| 13. | Outline the design issues in software engineering. | | CO3 | | U | 3 |
| 14. | Describe cleanroom software engineering approach in testing. | | CO4 | | U | 3 |
| 15. | Illustrate the role of people in a management spectrum. | | CO5 | | U | 3 |
| 16. | Enumerate “Defect Removal Efficiency”. | | 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 in detail the evolutionary process model with a neat diagram. | CO1 | | U | 8 |
|  | b. | Outline the software characteristics with necessary diagrams. | CO1 | | U | 4 |
|  |  |  |  | |  |  |
| 18. |  | Explain the requirements engineering process in detail. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | List the different types of architectural styles that exist for software and explain any one of them in detail. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Discuss the concept of validation testing in detail. | CO4 | | U | 6 |
|  | b. | Explain the types of system tests that are used for software-based systems. | CO4 | | U | 6 |
|  |  |  |  | |  |  |
| 21. |  | Discuss the four P’s in an effective software project management system in detail. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Explain the golden rules that are used in Interface design in detail. | CO3 | | U | 6 |
|  | b. | Summarize the overriding design principles and guidelines. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 23. |  | Explain Water fall Model. What are the problems that are encountered when the waterfall model is applied? | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the different metrics used in software measurement. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the software engineering and agile development processes. |
| CO2 | Formulate requirements and validate them. |
| CO3 | Make use of different software design methodologies. |
| CO4 | Determine suitable tests for testing and debugging a software. |
| CO5 | Apply appropriate methods to manage and maintain a software. |
| CO6 | Ensure that the software meets the required standards. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 28 | - | - | - | - | 29 |
| CO2 | 2 | 12 | 3 | - | - | - | 17 |
| CO3 | 1 | 27 | - | 1 | - | - | 29 |
| CO4 | 1 | 16 | - | - | - | - | 17 |
| CO5 | 1 | 15 | - | - | - | - | 16 |
| CO6 | 3 | 13 | - | - | - | - | 16 |
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**Graphical user interface, application

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| **Course Code** | **21EC2001** | **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. | Illustrate a C++ program to print the number entered by the user. | | CO1 | U | | 1 |
| 2. | Define Encapsulation. | | CO2 | R | | 1 |
| 3. | Estimate the output of the given source code:  #include <iostream>  using namespace std;  int main()  {  struct {  int a;  char b;  }str;  str.a = 999;  str.b = 'A';  cout<<str.a<<endl;  cout<<str.b<<endl;  return 0;  } | | CO1 | U | | 1 |
| 4. | Predict the output for the below source code:  #include <iostream>  using namespace std;  enum week {sun,mon,tues};  int main()  {  week a;  a=tues;  cout<<a+1;  return 0;  } | | CO3 | U | | 1 |
| 5. | Recall the syntax of creating an object in a class in C++. | | CO2 | R | | 1 |
| 6. | Observe the method to define and access multidimensional array in C++. | | CO3 | R | | 1 |
| 7. | Identify the procedure to read text containing embedded blanks in C++. | | CO1 | U | | 1 |
| 8. | Examine the procedure to create derived class. | | CO2 | R | | 1 |
| 9. | Illustrate a C++ program to print the value and address of a variable. | | CO1 | U | | 1 |
| 10. | List few istream class functions in C++. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the characteristics of Object Oriented Programing concepts. | | CO2 | | U | 3 |
| 12. | Explain inline function with an example program. | | CO4 | | A | 3 |
| 13. | Illustrate the concept of constructors with the help of an example program. | | CO2 | | A | 3 |
| 14. | Apply single inheritance concept and display student details. | | CO5 | | An | 3 |
| 15. | Compute the average of 5 numbers using the concept of pointers and arrays in C++. | | CO1 | | A | 3 |
| 16. | Express the hierarchical representation of stream classes. | | 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 characteristics of Object Oriented Programing languages in detail. | CO2 | | U | 6 |
|  | b. | Express an arithmetic calculator in C++ using switch-case statement. | CO1 | | U | 6 |
|  |  |  |  | |  |  |
| 18. |  | Show that the below mentioned functions for maintaining student database can be implemented in a single C++ program:   1. Function to get marks for 5 subjects. 2. Function to calculate CGPA. 3. Function to check scholarship eligibility from CGPA. 4. Function to Read and display student details. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Apply the concept of structures to add two distances measured in feet and inches. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Compare overloaded functions with normal functions in C++ and relate with suitable example programs. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain classes and objects with an example program.Relate the concept of overloaded constructor with this. | CO3 | | A | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain friend function and static function with suitable examples in C++. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Relate the concept of virtual member function accessed with pointers with an example program. | CO5 | | A | 6 |
|  | b. | Examine stream classes and stream errors in detail. | CO6 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain about templates in C++. | CO5 | | U | 4 |
|  | b. | Construct a C++ program for the below UML diagram using the concept of function overriding in inheritance : | CO4 | | A | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | Exhibit basic knowledge in object oriented programming for developing programming skills. |
| CO2 | Recognize features of object-oriented design such as encapsulation, inheritance, and composition of systems based on object identity for appropriate applications. |
| CO3 | Illustrate the concept of polymorphism and exceptions using object oriented approach. |
| CO4 | Specify simple data types and design implementations, using functions to document them. |
| CO5 | Create applications using inheritance in C++. |
| CO6 | Choose the appropriate techniques in algorithmic design strategies for real time application development. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 11 | 15 | - | - | - | 26 |
| CO2 | 3 | 9 | 3 | - | - | - | 15 |
| CO3 | 1 | 1 | 12 | - | - | - | 14 |
| CO4 | - | 12 | 11 | 12 | - | - | 35 |
| CO5 | - | 16 | 6 | 3 | - | - | 25 |
| CO6 | - | 3 | 6 | - | - | - | 9 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21EC2003** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONIC DEVICES AND CIRCUITS** | **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 expression for drift current density due to electron. | CO 1 / R | 1 |
| 2. | List the application of PN junction diode. | CO1 / U | 1 |
| 3. | Define the different operating region of transistor. | CO2 / R | 1 |
| 4. | Differentiate Enhancement and Depletion MOSFET. | CO2 / U | 1 |
| 5. | Give the symbol and structure of schottky diode. | CO3 / U | 1 |
| 6. | Define tunneling phenomenon. | CO3 / R | 1 |
| 7. | Which filter is used in rectifier? | CO4 / R | 1 |
| 8. | Can a rectifier convert DC to AC? | CO4 / A | 1 |
| 9. | List the types of bias method. | CO5 / U | 1 |
| 10. | Why the transistor is called a current controlled device? | CO5 / An | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Define avalanche break down. | CO 1 / R | 3 |
| 12. | The reverse leakage current of a transistor when connected in CB configuration is 0.2 µA and it is 18 µA when the same transistor is connected in CE configuration calculate α, β. | CO 2 / A | 3 |
| 13. | A Zener voltage regulator circuit is to maintain constant voltage at 60V, over a current range from 5 to 50mA. The input supply voltage is 200V. Solve for the value of resistance R to be connected in the circuit, for voltage regulation from load current IL =0mA, the maximum possible value of IL. What is the value of IL max? | CO 3 / An | 3 |
| 14. | Define rectifier and list its types. | CO 4 / U | 3 |
| 15. | List the requirements for biasing circuits. | CO 5/ U | 3 |
| 16. | List the types of feedback oscillators. | CO 6 / 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. | Outline the operation of conventional p-n junction diode. | CO1 / U | 6 |
| b. | Discuss the effect of doping on depletion region. | CO1 / An | 3 |
| c. | Point out why silicon is always preferred than germanium? | CO1 / A | 3 |
|  |  |  |  |  |
| 18. | a. | Justify transistor as an amplifier. | CO2/ U | 4 |
| b. | Develop the comparison of CE, CC, CB configuration. | CO2 / U | 5 |
| c. | Describe early effect. | CO2 / R | 3 |
|  |  |  |  |  |
| 19. | a. | Illustrative the V-I characteristic curve and explain the operation of zener diode. | CO3 / R | 6 |
| b. | Compare Avalanche and Zener breakdown. | CO3 / R | 3 |
| c. | Assess the characteristics of the material used in LED. | CO3/ A | 3 |
|  |  |  |  |  |
| 20. | a. | Explain the construction and working principle of full wave rectifier. | CO4/ U | 6 |
| b. | Draw an uncontrolled rectifier. | CO4/ An | 2 |
| c. | Explain the working of shunt regulator. | CO4/ A | 4 |
|  |  |  |  |  |
| 21. | a. | Explain the principle of operation and derive the expression for Class A amplifier. | CO5 / An | 8 |
| b. | Define biasing. | CO5 / R | 2 |
| c. | Recall stability. | CO5 / R | 2 |
|  |  |  |  |  |
| 22. | a. | Explain the concept of threshold voltage in a MOSFET. | CO2 / U | 5 |
| b. | Describe some applications of JFET. | CO2 / U | 3 |
| c. | Elaborate Channel length modulation. | CO2 / A | 4 |
|  |  |  |  |  |
| 23. | a. | Outline tunnel diode and varactor diode using energy band diagrams. | CO3 / U | 4 |
| b. | Explain about LED and its applications. | CO3/ A | 4 |
| c. | Describe the negative resistance of tunnel diode. | CO3/ R | 4 |
|  |  | **COMPULSORY** | | |
| 24. | a. | Explain the effect of negative feedback amplifiers. | CO6/ An | 4 |
| b. | Explain the principle of operation and derive the expression for Colpitts oscillator. | CO6/ U | 6 |
| c. | Define Barkhausen criterion. | CO6 / R | 2 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic properties of semiconductor physics |
| CO2 | Identify and differentiate the functioning of diode, BJT and FET. |
| CO3 | Define the fundamental operation principles and applications of special semiconductor devices. |
| CO4 | Demonstrate the functioning of DC Power supply. |
| CO5 | Analyze the biasing property and frequency response of amplifier circuits. |
| CO6 | Distinguish between amplifiers and oscillators. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 7 | 3 | 3 | - | - | 17 |
| CO2 | 8 | 18 | 3 |  |  |  | 29 |
| CO3 | 14 | 5 | 7 | 3 | - | - | 29 |
| CO4 | 1 | 9 | 5 | 2 |  |  | 17 |
| CO5 | 4 | 4 |  | 9 | - | - | 17 |
| CO6 | 2 | 9 |  | 4 | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21EC2005** | **Duration** | **3hrs** |
| **Course Name** | **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. | List the various stages in instruction cycle. | | CO1 | R | 1 |
| 2. | Infer the role of ready queue in process execution. | | CO1 | U | 1 |
| 3. | Define message passing. | | CO2 | R | 1 |
| 4. | Recall the function of ***fork ()*** system call. | | CO2 | R | 1 |
| 5. | Report any two CPU scheduling criteria. | | CO3 | U | 1 |
| 6. | Recall the worst-case CPU utilization for scheduling N processes. | | CO3 | R | 1 |
| 7. | List any two requirements that must be satisfied by critical-section problem. | | CO4 | R | 1 |
| 8. | Compare ***wait()*** and ***signal()*** operations. | | CO4 | U | 1 |
| 9. | Define C-SCAN scheduling. | | CO3 | R | 1 |
| 10. | Summarize the layers of a File system. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe the three general methods for passing parameters to the operating system. | | CO1 | U | 3 |
| 12. | Explain the role of the ***init (or systemd)*** process on UNIX and Linux  systems in regard to process termination. | | CO2 | An | 3 |
| 13. | Distinguish interrupt and dispatch latency. | | CO3 | U | 3 |
| 14. | Relate mutual exclusion and semaphore with an example. | | CO4 | U | 3 |
| 15. | Compare HDD and NVM scheduling. | | CO5 | R | 3 |
| 16. | Discuss all the file operations. | | 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 significance of system call interface and it types in detail. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss the different states of a process and highlight about process control block with a neat sketch. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19 |  | Consider the following set of processes, with the length of the CPU burst given in milliseconds:  **Process Burst Time Priority**  P1 2 2  P2 1 1  P3 8 5  P4 4 4  P5 5 3  The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0. Sketch the Gantt charts using the following scheduling algorithms: First Come First Serve (FCFS) algorithm and Shortest Job First (SJF) algorithm. Determine the turn-around time and waiting time of each process for each of these scheduling algorithms? Report the algorithms results in the minimum average waiting time (over all processes). | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe the Priority-based and Round Robin scheduling algorithm with a process table example and Gantt Chart. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the following classical synchronization problems in detail:   1. Bounded Buffer ii. Dining- Philosophers | CO4 | U | 6 |
|  | b. | Consider you have a ready queue which contains only two processes called and . They are trying to access a common data for their execution. Examine the two process synchronization using ***flag*** and ***turn*** variable? | CO4 | A | 6 |
|  |  |  |  |  |  |
| 22. |  | Consider the following snapshot of a system: Use the Banker’s algorithm.    a. Determine the content of the matrix ***Need***?  b. Is the system in a safe state?  c. If a request from process T1 arrives for (0,4,2,0), can the request be granted immediately? | CO4 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Consider the following requests are in the disk queue:  98, 183, 37,122, 14, 124, 65, 67  Head starts at: 53  Explain the procedure to provide services for above request sequence with the help of any two disk scheduling algorithms. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate the functions of file and file implementation. | CO6 | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Basic concepts and functions of operating systems. |
| CO2 | Design Processes and Threads. |
| CO3 | Analyze Scheduling algorithms. |
| CO4 | Explain the concept of Deadlocks. |
| CO5 | Analyze various memory management schemes. |
| CO6 | Construct I/O management and File systems. |

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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 | 2 | 12 | - | 3 | - | - | 17 |
| CO3 | 2 | 16 | 12 | - | - | - | 29 |
| CO4 | 1 | 10 | 18 | - | - | - | 29 |
| CO5 | 3 | - | - | 12 | - | - | 16 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |

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| **Course Code** | **21EC2006** | **Duration** | **3hrs** |
| **Course Name** | **MATHEMATICS FOR SIGNAL 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: Identity Matrix. | | CO1 | R | | 1 |
| 2. | List the uses of Cayley-Hamilton theorem. | | CO1 | R | | 1 |
| 3. | Find the number of samples at the output of a DTLTI system if the input has 2 samples and the impulse response of the system has 7 samples. | | CO2 | A | | 1 |
| 4. | Define a Dynamic system. | | CO2 | R | | 1 |
| 5. | Recall the Analysis equation of Continuous-Time Fourier Series (CTFS). | | CO3 | R | | 1 |
| 6. | Define the Fourier transform of x(-t) if the Fourier Transform of x(t) is X(jω) | | CO3 | U | | 1 |
| 7. | Identify the Nyquist interval for the signal x(t)=sin 600πt. | | CO4 | A | | 1 |
| 8. | State any two properties of ROC of Laplace Transform. | | CO4 | R | | 1 |
| 9. | Identify the DTFT of u | | CO5 | A | | 1 |
| 10. | Indicate the relation between the Z-transform and the Fourier Transform. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Calculate the even and odd components of the continuous time signal | | CO1 | | A | 3 |
| 12. | Test whether the given system is Causal or not. | | CO2 | | An | 3 |
| 13. | Discuss the Dirichlet conditions for Fourier Series | | CO3 | | U | 3 |
| 14. | Compute the Initial value of if | | CO4 | | A | 3 |
| 15. | Calculate the DTFT of | | CO5 | | A | 3 |
| 16. | Determine the Z transform of u(-n). | | 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. | Sketch the graphical representation of the following signals.  (i)  (ii)  (iii)  given | CO1 | | A | 8 |
|  | b | Test whether the given signal is periodic or not. If it is periodic, compute the Fundamental period. | CO1 | | An | 4 |
|  |  |  |  | |  |  |
| 18. | a. | Test the following properties for the system  i) Static or Dynamic  ii) Linear or Non-linear  iii) Time invariant or variant  iv) Causal or Non- causal | CO2 | | An | 6 |
|  | b. | Determine the response of the Discrete time system with the input and impulse response  using  Tabular method | CO2 | | A | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Determine the Fourier series coefficients of | CO3 | | A | 8 |
|  | b. | Explain Parseval’s relation of CTFS. | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 20. | a. | Explain impulse train sampling with necessary diagrams | CO4 | | A | 8 |
|  | b. | Calculate the Nyquist rate and the Nyquist interval of the signal | CO4 | | A | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Determine the Fourier Transform of | CO5 | | A | 6 |
|  | b. | Evaluate the (i) Frequency response and (ii) impulse response of a Causal system represented by the following difference equation. | CO5 | | E | 6 |
|  |  |  |  | |  |  |
| 22. | a. | Calculate the Laplace Transform and the ROC of | CO4 | | An | 6 |
|  | b. | Evaluate the Complete response of the following system using Laplace Transform  ; with initial conditions  ; and | CO4 | | E | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Calculate the inverse Laplace Transform of  given ROC < -2 | CO4 | | An | 6 |
|  | b. | State Sampling Theorem and explain Aliasing with a neat diagram | CO4 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a | Compute the Z transform of . Find out the ROC. | CO6 | | A | 6 |
|  | b. | Evaluate the Inverse Z-transform of  for ROC | CO6 | | An | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Analyze different types of matrices, signals for mathematical modeling. |
| CO2 | Realize the system properties to build basic model. |
| CO3 | Represent continuous time system using Fourier series and Fourier transform. |
| CO4 | Investigate the sampling process and Laplace Transform. |
| CO5 | Signify discrete time system using Fourier series and Fourier transform. |
| CO6 | Familiarize the frequency analysis of discrete time system using Z transform. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | - | 11 | 4 | - | - | 17 |
| CO2 | 1 | 1 | 6 | 9 | - | - | 17 |
| CO3 | 2 | 7 | 8 | - | - | - | 17 |
| CO4 | 1 | 7 | 15 | 12 | 6 | - | 41 |
| CO5 | - | 1 | 9 | - | 6 | - | 16 |
| CO6 | - | 4 | 6 | 6 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **21EC2007** | **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. | Tell the other name of Stack. | | CO1 | R | | 1 |
| 2. | Analyze the following code and write the output of the code  int main()  {  intarr[7]={10,20,30,40,50,60.70};  cout<<arr[5];  return 0;  } | | CO1 | An | | 1 |
| 3. | List any two common data structures. | | CO1 | R | | 1 |
| 4. | Show the time complexity of merge sort algorithm. | | CO2 | R | | 1 |
| 5. | Identify the correct notation for the following arithmetic expression  A B+ | | CO3 | U | | 1 |
| 6. | Examine the following binary tree and find the number of leaf nodes.  Binary Tree - javatpoint | | CO3 | R | | 1 |
| 7. | Define tail node in linked list. | | CO4 | R | | 1 |
| 8. | Analyze the following graph and find the degree of vertex C | | CO5 | R | | 1 |
| 9. | Define problem instance. | | CO6 | R | | 1 |
| 10 | Name the two types of knapsack problems. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Describe the following :  Time complexity.  Space complexity. | | CO1 | | U | 3 |
| 12. | Define sorting and give examples for sorting algorithms. | | CO2 | | R | 3 |
| 13. | Write adjacency matrix for the following undirected graph. | | CO3 | | A | 3 |
| 14. | Develop graph for the following linked list   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | A |  | B | 5 | X |  |  |  |  | |  |  |  |  |  |  |  |  |  | | B |  | C | 2 |  |  | D | 8 | X | |  |  |  |  |  |  |  |  |  | | C |  | E | 4 | X |  |  |  |  | |  |  |  |  |  |  |  |  |  | | D |  | A | 7 | X |  |  |  |  | |  |  |  |  |  |  |  |  |  | | E |  | D | 10 | X |  |  |  |  | | | CO4 | | A | 3 |
| 15. | Write short notes on recursive function. | | CO5 | | A | 3 |
| 16. | Name the components of Greedy Algorithm. | | 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. |  | Write different types of data structures and explain each type in detail. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain Bubble sort algorithm with example | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Construct sequential array representation for the following tree Sequential Representation of Binary Tree | CO3 | | A | 4 |
|  | b. | Define the following stack related operations:  PUSH.  POP.  Over flow condition.  Under flow condition. | CO3 | | R | 8 |
|  |  |  |  | |  |  |
| 20. |  | Explain different types of linked list with proper diagram. | CO4 | | An | 12 |
|  |  |  |  | |  |  |
| 21. |  | Explain prim’s algorithm with example. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. |  | Illustrate the shortest path between node C and the other nodes using Dijkstra’s algorithm.  Graph example | CO5 | | An | 12 |
|  |  |  |  | |  |  |
| 23. |  | Analyse the following linked list and answer the given questions, if the head node is 1005 then.    Write the address of Tail node.  Write the address of the location in which data N is stored.  Write the address of Successor node of 1009.  Write the data which is stored in the location 1003 | CO4 | | An | 4 |
|  | b. | Define the following with proper diagram:  Full binary tree.  Complete binary tree.  Perfect binary tree.  Balanced Binary tree. | CO3 | | R | 8 |
| **COMPULSORY QUESTION** | | | | | | |
| 24 | a. | Illustrate Knapsack Problem in detail. | CO6 | | An | 6 |
|  | b | Write the characteristics of an algorithm. | CO6 | | A | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Analyze the time and space efficiency of data structures and algorithms and apply this analysis to select the best tools for solving particular problems. |
| CO2 | Implement a variety of algorithms for searching and sorting, including linear search, binary search, insertion sort, selection sort, merge sort, quicksort, and heap sort. |
| CO3 | Describe, explain, and use abstract data types including stacks, queues, lists, sets, maps and graphs. |
| CO4 | Implement those data types using both contiguous and linked representations. |
| CO5 | Read and write recursive algorithms. Understand when recursion is, and is not, appropriate. |
| CO6 | Implement an advanced algorithm using Elementary and Greedy Method with Single Source Shortlist Paths. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 3 | 12 | 1 |  |  |  |
| CO2 | 4 |  | 12 |  |  |  |  |
| CO3 | 17 | 1 | 7 |  |  |  |  |
| CO4 | 1 |  | 3 | 16 |  |  |  |
| CO5 | 1 | 12 | 3 | 12 |  |  |  |
| CO6 | 5 |  | 6 | 6 |  |  |  |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **22EC2007** | **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. | Define Regular expressions with an example. | | CO1 | R | | 1 |
| 2. | Infer Bigrams with an example. | | CO1 | U | | 1 |
| 3. | Discuss Rounding Harmony rule with an example. | | CO2 | U | | 1 |
| 4. | Recite on two formal mechanisms involved in Optimality Theory. | | CO2 | R | | 1 |
| 5. | Recall the representation of Feature structure with an example. | | CO3 | R | | 1 |
| 6. | Identify in which type does Turing equivalent is found. | | CO3 | R | | 1 |
| 7. | Discuss the term Expressiveness in meaning representation with an example. | | CO4 | U | | 1 |
| 8. | Discuss Fallout to ignore spurious information in the text. | | CO4 | U | | 1 |
| 9. | Recall Frame net with thematic role explanation. | | CO5 | R | | 1 |
| 10. | Infer Stemming with an example. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List the important challenges faced by Natural Language Processing. | | CO1 | | R | 3 |
| 12. | Infer with a schematic diagram the vocal system and speech production. | | CO2 | | U | 3 |
| 13. | Explain pumping Lemma with a neat diagram. | | CO3 | | U | 3 |
| 14. | Explain on selectional restrictions towards word sense disambiguation. | | CO4 | | U | 3 |
| 15. | Differentiate Brown Corpus and British National Corpus. | | CO5 | | U | 3 |
| 16. | Relate the concepts of conversational implicature with its types. | | 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 the framework of finite state automata for discrete event system with an example. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. |  | Discuss the two main classes of speech sounds with Spectrogram. | CO2 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Describe Probabilistic context free grammar to solve the problem of disambiguation. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 20. |  | Discuss in detail the Lexical semantics with a parse tree example. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Recall on Human computer interaction in computational discourse segmentation. | CO5 | | R | 12 |
|  |  |  |  | |  |  |
| 22. |  | Explain in detail the N- Best list in multipass decoding in Speech Recognition with a neat block diagram. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Describe the syntax tree for an example “book that flight” using Top down parsing and Bottom up parsing. | CO2 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Discuss the architecture of adhoc IR systems with real time applications in Question and Answering. | CO6 | | U | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Build a tag for the given text with basic Language features. |
| CO2 | Design an innovative application using NLP components. |
| CO3 | Understand the rule-based system to tackle morphology/syntax of a language. |
| CO4 | Apply the tag set for statistical processing of real-time applications. |
| CO5 | Comprehend the use of different statistical approaches for different types of NLP applications. |
| CO6 | Understand the applications of the NLP techniques. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 25 | - | - | - | - | 29 |
| CO2 | 1 | 28 | - | - | - | - | 29 |
| CO3 | 2 | 15 | - | - | - | - | 17 |
| CO4 | - | 17 | - | - | - | - | 17 |
| CO5 | 13 | 3 | - | - | - | - | 16 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **22EC3004** | **Duration** | **3hrs** |
| **Course Name** | **GRAPH THEORY AND APPLICATIONS** | **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. | Show that a simple graph (i.e., a graph without parallel edges or self-loops) with n vertices and k components can have at most  (n − k)(n − k + l)/2 edges. | CO1 | U | 10 |
|  | b. | Develop the followingfor the given graph    i)G⊕G  ii) G — vi and  iii)G — ej | CO1 | An | 6 |
|  |  |  |  |  |  |
| 2. | a. | Explain geometric duality and the uniqueness of duality | CO2 | An | 12 |
|  | b. | Analyze the following and check Planarityby applying Elementary Reduction | CO2 | An | 4 |
|  |  |  |  |  |  |
| 3. |  | Explain the application of graph in solving problems | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. |  | Explain the properties of trees. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | Construct minimum cost spanning tree for the following graph using Prim's algorithm.  MST Prim's Algorithm | CO5 | A | 16 |
|  |  |  |  |  |  |
| 6. |  | Explain any four operations that can be performed on a layout using the corner stitch data structure. | CO6 | An | 16 |
|  |  |  |  |  |  |
| 7. | a. | Estimate the following for the binary tree which has n=11 vertices,   1. what is the minimum and maximum height(number of levels) of the tree 2. calculate the internal vertices and pendent vertices. | CO4 | E | 10 |
|  | b. | Calculate the distance d(T1,T2), d(T1,T3) and d(T2,T3) | CO4 | A | 6 |
|  |  |  |  |  |  |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Construct the interval graph by drawing containment graph and overlap graph for the following set of intervals | CO6 | A | 10 |
|  | b. | Explain Graph K-Colorability Problem in Physical Design. | CO6 | An | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic structure of graphs . |
| CO2 | Understand the concept of planar and dual graph |
| CO3 | Relate graph theory concepts in solving problems |
| CO4 | Understand the data structure concepts. |
| CO5 | Apply the appropriate algorithms to for Physical design. |
| CO6 | Apply an analytical approach for Physical design. |

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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 |  |  |  | 16 |  |  | 16 |
| CO3 |  |  | 16 |  |  |  | 16 |
| CO4 |  |  | 6 | 16 | 10 |  | 32 |
| CO5 |  |  | 16 |  |  |  | 16 |
| CO6 |  |  | 10 | 26 |  |  | 36 |
|  | | | | | | | **132** |



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| **Course Code** | **22EC3013** | **Duration** | **3hrs** |
| **Course Name** | **WIRELESS SENSOR NETWORKS 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. | a. | List the major differences between MANETS and WSNs. | CO1 | R | 10 |
|  | b. | Define the following:  i) I2C  ii) CAN  iii) RS485  iv) LPWAN  v) LORAWAN | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Distinguish between SoC and SBC. | CO2 | U | 10 |
|  | b. | Classify the boards for small scale applications and large-scale applications. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Analyzethe different protocol stack for sensor networks with a help of a diagram. | CO3 | An | 10 |
|  | b. | Identify the differences between Ad-Hoc networks and WSN in case of an IoT architecture. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | There are three predominant methods of Mac protocols for WSNs, Explain the protocol that includes S-MAC and DS-MAC within it. | CO4 | U | 10 |
|  | b. | Design networks with an effort to reduce issue of broadcast and flooding techniques. | CO4 | C | 10 |
|  |  |  |  |  |  |
| 5. |  | Examine the major ways of Data Gathering in Wireless sensor networks. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Identify the most important programming languages for IoT development and identify the most predominant language among them. | CO2 | U | 10 |
|  | b. | Illustrate the different sensor network architectures. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Interpret the use cases of IEEE 802.15.4 standards in ZigBee and LOWPAN. | CO4 | U | 10 |
|  | b. | Develop suitable algorithms to improve existing wireless sensor network applications. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Distinguish between IPV 4 and IPV 6. | CO6 | E | 10 |
|  | b. | Describe the AllJoyn framework with all its components with a real-world example. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Identify design requirements, suitable algorithms, and the state-of-the-art cloud platform to meet the industrial requirement. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Assess the applicability and limitations of communication protocols for a real time WSN application |
| CO2 | Infer and develop hardwarebased set-up for the required IoT application with the most effective hardware and software implementation. |
| CO3 | Interpret the routing protocols function and their implications on datatransmission delay and bandwidth. |
| CO4 | Design networks with an attempt to reduce issue of broadcast and flooding techniques. |
| CO5 | Develop appropriate algorithms to improve existing or new wireless sensor network applications. |
| CO6 | Identify different protocol, design requirements, suitable algorithms, and the state-of-the-art cloud platform to meet the industrial requirement. |

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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 |  | 10 |  |  | 30 |
| CO3 |  | 20 |  | 10 |  |  | 30 |
| CO4 |  | 20 |  |  |  | 10 | 30 |
| CO5 |  |  | 30 |  |  |  | 30 |
| CO6 |  | 30 |  |  | 10 |  | 40 |
|  | | | | | | | **180** |

**Graphical user interface, application

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| **Course Code** | **18EC2003** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SYSTEM 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 logic gate that performs the AND-NOT operation. | | CO1 | R | | 1 |
| 2. | Show the equivalency of A+A’ using Boolean law. | | CO2 | U | | 1 |
| 3. | Write the output equation for sum in full adder. | | CO3 | A | | 1 |
| 4. | Name the combinational circuit that performs many to one function. | | CO3 | R | | 1 |
| 5. | Compare latch and flipflop. | | CO4 | U | | 1 |
| 6. | Calculate the number of states that can be counted using ring counter with 3 flipflops. | | CO4 | A | | 1 |
| 7. | Tell the expansion of EEPROM. | | CO5 | R | | 1 |
| 8. | Identify the PLD in which both AND gates and OR gates are programmable. | | CO5 | R | | 1 |
| 9. | Name any two modelling in verilog. | | CO6 | R | | 1 |
| 10. | Recall the condition for JK flip flop to toggle. | | CO4 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Convert the given gray code 101101 into equivalent binary code. | | CO1 | | U | 3 |
| 12. | Show the logic diagram of 1-bit magnitude comparator. | | CO3 | | U | 3 |
| 13. | Define pulse width and propagation delay. | | CO4 | | R | 3 |
| 14. | Summarize the advantages of ECL and CMOS. | | CO5 | | U | 3 |
| 15. | Compare RAM and ROM. | | CO5 | | U | 3 |
| 16. | Classify the types of operators in Verilog. | | 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. |  | Sketch the symbols, truth tables and output expressions for all the basic logic gates. | CO1 | | A | 12 |
|  |  |  |  | |  |  |
| 18. |  | Explain 4x1 Mux and 1x4 Demux with their truth tables, output expressions and logic diagrams. | CO3 | | U | 12 |
|  |  |  |  | |  |  |
| 19. |  | Develop a 3-bit asynchronous up counter with relevant truth table and diagrams. | CO4 | | A | 12 |
|  |  |  |  | |  |  |
| 20. |  | Classify the types of logic families and analyze any one logic gate using CMOS logic with suitable diagram. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Tabulate the various types of memory. List the characteristics of each type of memory. | CO5 | | R | 12 |
|  |  |  |  | |  |  |
| 22. |  | Describe the working of SISO, PIPO shift registers with relevant diagrams. | CO4 | | U | 12 |
|  |  |  |  | |  |  |
| 23. |  | Sketch the logic diagrams, output expressions and truth tables of Half Subtractor, Full Subtractor. | CO3 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Show the PLA connections to employ the below expressions.  F1 = X1X2 + X1X3’ + X1’ X2’ X3  F2 = X1X2 + X1’X2’X3 + X1X3 | CO5 | | U | 8 |
|  | b. | Compare PLA and PAL. | CO5 | | U | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the basic postulates of Boolean algebra and the operation of logic gates. |
| CO2 | Choose an optimal method for simplification of Boolean expressions. |
| CO3 | Design and distinguish various combinational logic circuits. |
| CO4 | Design and compare various sequential logic circuits. |
| CO5 | Illustrate different logic families; classify memory devices and identify methods for implementation of logic circuits. |
| CO6 | Design simple logic circuits using HDL codes. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | 12 |  |  |  | 16 |
| CO2 |  | 1 |  |  |  |  | 1 |
| CO3 | 1 | 15 | 13 |  |  |  | 29 |
| CO4 | 4 | 13 | 13 |  |  |  | 30 |
| CO5 | 14 | 30 |  |  |  |  | 44 |
| CO6 | 1 | 3 |  |  |  |  | 4 |
|  | | | | | | | **124** |

**Graphical user interface, application

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| **Course Code** | **20EC1003** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING WITH 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 problem solving technique,  Step1: Start  Step2: Include standard I/O header files  Step3: Read length and breadth from the user  Step4: Calculate the area, length X breadth  Step5: Store the result in the variable area.  Step6: Display the result  Step7: Stop | | CO1 | U | 1 |
| 2. | Write a C program to display ‘I am born to succeed’. | | CO2 | A | 1 |
| 3. | Analyze the bugs and correct them.  #include <stdio.h>  {  int a, b;  a=10.5;  b=6;  printf(“A is” a b);  } | | CO2 | An | 1 |
| 4. | Identify the expected Output.  #include <stdio.h>  int main()  {  int a=0;  a = 5<2 ? 4 : 3;  printf("%d",a);  return 0;  } | | CO2 | U | 1 |
| 5. | Interpret the output.  #include <stdio.h>  int main()  {  int a[4] = {1,11,14,20};  int i=0;  while(i<4)  {  printf("%d ", a[i]);  i++;  }  } | | CO3 | U | 1 |
| 6. | Write a C program to read a String with blank space | | CO3 | A | 1 |
| 7. | Describe about ‘Function declaration’. | | CO4 | R | 1 |
| 8. | List any 4 types of ‘String Functions’. | | CO4 | R | 1 |
| 9. | Explain in brief about ‘&’ and ‘\*’ operators. | | CO5 | U | 1 |
| 10. | Interpret a[1][2] from the following.  int a[3][4] = {{0, 1, 2, 3} , {4, 5, 6, 7} , {8, 9, 10, 11 }}; | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Compare Hardware and Software. | | CO1 | U | 3 |
| 12. | Compare While loop and Do-While loop. | | CO2 | U | 3 |
| 13. | Write a C program to display the elements in an array. | | CO3 | A | 3 |
| 14. | Compare User defined functions and Library functions. | | CO4 | U | 3 |
| 15. | Distinguish Arrays and Structure. | | CO5 | U | 3 |
| 16. | Explain pointer array. | | 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. | Explain in detail about the ‘Program development cycle’. | CO1 | U | 8 |
|  | b. | Compare: Algorithm and Flowchart. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. |  | Write a ‘C’ code for building an arithmetic calculator to perform Addition, Subtraction, Multiplication and Division using Switch-case statement. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Construct a C program to perform Matrix Subtraction. | CO3 | A | 8 |
|  | b. | Write a C program to concatenate two strings by adopting the library functions. | CO3 | A | 4 |
|  |  |  |  |  |  |
| 20. |  | Write a C program to swap two numbers by adopting,  a). Call by Value b). Call by Reference | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Write a C program to sort a given array in both ascending and descending order by adopting the concept of functions. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Write a C program using Structures to create a payroll report of employees in an organization. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Choose an application in C to print the Name (Get the input from the user), Reg. No (Get the input from the user), Marks for 5 subjects (Get the input from the user), Calculate the  average and display the grade. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Construct a C program to accept records of 5 different states using array of structures. The structure should contain ‘char’ state and number of ‘int’ engineering colleges, ‘int’ medical colleges, ‘int’ management colleges, and ‘int’ universities. Calculate the total colleges and display the state, which is having highest number of colleges. | CO6 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of computer and software development process. |
| CO2 | Understand the basics of programming skills using C language |
| CO3 | Apply innovative ideas for the problem using arrays and strings. |
| CO4 | Adopt different techniques for using functions in the program. |
| 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 |  | 16 |  |  |  |  | 16 |
| CO2 |  | 4 | 13 | 1 |  |  | 18 |
| CO3 |  | 1 | 16 |  |  |  | 17 |
| CO4 | 2 | 3 | 12 |  |  |  | 17 |
| CO5 |  | 8 | 24 |  |  |  | 32 |
| CO6 |  |  | 24 |  |  |  | 24 |
|  | | | | | | | **124** |

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| **Course Code** | **20EC2014** | **Duration** | **3hrs** |
| **Course Name** | **BASIC ELECTRONICS FOR AEROSPACE ENGINEERS** | **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 symbol for fixed and variable resistor. | | CO1 | U | | 1 |
| 2. | What was the key invention of Heinrich Hertz in the year of 1888? | | CO1 | R | | 1 |
| 3. | List down the applications of an Induction motor. | | CO2 | R | | 1 |
| 4. | What is the role of commutator in a DC Generator? | | CO2 | R | | 1 |
| 5. | List the various types of Arduino microcontroller. | | CO3 | U | | 1 |
| 6. | What is unit for measuring magnetic flux? | | CO3 | R | | 1 |
| 7. | Name some examples for Active electronic components. | | CO4 | U | | 1 |
| 8. | Draw the truth table of universal gate. | | CO4 | R | | 1 |
| 9. | List few applications of Gyro sensors. | | CO5 | U | | 1 |
| 10. | The speed (Data Rate) of 3G Technology is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Figure out the main classification blocks of active Elements and explain the same with some examples | | CO1 | | R | 3 |
| 12. | Draw and explain the VI characteristics of a diode under reverse bias condition. | | CO2 | | U | 3 |
| 13. | Draw the equivalent circuit diagram of DC Shunt motor with necessary equations. | | CO3 | | C | 3 |
| 14. | Draw and explain the working of half wave rectifier. | | CO4 | | C | 3 |
| 15. | With an example elaborate the working of an ultrasonic sensor. | | CO5 | | U | 3 |
| 16. | Brief out the 5G bands in India. | | 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. |  | Determine the maximum and minimum value of a resistor with the following color code in ohms. Make a color code table by including all necessary colors.  a) Red, Violet, Orange and No color  b) Yellow, White, Black and Gold | CO1 | | An | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Find the total resistance, voltage, and current in series resistor circuit with four resistors. That are each measured as R1= 12Ω, R2 = 10 Ω, R3 = 4 Ω, and R4 = 15 Ωrespectively. The voltage between the resistors is measured as V1=2, V2=8, V3=6, V4=4, Drawa neat circuit diagram. | C01 | | E | 8 |
|  | b. | Differentiate different types of Resistors. | C01 | | R | 4 |
|  |  |  |  | |  |  |
| 19. |  | A 6 pole DC shunt generator, Lap connected with 100 slots each slots contain 40 conductors and running at 1500 rpm supplies a load of 20.5 Ω resistance at the terminal voltage of 240V. The armature resistance is 0.25 Ω and the field resistance is 240Ω . find the armature current, the induced EMF and the flux per pole. | C02 | | E | 12 |
|  |  |  |  | |  |  |
| 20. | a. | Elaborate CB, CE configurations of a transistors. | C03 | | R | 6 |
|  | b. | Draw and explain the characteristics of a BJT. | C03 | | C | 6 |
|  |  |  |  | |  |  |
| 21. | a. | Using a detailed constructional diagram, explain how a DC generator works and how it is built. | C02 | | R | 8 |
|  | b. | Draw and explain the parts of a DC 3 Point Starter. | C02 | | R | 4 |
|  |  |  |  | |  |  |
| 22. | a. | Draw and name all the basic logic gates and also explain its function based on truth table representation and symbolic diagrams. | C04 | | C | 8 |
|  | b. | Illustrate the working of an Arduino with any small project example. | C04 | | C | 4 |
|  |  |  |  | |  |  |
| 23. |  | Describe the operation of the bourdon tube with a neat diagram. Write the advantages and limitations of bourdon tube pressure gauge. | C05 | | A | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Explain the various blocks of general communication system with the neat diagram. | CO6 | | R | 6 |
|  | b. | Differentiate 2G,3G and 4G technologies. | CO6 | | U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize importance and judicious use of electronic components in everyday life. |
| CO2 | Identify the types of electrical machines used for various applications. |
| CO3 | Understand and apply the concept of electronics to design simple circuits. |
| CO4 | Understand and relate various digital circuits. |
| CO5 | Understand the various sensing and instrumentation applications. |
| CO6 | Identify the various generations of wireless communications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 1 |  | 12 | 8 |  | 29 |
| CO2 | 14 | 3 |  |  | 12 |  | 29 |
| CO3 | 7 | 1 |  |  |  | 9 | 17 |
| CO4 | 1 | 1 |  |  |  | 15 | 17 |
| CO5 | 1 | 3 | 12 |  |  |  | 16 |
| CO6 | 10 | 6 |  |  |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **20EC2015** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRICAL AND ELECTRONICS IN CIVIL 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. | Give few examples for conductors and insulators. | | CO1 | U | | 1 |
| 2. | Draw the symbol for fixed and variable Inductor. | | CO1 | R | | 1 |
| 3. | State faradays law of electromagnetic induction. | | CO2 | R | | 1 |
| 4. | Define what is an active element with its example | | CO2 | R | | 1 |
| 5. | George Simon ohm invented resistance in the year of \_\_\_\_\_\_\_. | | CO3 | U | | 1 |
| 6. | Write the formula for finding total capacitance value if the circuit is in series. | | CO3 | R | | 1 |
| 7. | Describe the various arduino microcontroller types. | | CO4 | U | | 1 |
| 8. | Covert the number 8, 12 to a 4-bit Binary number | | CO5 | E | | 1 |
| 9. | What are all the three categories of satelites ? | | CO6 | U | | 1 |
| 10. | Point out the role of a transmitter in communication system. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Compare led and CFL lamps. | | CO1 | | An | 3 |
| 12. | Write any few applications of an Induction motor. | | CO2 | | U | 3 |
| 13. | Differentiate different types of capacitors. | | CO3 | | An | 3 |
| 14. | Explain Sequential circuit. | | CO4 | | U | 3 |
| 15. | Differentiate analog and digital sensors. | | CO5 | | An | 3 |
| 16. | What are all the key features of 5G technology? | | 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. | Draw a Simple wiring diagram for a Three phase wiring system with any 3 basics load. | CO1 | | C | 8 |
|  | b. | Point out the key advantages and disadvantages of single-phase wiring system. | CO1 | | R | 4 |
| 18. | a. | Elaborate on Non- conventional sources of energy. | CO1 | | U | 6 |
|  | b. | What general safety precautions should anyone take when working with or near electricity? | CO1 | | An | 6 |
| 19. |  | A 4 pole DC series generator, lap connected with 122 slots each slots contain 60 conductors and running at 1700 rpm supplies a load of 20.5 Ω resistance at the terminal voltage of 230V. The armature resistance is 0.25 Ω and the field resistance is 230Ω. Find the armature current, the induced EMF and the flux per pole. Draw the neat equivalent circuit diagram. | C02 | | A | 12 |
| 20. | a. | Using a detailed constructional diagram, explain how a DC Motor works and how it is built. | CO2 | | C | 8 |
|  | b. | Draw and explain the parts of a DC 3 Point Starter. | CO2 | | C | 4 |
| 21. | a. | Find the total resistance, voltage, and current in parallel resistor circuit with three resistors. That are each measured as R1= 9 Ω, R2 = 12 Ω and R3 = 4 Ω, respectively. The Current between the resistors is measured as I1=2A, I2=8A and I3=6A, Draw the circuit neatly. | CO3 | | E | 8 |
|  | b. | Determine the maximum and minimum value of a resistor with the following color code in ohms. Make a color code table by including all necessary colors.  Yellow, White, Black and Gold. | CO3 | | E | 4 |
| 22. |  | On the basis of truth table representation and symbolic diagrams, draw, label, and describe each basic logic gate's functions. | CO4 | | C | 12 |
| 23. |  | Describe the procedure for automatically turning on and off a pump motor by monitoring the water level inside the water tank. | CO5 | | C | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | With a neat diagram describe the satellite system for global mobile communication. | CO6 | | U | 6 |
|  | b. | Explain in brief on 2G, 3G and 4G technologies. | CO6 | | R | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize importance and judicious use of energy systems in everyday life |
| CO2 | Identify the types of electrical machines used for various applications. |
| CO3 | Understand and apply the concept of electronics to design simple circuits. |
| CO4 | Understand and relate various digital circuits. |
| CO5 | Understand the various sensing and instrumentation applications |
| CO6 | Identify the various generations of wireless communications |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 7 |  | 9 |  | 8 | 29 |
| CO2 | 2 | 3 | 12 |  |  | 12 | 29 |
| CO3 | 1 | 1 |  | 3 | 12 |  | 17 |
| CO4 |  | 4 |  |  |  | 12 | 16 |
| CO5 |  | 3 |  |  | 1 | 12 | 16 |
| CO6 | 6 | 8 |  | 3 |  |  | 17 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21EC1001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONICS FOR EVERYDAY LIFE** | **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 applications of electronic control. | | | CO1 | R | | 1 |
| 2. | Indicate few components used to control electrons. | | | CO1 | U | | 1 |
| 3. | Define signal to noise ratio. | | | CO2 | R | | 1 |
| 4. | Tell the three basic forms of analog modulation. | | | CO2 | R | | 1 |
| 5. | Differentiate LCD and LED screens. | | | CO3 | U | | 1 |
| 6. | Name the types of cables used in CATV transmission. | | | CO3 | R | | 1 |
| 7. | State the access technology used in 4G mobile communication. | | | CO4 | R | | 1 |
| 8. | Enumerate the generations of cordless phones. | | | CO4 | R | | 1 |
| 9. | Distinguish between barcode and QR code. | | | CO5 | U | | 1 |
| 10. | State the types of pacemakers. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Show the Hierarchy of Electronics. | | | CO1 | | U | 3 |
| 12. | Differentiate Buffer and Power amplifier. | | | CO2 | | U | 3 |
| 13. | Indicate the reason for slanted video recording/playback head in a VCR. | | | CO3 | | U | 3 |
| 14. | Review the working of GPS. | | | CO4 | | U | 3 |
| 15. | Tabulate the advantages of microwave cooking. | | | CO5 | | R | 3 |
| 16. | Discuss the functioning of heart. | | | 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 the working of a personal computer with detailed block diagram. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Discuss the various characteristics of loudspeakers. | CO2 | | U | 6 |
|  | | b. | Illustrate the block diagram of a complete PA system. | CO2 | | U | 6 |
|  | |  |  |  | |  |  |
| 19. | |  | Express the working of a television receiver with a neat block diagram. | CO3 | | U | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Describe how a cell phone call works. | CO4 | | U | 8 |
|  | | b. | Indicate the advantages and disadvantages of cell phones. | CO4 | | U | 4 |
|  | |  |  |  | |  |  |
| 21. | | a. | Examine the operation of refrigerators. | CO5 | | R | 8 |
|  | | b. | Construct a digital clock. | CO5 | | C | 4 |
|  | |  |  |  | |  |  |
| 22. | |  | Illustrate the block diagram of a microwave oven and explain its working. | CO5 | | U | 12 |
|  | |  |  |  | |  |  |
| 23. | | a. | Report the components and working of a DTH system. | CO3 | | U | 6 |
|  | | b. | Record the working of a moving coil cone type loudspeaker. | CO2 | | A | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Explain about the need, components, and types of pacemakers. | CO6 | | U | 8 |
|  | | b. | Write short notes on Pulse Oximeter. | CO6 | | A | 4 |

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|  | **COURSE OUTCOMES** |
| CO1 | Define the components in an electronic system. |
| CO2 | Understand the working of audio systems. |
| CO3 | Explain the various standards and technology in video systems. |
| CO4 | Understand the telephone network and mobile phone systems. |
| CO5 | Demonstrate the working of office and domestic appliances. |
| CO6 | Comprehend the functioning of medical equipments. |

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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 | 2 | 15 | 6 | - | - | - | 23 |
| CO3 | 1 | 22 | - | - | - | - | 23 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | 11 | 13 | - | - | - | 4 | 28 |
| CO6 | 1 | 11 | 4 | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **21EC1006** | **Duration** | **3hrs** |
| **Course Name** | **INTRODUCTION TO COMPUTER 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. | Identify the bidirectional bus in computer architecture. | | CO1 | U | | 1 |
| 2. | Recall an example of output device through which computer can communicate to the user. | | CO1 | R | | 1 |
| 3. | List any 2 inputs to control unit. | | CO3 | R | | 1 |
| 4. | Sketch the machine instruction format. | | CO1 | A | | 1 |
| 5. | Name the special function register used to hold the address of the next instruction to be executed. | | CO1 | R | | 1 |
| 6. | Show the instruction used to transfer data to peripheral devices. | | CO5 | R | | 1 |
| 7. | Identify the technique used to determine the device which issued the interrupt in Interrupt driven IO transfer. | | CO5 | R | | 1 |
| 8. | Recall any one disadvantage of multicore system. | | CO4 | R | | 1 |
| 9. | Show the significance of mapping fucntion. | | CO5 | U | | 1 |
| 10. | State Miss Rate. | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Summarize the registers used in CPU. | | CO1 | | U | 3 |
| 12. | Differentiate hardwired and microprogrammed control unit | | CO3 | | U | 3 |
| 13. | Give an example for 1-byte, 2-byte and 3-byte instruction. | | CO1 | | An | 3 |
| 14. | List some demerits of programmed IO transfer. | | CO5 | | U | 3 |
| 15. | Draw out the applications of parallel processing. | | CO4 | | An | 3 |
| 16. | Identify the types of cache mapping functions. | | 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. |  | Discuss the importance of flag and explain each flag with suitable illustrations. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Describe the microoperations used in fetch cycle. | CO3 | | U | 6 |
|  | b. | Explain with a neat block diagram of control unit with input and output signal specifications. | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 19. | a. | Write an assembly language program to add 8 bit numbers and store the result in memory. | CO1 | | A | 6 |
|  | b. | Summarize the instructions used for data transfer and arithmetic operations. | CO2 | | U | 6 |
|  |  |  |  | |  |  |
| 20. |  | Express the various addressing modes in 8085 microprocessors | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 21. |  | Describe with neat illustration how data is transferred from IO to CPU in programmed IO transfer mode. | CO5 | | U | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Discuss on the modes of data transfer using Direct Memory Access | CO5 | | U | 8 |
|  | b. | Explain the advantage of pipelining concept and how it really helps in reducing the instruction execution time. | CO3 | | U | 4 |
|  |  |  |  | |  |  |
| 23. | a. | Express the meaning of parallelism and explain the various forms of parallel computing. | CO4 | | U | 8 |
|  | b. | Represent the concept of Multithreading and what are the advantages of it. | CO5 | | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Inspect the memory technologies used in memory hierarchies and give your inferences. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics structure of computers, operations and instructions. |
| CO2 | Design arithmetic and logic unit. |
| CO3 | Understand pipelined execution and design control unit. |
| CO4 | Understand parallel processing architectures. |
| CO5 | Understand the various memory systems and I/O communication. |
| CO6 | Design Memory Systems. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 28 | 7 | 3 |  |  | 40 |
| CO2 |  | 6 |  |  |  |  | 6 |
| CO3 | 1 | 19 |  |  |  |  | 20 |
| CO4 | 1 | 8 |  | 3 |  |  | 12 |
| CO5 | 2 | 28 |  |  |  |  | 30 |
| CO6 | 1 | 3 |  | 12 |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| **Course Code** | **22EC1001** | **Duration** | **3hrs** |
| **Course Name** | **PHYSICAL ELECTRONICS** | **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 term “Pitch”. | | CO1 | R | | 1 |
| 2. | Consider two speakers are connected in parallel with the impedances of Z1= 4 Ω and Z2= 4 Ω. Find the equivalent impedance Z in ohms. | | CO1 | E | | 1 |
| 3. | Give examples for high-pitched sound and low-pitched sound. | | CO2 | U | | 1 |
| 4. | Tell the units for Sound Intensity. | | CO2 | R | | 1 |
| 5. | List the methods of Ultrasonics production. | | CO3 | R | | 1 |
| 6. | Write the drawbacks of solar cells. | | CO3 | A | | 1 |
| 7. | Predict the maximum open circuit voltage of a solar cell. | | CO4 | E | | 1 |
| 8. | Label the parts of wind turbine with a neat diagram. | | CO4 | R | | 1 |
| 9. | List any two properties of superconductor. | | CO5 | R | | 1 |
| 10. | Write the advantages of fuel cell. | | CO6 | A | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Estimate the intensity of sound in decibels, if I/IO=7.5 | | CO1 | | E | 3 |
| 12. | Compute the reverberation time (T), if the volume of room is 2500 m3 and absorption co-efficient to be 99 sabin. | | CO2 | | A | 3 |
| 13. | Recall the concept “Piezoelectric effect”. | | CO3 | | R | 3 |
| 14. | Define cavitation in ultrasonic cleaning. | | CO4 | | R | 3 |
| 15. | Visualize the tidal energy harvester kept at seashore. | | CO5 | | R | 3 |
| 16. | List the applications of LASER. | | 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 in detail about the factors affecting acoustics of sound and its remedies. | CO1 | | A | 8 |
|  | b. | |  | | --- | | Discuss briefly about the magnetostriction effect. | | CO1 | | U | 4 |
| 18. | a. | |  | | --- | | Construct the internal structure of condenser microphone and explain its working principle. | | CO2 | | A | 7 |
|  | b. | |  | | --- | | Write the properties of ultrasonic waves. | | CO2 | | A | 5 |
| 19. |  | Explain the working principle of wind turbine with necessary diagrams. | CO3 | | U | 12 |
| 20. |  | Classify and correlate the non-destructive testing using ultrasonics. | CO4 | | U | 12 |
| 21. | a. | Explain in detail about the mechanism, classification and applications of fuel cell. | CO5 | | An | 6 |
|  | b. | Explain in detail about the principles and properties of superconductivity. | CO5 | | A | 6 |
| 22. |  | Express the equation for energy density ρ(r) using Einstein’s Co-efficient. | CO5 | | C | 12 |
| 23. | a. | Paraphrase the working principle of CO2 laser with neat sketch. | CO6 | | U | 6 |
|  | b | Explain the arrangement and working of G.P Thomson experiment. | CO6 | | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. |  | Describe the basic components and working principle of scanning electron microscope. | CO6 | | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of lasers and apply laser action in electronic |
| CO2 | Discern the laws governing acoustics and implement the same in creating better environment for workers in electronics and communication industries. |
| CO3 | Apply non-destructive testing techniques in the field of electronics industry. |
| CO4 | Create efficient electronics industrial applications by applying the principles of superconducting materials. |
| CO5 | Infer the knowledge of Renewable energy sources and devices. |
| CO6 | Apply the basic concepts of quantum mechanics in devices such as Single Electron Transistor. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 | 8 |  | 4 |  | 17 |
| CO2 | 1 | 1 | 15 |  |  |  | 17 |
| CO3 | 4 | 12 | 1 |  |  |  | 17 |
| CO4 | 4 | 12 | 6 |  | 1 |  | 22 |
| CO5 | 3 | 8 | 12 |  |  |  | 23 |
| CO6 | 15 | 6 | 1 | 6 |  |  | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

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| --- | --- | --- | --- |
| **Course Code** | **22EC1004** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS 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. | Compare renewable and non-renewable energy sources. | | | CO1 | U | | 1 |
| 2. | State few advantages of smart energy meter. | | | CO1 | R | | 1 |
| 3. | Infer the significance of commutator. | | | CO2 | U | | 1 |
| 4. | List the advantages of BLDC motor. | | | CO2 | R | | 1 |
| 5. | Name the majority and minority charge carriers in N type semiconductor. | | | CO3 | R | | 1 |
| 6. | List few applications of a transistor. | | | CO3 | R | | 1 |
| 7. | Name the gate that is used to implement SUM output in a half adder circuit. | | | CO4 | R | | 1 |
| 8. | Define embedded system. | | | CO4 | R | | 1 |
| 9. | List an example of inverse sensor. | | | CO5 | R | | 1 |
| 10. | Compare active and passive satellites. | | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | |
| 11. | Illustrate the working principle of a solar cell. | | | CO1 | | A | 3 |
| 12. | Paraphrase Fleming’s right hand rule. | | | CO2 | | U | 3 |
| 13. | Interpret the reverse saturation current. | | | CO3 | | A | 3 |
| 14. | Compare combinational and sequential circuits. | | | CO4 | | U | 3 |
| 15. | Infer the working of a piezo-electric crystal. | | | CO5 | | U | 3 |
| 16. | Sketch the basic block diagram of a communication 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. | |  | Explain the working of thermal power plant with neat diagram. | CO1 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | |  | Explain the working principle of motor in detail. | CO2 | | A | 12 |
|  | |  |  |  | |  |  |
| 19. | |  | Classify the various passive components and briefly describe about the color coding process of a resistor. | CO3 | | An | 12 |
|  | |  |  |  | |  |  |
| 20. | |  | Interpret the logic circuit and truth table of various logic gates. | CO4 | | U | 12 |
|  | |  |  |  | |  |  |
| 21. | |  | Illustrate the applications of sensor in Overhead tank water level indication system. | CO5 | | A | 12 |
|  | |  |  |  | |  |  |
| 22. | | a. | Describe Fleming’s left hand and right hand rule. | CO2 | | U | 6 |
|  | | b. | Discuss about the various types of memories. | CO4 | | U | 6 |
|  | |  |  |  | |  |  |
| 23. | |  | Interpret the logic circuit and characteristic table of half adder and SR flip flop. | CO1 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | |  | Compare the various features of 1G to 5G technologies in detail with necessary applications. | CO6 | | An | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize importance and judicious use of energy systems in everyday life. |
| CO2 | Identify the types of electrical machines used for various applications. |
| CO3 | Understand and apply the concept of electronics to design simple circuits. |
| CO4 | Understand and relate various digital circuits. |
| CO5 | Understand the various sensing and instrumentation applications. |
| CO6 | Identify the various generations of wireless communications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 25 | 3 | - | - | - | 29 |
| CO2 | 1 | 10 | 12 | - | - | - | 23 |
| CO3 | 2 | - | 3 | 12 | - | - | 17 |
| CO4 | 2 | 21 | - | - | - | - | 23 |
| CO5 | 1 | 3 | 12 | - | - | - | 16 |
| CO6 | - | 1 | 3 | 12 | - | - | 16 |
|  | | | | | | | **124** |