

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **09EC224/14EC2014/EC228/EC245/12EC216** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SIGNAL PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Determine the number complex additions are required to be performed in linear filtering of a sequence using FFT algorithm? | | CO1 | A | 1 |
| 2. | Define zero padding. | | CO1 | R | 1 |
| 3. | Consider the signal x(t)=cos(6πt)+sin(8πt), where t is in seconds. Determine the Nyquist sampling rate (in samples/second) for the signal y(t)=x(2t+5). | | CO1 | A | 1 |
| 4. | **List any two properties of Butterworth filter and Chebyshev type-I filter.** | | CO2 | R | 1 |
| 5. | Report the function of Bilinear Transformation. | | CO2 | U | 1 |
| 6. | Determine the order of the filter if the discrimination factor ‘d’ and the selectivity factor ‘k’ of a chebyshev I filter are 0.077 and 0.769 respectively. | | CO2 | A | 1 |
| 7. | Recall any two advantages of Hanning window over rectangular window | | CO2 | R | 1 |
| 8. | **Define linear phase filter.** | | CO2 | R | 1 |
| 9. | Differentiate fixed point and floating-point number representation. | | CO3 | U | 1 |
| 10. | Define dead band in limit cycle oscillations. | | CO3 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain “Bit Reversal” and “Zero Padding”. | | CO1 | U | 3 |
| 12. | Determine the computation efficiency of 1024 point FFT over 1024 point DFT. | | CO1 | A | 3 |
| 13. | Compare one to one mapping and many to one mapping in digital filter design. | | CO2 | U | 3 |
| 14. | Design the linear phase realization of H(z)  H(z) = ½ + 1/3 z-1 + z -2 + ¼ z-3  + z-4 + 1/3 z-5+ ½ z-6 | | CO2 | C | 3 |
| 15. | List the effects of input quantization. | | CO3 | R | 3 |
| 16. | List the significance of step size in LMS algorithm. | | 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. | Determine the response of an LTI system with impulse response.  h(n)={-4,-4,-6} for input  x(n)={1, 2,3,4,5} using circular convolution | CO1 | A | 8 |
|  | b. | Compute the DFT of the sequence | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. |  | A 8-point sequence is given by. Compute the 8-point DIT FFT of x (n). Draw the flow graph and tabulate the intermediate stage results. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Design a Butterworth digital IIR filter using the impulse variance method for the followingspecifications:    Assume T = 1 sec. | CO2 | C | 12 |
|  |  |  |  |  |  |
| 20. |  | Determine the filter coefficients obtained by frequency sampling for  N = 7. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Consider the LTI system governed by the equation  y[n]+0.92y[n-1]+0.35y[n-2] = x[n-2].  Discuss the effect of co-efficient quantization on pole locations when the co-efficient are quantized using (i) 3 bits by truncation (ii) 4 bits by truncation. | CO3 | U | 8 |
|  | b. | Discuss the effects of input quantization and product quantization in digital system design | CO3 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | An LTI system is characterized by the difference equation  y[n] = 0.75 y[n-1]+0.3x[n]. The input signal x[n] has a range of -4V to +4V represented by 9 bits. Calculate the output noise power due to input quantization | CO3 | A | 6 |
|  | b. | Explain in detail about finite word length effects in digital filter | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Calculate the IDFT for the given coefficients  X(K)={38, -5.828+j6.07, j6, -0.172+j8.07, -10, -0.172-j8.07, -j6,  -5.828-j6.07} using decimation in frequency algorithm | CO1 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the LMS algorithm in detail and also discuss its limitations | CO3 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 3 | 29 | - | - | - | 33 |
| CO2 | 3 | 4 | 25 | - | - | 15 | 47 |
| CO3 | 7 | 31 | 6 | - | - | - | 44 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **12EC236/14EC2038/19EC2041** | **Duration** | **3hrs** |
| **Course Name** | **CELLULAR MOBILE COMPUTING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define frequency reuse distance. | | CO1 | R | 1 |
| 2. | List the effect of adjacent channel 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 advantage of micro zonal concept. | | CO3 | R | 1 |
| 6 | Mention the feature of SDMA. | | CO4 | R | 1 |
| 7 | State any one application of TDMA. | | 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 Cell Splitting. | | CO1 | R | 3 |
| 12. | Illustrate the Near End Far End Interference. | | CO2 | U | 3 |
| 13. | List the Handoff’s in mobile telephone system. | | CO3 | R | 3 |
| 14. | Illustrate the interfaces in GPRS. | | CO3 | U | 3 |
| 15. | Recall the advantages of FDMA. | | CO4 | R | 3 |
| 16. | Enumerate the generation of Pseudo Random Noise sequence. | | 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 methods to improve coverage and capacity in cellular systems. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Express cochannel and its interference, also find the distance between 2 cochannel cells for N=7 and radius 4km. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Discuss the importance of diversity in cellular communication. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize the generation of cellular communication stating its advantages. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Describe the working of Code Division Multiplexing. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Recite the effect of Doppler spread in wireless communication. | CO5 | R | 5 |
|  | b. | Analyze types of fading in mobile communication. | CO6 | An | 7 |
|  |  |  |  |  |  |
| 23. | a | Enumerate the architecture and services in the GSM segment supporting the development of the GSM system. | CO6 | R | 12 |
|  | b. | Summarize the architecture of GPRS. | CO1 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Justify the importance of spread spectrum technique. | CO3 | E | 6 |
|  | b. | Summarize the process of cell routing in GSM. | CO1 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |



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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | **CO** | **BL** | **Marks** |
|  | **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Find the 2’s complement of the binary number 1010101. | CO1 | A | 1 |
| 2. | Write the Boolean expressions of Demorgan’s theorems. | CO1 | R | 1 |
| 3. | Name the Universal Gates in digital electronics. | CO1 | R | 1 |
| 4. | How many cells are required for a 4 variable K-map problem? | CO2 | U | 1 |
| 5. | Which digital circuit has its output as a function of only present input and does not have a memory unit? | CO2 | U | 1 |
| 6. | Mention the gates from which S-R flip flop is constructed by cross-coupling. | CO2 | U | 1 |
| 7. | What is the bit storage capacity of any flip flop? | CO2 | R | 1 |
| 8. | Which flip flop serve to be the fundamental building block of counters? | CO2 | U | 1 |
| 9. | Which PLD device cannot be reprogrammed? | CO3 | U | 1 |
| 10. | Which of the logic family dissipates minimum power? | CO3 | An | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PART – B (6 X 3 = 18 MARKS)** | | | | |
| 11. | List the different number systems. | CO1 | R | 3 |
| 12. | Summarize the advantages and disadvantages of Quine-Mc Cluskey method. | CO2 | U | 3 |
| 13. | What are min terms and max terms? | CO2 | R | 3 |
| 14. | What is an encoder and decoder? | CO2 | R | 3 |
| 15. | What are the different types of flip-flop? | CO2 | R | 3 |
| 16. | Define propagation delay. Which logic family has minimum delay? | CO3 | An | 3 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. |  | Simplify the following using Kmap  f(a,b,c,d)=m(1,2,4,6,7,8,9,11,13,15)+d(0,3,12) | CO2 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Convert (280.5)10 to its binary, octal and hexadecimal equivalent. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Design a 4x1 multiplexer and explain its function. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Draw the logic circuit, characteristic table and derive the characteristic equation of SR and D flip flop. | CO2 | An | 12 |
|  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 21. |  | Explain ring counter with truth table and circuit diagram. | CO2 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | Draw and explain the block diagram of 4-bit Parallel In Serial Out shift register. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Design a 3-bit synchronous binary up-down binary counter using T flip flop. | CO2 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Draw and explain NAND, NOT and NOR gate CMOS representation. | CO3 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | The student understands number systems, binary codes and the basic postulates of Boolean algebra. |
| CO2 | The students acquire knowledge to design various combinational and sequential circuits. |
| CO3 | The student gains better understanding in the implementation of digital circuits in programmable logic devices and about different logic families. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 13 | - | - | - | - | 17 |
| CO2 | 10 | 7 | 24 | 24 | 12 | 12 | 89 |
| CO3 | - | 1 | - | 4 | 12 | - | 17 |
|  | | | | | | | **123** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **14EC2008 / EC211 / 12EC208** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | What are the major components in IC 741 op amp? | | CO1 | R | 1 |
| 2. | An op-amp based voltage follower circuit has an input impedance of 1MΩ and an output impedance of 10Ω. Calculate the voltage gain. | | CO1 | R | 1 |
| 3. | Infer on the term "time constant" in the context of a differentiator circuit. | | CO1 | R | 1 |
| 4. | Calculate the output voltage of a precision full-wave rectifier circuit with an input signal of 2V peak amplitude and a diode forward voltage drop of 0.7V. | | CO1 | U | 1 |
| 5. | Which component replaces the feedback resistor by a common base transistor in an inverting op amp? | | CO1 | U | 1 |
| 6. | What is the time period of the output pulse in a monostable multivibrator? | | CO1 | R | 1 |
| 7. | What is the significance of the Barkhausen criterion in oscillator design? | | CO1 | R | 1 |
| 8. | What is the type of feedback used in oscillator? | | CO1 | R | 1 |
| 9. | What is the function of an op-amp in a multiplier circuit? | | CO1 | U | 1 |
| 10. | Design a voltage divider using an op-amp to produce an output voltage of  5V for an input voltage of 10V. | | CO1 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Make use of the circuit diagram of an inverting summing amplifier with three input voltages and calculate the output voltage for input voltages of 1 V, 2 V, and 3V. | | CO1 | A | 3 |
| 12. | A differential amplifier using an op-amp has an input impedance of 100 kΩ, a differential voltage gain of 10,000, and a common mode gain of 0.01. Calculate the common mode gain of the differential amplifier circuit when the input common mode voltage is 1 V. | | CO2 | An | 3 |
| 13. | A PLL circuit using op-amp is designed to operate at a center frequency of 1 MHz with a capture range of 100 kHz and a lock range of 10 kHz. Determine the upper and lower frequencies of the capture and lock ranges. | | CO1 | U | 3 |
| 14. | Draw the circuit diagram to generate a triangular wave. | | CO1 | R | 3 |
| 15. | Explain the basic operation of an op-amp comparator and its ideal characteristics. | | CO1 | U | 3 |
| 16. | A Schmitt trigger circuit using an IC 741 op-amp has a lower threshold voltage of 1V and an upper threshold voltage of 4V. The input voltage is a sinusoidal waveform with a peak amplitude of 5V and a frequency of 100 Hz. Determine the output waveform of the Schmitt trigger circuit. | | CO1 | 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. | An inverting amplifier circuit with a gain of -5 has an input impedance of 1 kΩ and an output impedance of 100 Ω. Calculate the input and output voltages of the circuit when the input signal is 500 mV peak-to-peak. | CO1 | R | 6 |
|  | b. | Design a non-inverting amplifier with a gain of 5 and an input impedance of 100 kΩ. Determine the resistor values required for the circuit. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 18. |  | Explain the principle of operation of an op-amp differentiator circuit. Derive an expression for the output voltage of the circuit for a sinusoidal input signal. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Give the functional description of a 555 timer and also explain how it works as an astable multivibrator. Derive the value of time period of the output signal. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Derive the output voltage equation for a non-inverting op-amp integrator circuit. Compare and contrast this circuit with the inverting op-amp integrator circuit. | CO1 | U | 6 |
|  | b. | Design an op-amp integrator circuit that can integrate a sawtooth wave signal with a frequency of 500 Hz and a peak-to-peak amplitude of 3V. Calculate the required resistor and capacitor values for the circuit. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Explain the functional modules of a Phase locked loops with the necessary diagrams. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 22. | a. | Design a high-pass filter with a gain of 10 dB and a cutoff frequency of 1 kHz using an op-amp. Determine the resistor and capacitor values required for the circuit. | CO1 | U | 6 |
|  | b. | With a neat circuit diagram explain the methods used in weighted resistor digital to analog converter. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the mechanism of IC 723 voltage regulator with a neat functional diagram. | CO2 | A | 6 |
|  | b. | Derive the expression for the frequency of oscillation of an astable multivibrator using an op-amp. Explain the working principle of the astable multivibrator and draw the necessary waveforms. | CO1 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | With neat diagrams explain the basic planar process involved in chip fabrication. | CO3 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Define and infer on IC 741 and its applications. |
| CO2 | Examine on IC fabrication and acquire knowledge on its various methods. |
| CO3 | Outline and discover on IC 555 and its applications. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 33 | 46 | 12 |  |  |  | 91 |
| CO2 |  | 12 | 6 | 3 |  |  | 21 |
| CO3 |  | 12 |  |  |  |  | 12 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **14EC2009/17EC2056** | **Duration** | **3hrs** |
| **Course Name** | **MICROPROCESSOR AND INTERFACING TECHNIQUES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the architecture of 8085 microprocessor with neat diagram. | CO1 | U | 15 |
|  | b. | Calculate the time required to execute an instruction of 7 T-states, if the clock frequency is 3 MHz. | CO1 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Interpret the functions of the given instruction, with the help of timing diagram.   |  |  | | --- | --- | | Address | Instruction | | 5500 | MVI A, 65 | | CO1 | A | 15 |
|  | b. | Identify the 8085 addressing modes for the following instructions.   1. LDA 4305 2. CMA 3. MOV A,B 4. RRC 5. MVI A, 42 | CO1 | U | 5 |
|  |  |  |  |  |  |
| 3. | a. | Write an Assembly Language Program in 8085 Microprocessor to subtract two 8-bit numbers. | CO1 | A | 5 |
|  | b. | Show a memory interfacing system with the 8085 microprocessor such that it can interface with 4Kbyte of ROM and 4Kbyte of RAM. | CO3 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Develop an 8085 Assembly Language Program to separate the odd numbers from an array of 6 numbers. | CO1 | A | 5 |
|  | b. | Explain the block diagram and functions of 8086 microprocessor with a neat architecture. | CO2 | U | 15 |
|  |  |  |  |  |  |
| 5. | a. | Sketch the block diagram of 8255- Programmable Peripheral Interface and discuss its different modes of operations. | CO3 | A | 15 |
|  | b. | Write an Assembly Language Program in 8086 Microprocessor to sort data in ascending order and store the result in memory location 5000. | CO2 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write an Assembly Language Program in 8086 Microprocessor to implement the equation (x+6y)/4 and store the result in a memory location, where x, y are 8-bit numbers. | CO2 | A | 10 |
|  | b. | List the different Addressing Modes of 8086 microprocessor with two examples for each modes. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 7. |  | Discuss how transmission and reception of data takes place using 8251 serial communication with neat block diagram. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain in detail about 8253 programmable timer and discuss its various modes of operation. | CO3 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Discuss in detail how DMA controller is designed to work with 8085 microprocessor with neat block diagram. | CO3 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | The Student acquires programming skills in 8085. |
| CO2 | The Student acquires programming skills in 8086. |
| CO3 | The Student understands the interfacing devices, programmable peripheral devices and applications. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 | 30 |  |  |  | 50 |
| CO2 | 10 | 15 | 15 |  |  |  | 40 |
| CO3 |  | 75 | 15 |  |  |  | 90 |
|  | | | | | | | **180** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Interpret the number of electrons and number of holes in intrinsic Semiconductors. | | CO1 | A | 1 |
| 2. | Define Drift current. | | CO1 | R | 1 |
| 3. | Name the configurations of transistor. | | CO1 | R | 1 |
| 4. | Construct the Circuit for BJT as Switch. | | CO1 | A | 1 |
| 5. | Calculate the supply current required for seven segment LED display that uses 5 mA per segment. | | CO3 | An | 1 |
| 6. | List the types of Diodes. | | CO3 | R | 1 |
| 7. | Design LC filter Circuit diagram. | | CO4 | C | 1 |
| 8. | Write the types of filters. | | CO4 | A | 1 |
| 9. | Differentiate oscillator and amplifier. | | CO5 | U | 1 |
| 10. | Write the IC number of Positive fixed voltage regulator. | | CO6 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | State the band theory of solid. | | CO1 | R | 3 |
| 12. | Distinguish between NPN and PNP transistor. | | CO1 | U | 3 |
| 13. | Define Phototransistor. | | CO2 | R | 3 |
| 14. | Analyze half wave rectifier with circuit diagram. | | CO2 | An | 3 |
| 15. | List the modes of operation in power amplifiers. | | CO4 | R | 3 |
| 16. | Define the Differential Amplifier. | | 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. | Compare semiconductors, insulators and conductors with the suitable examples. | CO1 | U | 6 |
|  | b. | Distinguish between Intrinsic and extrinsic semiconductors. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain the input and output characteristics of CB configurations of a transistor. | CO1 | An | 6 |
|  | b. | Describe the forward bias and reverse bias in a PN junction and also VI characteristics of PN junction. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 19. |  | Construct the VI characteristics of Tunnel diode and photodiode. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize in detail the two types of Full Wave Rectifier. | CO2 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Design the Op-Amp Series regulator circuit diagram. | CO3 | C | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the RC Phase shift amplifier using op-amp and obtain the frequency of oscillation. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the Class A, Class AB push pull amplifier with a neat circuit diagram. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Analyze on Hartley and Colpitts oscillator with the circuit diagram. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 11 | 15 | 2 | 6 | - | - | 34 |
| CO2 | 3 | - | 12 | 3 | 12 | - | 30 |
| CO3 | 1 | - | - | 1 | - | 12 | 14 |
| CO4 | 3 | - | 13 | - | - | 1 | 17 |
| CO5 | - | 1 | - | 12 | - | - | 13 |
| CO6 | 3 | - | 1 | 12 | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **17EC2015** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Label some applications of op-amp. | | CO1 | R | 1 |
| 2. | Find the early voltage, if the output resistance is 2.5x2KΩ and input current is 2mA. | | CO1 | R | 1 |
| 3. | Identify the gain for Butterworth second order low pass filter. | | CO2 | A | 1 |
| 4. | How many comparators required for 3bit flash type ADC | | CO3 | R | 1 |
| 5. | List the disadvantage of binary weighted type DAC? | | CO3 | R | 1 |
| 6. | Tell the number of stable states in astable multivibrator? | | CO4 | R | 1 |
| 7. | Find the expression of time period (T) of monostable multivibrator if R1=R2? | | CO4 | R | 1 |
| 8. | State Barkhausen criterion. | | CO5 | R | 1 |
| 9. | Define Comparator. | | CO5 | R | 1 |
| 10. | Give one example for fixed negative voltage regulator. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Recall ideal characteristics of an Operational amplifier. | | CO1 | R | 3 |
| 12. | Name some commonly used active filters. | | CO2 | R | 3 |
| 13. | Show the types of ADC and DAC | | CO3 | U | 3 |
| 14. | Compare Schmitt trigger and comparator. | | CO4 | U | 3 |
| 15. | List out the major blocks of 555 timer functional diagram. | | CO5 | R | 3 |
| 16. | Define voltage regulators and give the types? | | 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. |  | 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. |  | Write short notes on the following.  a)Input Bias current  b)Input Offset current | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Construct the Lossy integrator with necessary equations and also explain its frequency response with neat diagram. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Design a second order Butterworth high pass filter having lower cut off frequency 1kHz. | CO2 | C | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the methods used in weighted resistor R-2R digital to analog converter with a neat circuit diagram. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Illustrate the mechanism of Monostable multivibrator using 555 IC timer with neat functional block diagram. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the functional modules of a Phase locked loops with the necessary diagrams. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Interpret the principle of IC723 regulator with neat diagram. Also discuss the limitations of linear voltage regulators. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 12 | 24 | - | - | - | 41 |
| CO2 | 3 | - | 1 | - | - | 12 | 16 |
| CO3 | 2 | 3 | 12 | - | - | - | 17 |
| CO4 | 2 | 3 | - | 12 | - | - | 17 |
| CO5 | 5 | - | 12 | - | - | - | 17 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **17EC3007** | **Duration** | **3hrs** |
| **Course Name** | **SATELLITE COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | A satellite is in an elliptical orbit with a perigee of 1000 km and an apogee of 4000 km. Using a mean earth radius of 6378.14 km, find the period of the orbit in hours, minutes, and seconds, and the eccentricity of the orbit. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define Kepler’s laws and discuss in detail. | CO1 | U | 10 |
|  | b. | Explain the features of a typical launch vehicle with a neat sketch. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. |  | Sketch and explain the Spacecraft subsystems of a satellite. | CO2 | Ap | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Examine how stabilization is achieved using attitude and orbit control system (AOCS)? | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Why is CDMA called as spread spectrum communication? How does it differ from FDMA and TDMA? | CO3 | Ap | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | TDMA is a truly digital technology, requiring that all information be converted into bit streams or data packets before transmission to the satellite. Justify. | CO3 | E | 20 |
|  |  |  |  |  |  |
| 7. |  | Write the features of digital TV broadcast. List the features of a home receiver unit. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Express how mobile services are used in satellite communication systems. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the purpose of telemetry and command operations. | CO1 | U | 10 |
|  | b. | How earth stations are classified on the basis of services provided by them? Briefly describe the features and facilities of each one of them. | CO6 | Ap | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Describe satellite orbits and orbital mechanisms. |
| CO2 | Explain communication satellite design. |
| CO3 | Interpret various multiple access schemes used for data transmission. |
| CO4 | Appraise satellite link power budget. |
| CO5 | Design OBP or FT type satellite transponder. |
| CO6 | Select suitable satellite for particular service. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 20 | 20 | - | - | - | 50 |
| CO2 | - | 20 | 20 | - | - | - | 40 |
| CO3 | - | - | 20 | 20 | - | - | 40 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | - | 10 | - | - | - | 10 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **17EC3017** | **Duration** | **3hrs** |
| **Course Name** | **OPTICAL SIGNAL PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain a general signal using bandwidth and number of sample levels. | CO1 | An | 10 |
|  | b. | Explain the concept of refraction at a curve surface for lenses. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What are the different optical aberrations? Explain. | CO2 | An | 10 |
|  | b. | Illustrate the general imaging conditions with reference to ray tracing. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Compare and contrast spatial and temporal coherence. | CO3 | An | 10 |
|  | b. | Explain the basic elements of optical system. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4 |  | Discover the following along with neat sketches  (i) Light Valve spatial Light Modulators.  (ii) Optically Addressed Electro-Optic Spatial Light Modulators. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 5 |  | Explain the following:  (i) Maximum information capacity.  (ii) Convergent Illumination. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Illustrate on the key parameters that affect performance of spectrum analyzers at system level. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | Construct the block diagram, describe in detail about phase spatial filters and spatial light modulator. | CO5 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8 |  | Describe the optimum photo detector size for plane-wave interference. | CO6 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss about spatial interference between two light waves. | CO6 | U | 10 |
|  | b. | Describe the different applications of Acousto – optic devices. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand basic concepts of light propagation, spatial frequency and Spectral analysis. |
| CO2 | Develop optical modulators for various applications of light processing. |
| CO3 | Design spatial filters to clean up the output of lasers, removing aberrations in the beam due to imperfect, dirty, or damaged optics, or due to variations in the laser gain medium itself. |
| CO4 | Judge the characteristics of optical filters, modulators and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions. |
| CO5 | Familiar with Design considerations of acousto-optic devices. |
| CO6 | Analysis and decision-making skills based on the results of acousto-optic power spectrum analyzer. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  |  | 20 |  |  | 20 |
| CO2 |  |  | 10 | 10 |  |  | 20 |
| CO3 |  |  | 20 | 20 |  |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  |  | 40 |  |  |  | 40 |
| CO6 |  | 40 |  |  |  |  | 40 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **17EC3020** | **Duration** | **3hrs** |
| **Course Name** | **ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the importance of EMC in electronic product design. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the sources and victims of EMI, including conducted and radiated emissions, transient EMI, and ESD. Provide a case study highlighting the significance of EMC. | CO1 | U | 10 |
|  | b. | Explain the significance of EMC and its importance in ensuring reliable operation and regulatory compliance. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Differentiate between conducted, radiated and transient coupling in the context of EMI. | CO2 | U | 10 |
|  | b. | Explain common ground impedance coupling, common mode, and ground loop coupling, and differential mode coupling. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Describe the causes, effects and techniques to mitigate each type of coupling. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Enumerate the techniques used for EMI control, including shielding, filtering, grounding, transient suppressors, cable routing, signal control and EMI gaskets. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Examine how the filters address specific EMI challenges and ensure optimal performance in their respective applications. | CO3 | R | 20 |
|  |  |  |  |  |  |
| 7. |  | Describe the EMI suppression techniques employed in PCB design. | CO4 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain absorptive and ribbon cables, transient protection hybrid circuits, component selection and mounting, PCB trace impedance, routing, cross-talk control, noise reduction from relays and switches, power distribution decoupling, zoning, grounding, VIA connections and terminations. | CO4 | R | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Compare the various EMI assessment methods for electromagnetic interference. | CO5 | U | 10 |
|  | b. | Illustrate the salient features and applications of open area test sites. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design and test electronic products with acceptable radiations and susceptible to EMI. |
| CO2 | Analyze cabling and grounding problems in high-frequency systems. |
| CO3 | Analyze and simulate component placements in PCB board design to reduce EMI. |
| CO4 | Design shielding techniques to prevent ESD and EMI in high-frequency systems. |
| CO5 | Apply techniques to prevent crosstalk in high-frequency systems. |
| CO6 | Interpret EMC lab reports and certificates. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 40 | - | - | - | - | 40 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | 40 | - | - | - | - | - | 40 |
| CO4 | 40 | - | - | - | - | - | 40 |
| CO5 | - | 10 | - | - | - | - | 10 |
| CO6 | - | 10 | - | - | - | - | 10 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **17EC3021** | **Duration** | **3hrs** |
| **Course Name** | **RF SYSTEM DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Summarize the factors that affect the performance of RF receivers. Explain how noise, selectivity, sensitivity, and dynamic range are related in an RF receiver. | CO1 | U | 10 |
|  | b. | Apply two port noise theory and explain about thermal noise, Popcorn noise and Flicker noise. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Summarize transceiver specifications. | CO1 | U | 10 |
|  | b. | Explain about direct up conversion and two step up conversion in RF transmitters. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Evaluate the effectiveness of the Smith chart as a tool for impedance matching in RF circuit design, and identify potential limitations or areas for improvement. | CO2 | E | 10 |
|  | b. | Design a novel LNA circuit that incorporates both power match and noise match, and justify your design choices using simulation tools and analysis. | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Develop a novel impedance matching network for a common gate amplifier that can improve its performance in the presence of strong electromagnetic interference. Justify your design choices and evaluate the performance of the amplifier using simulations or experimental measurements. How does your proposed network compare to other commonly used impedance matching techniques, and what are its potential limitations or drawbacks? | CO2 | C | 20 |
|  |  |  |  |  |  |
| 5. |  | Given the transfer function of an RF circuit with feedback, use the root locus technique to analyze the stability of the system and determine the gain and phase margin. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Analyze the model and performance of compensation power amplifier in detail. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Design a quadratic mixer for a frequency conversion application with an input signal at 1 GHz and a LO frequency of 2 GHz. The mixer should have an IF output frequency of 100 MHz and a conversion loss of no more than 6 dB. Using circuit analysis techniques, evaluate the performance of the mixer for different values of input power and LO power. What is the maximum dynamic range of the mixer, and how does it compare to other types of mixers? | CO5 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Compare and contrast the Colpitts oscillator and tuned oscillator in terms of their design, operation, and performance characteristics. What factors should be considered when selecting an oscillator for a particular application? | CO5 | An | 15 |
|  | b. | Summarize the advantages and disadvantages of Colpitts oscillator and tuned oscillator, and explain how they can be improved to achieve better performance. | CO5 | U | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the issues that can limit the efficient design of RFIC and how they can be minimized in circuit design. | CO6 | U | 10 |
|  | b. | Define what transceiver architecture is in RFIC design and explain its importance in wireless communication systems. Describe the basic components of a transceiver and their functions. | CO5 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 its 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 RF front-end as per given system specification for the required performance using software tools. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 30 | 10 | - | - | - | 40 |
| CO2 | - | - | - | - | 10 | 20 | 30 |
| CO3 | - | - | - | 20 | - | - | 20 |
| CO4 | - | - | - | 20 | - | - | 20 |
| CO5 | 10 | 5 | - | 15 | 20 | - | 50 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2003** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SYSTEM DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Self-Complementing code. | | CO1 | R | 1 |
| 2. | Visualize a 2 input OR gate using NAND gate. | | CO1 | R | 1 |
| 3. | State De Morgan’s theorem. | | CO2 | R | 1 |
| 4. | Solve A + AB. | | CO2 | A | 1 |
| 5. | Identify the combinational circuit that converts binary information from 2n  input lines to n input lines. | | CO3 | U | 1 |
| 6. | Predict the number of Full adders required to design a 4 - bit parallel adder. | | CO3 | U | 1 |
| 7. | List the basic components of ASM Chart. | | CO4 | R | 1 |
| 8. | Recall the characteristic equation of JK flip flop. | | CO4 | R | 1 |
| 9. | Define the basic configuration of PAL. | | CO5 | R | 1 |
| 10. | List the difference between Net and Register in Verilog. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Evaluate the complement of F = xy’ +x’y using De Morgan’s theorem. | | CO1 | An | 3 |
| 12. | Develop the canonical expression for F(A,B,C) = AB + AB’C. | | CO2 | A | 3 |
| 13. | Compare the Multiplexer method with the Decoder method for implementing a combinational circuit. | | CO3 | U | 3 |
| 14. | Sketch a Mod-3 Asynchronous counter. | | CO4 | A | 3 |
| 15. | Define Noise Margin and Propagation delay. | | CO5 | R | 3 |
| 16. | State the dataflow statement of 2 x 1 Mux 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. | State any 3 theorems of Boolean Algebra. | CO1 | R | 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. | Explain the operation of a 4 - bit Adder/Subtractor with a neat diagram. | CO3 | A | 6 |
|  | b. | Develop a 4 x 1 Multiplexer. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. |  | Design an Asynchronous Mod 6 counter using T Flip Flops and explain its operation with a timing diagram. | CO4 | C | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the Memory Read and Memory Write Cycle with a neat timing diagram | CO5 | U | 6 |
|  | b. | Explain the operation of a 2-Input CMOS NAND gate with a neat diagram | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Develop the given Boolean function using PLA  F1=AB’ + AC + A’BC’  F2 =(AC +BC)’ | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Design a 3 bit Synchronous Up-Down Counter using T-FFs. | CO4 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Develop the Verilog HDL code for   1. 2 x 4 Decoder 2. 4 bit binary up counter | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | - | 6 | 3 | - | - | 17 |
| CO2 | 1 | - | 16 | - | - | - | 17 |
| CO3 | - | 5 | 12 | - | - | - | 17 |
| CO4 | 2 | - | 3 | - | - | 24 | 29 |
| CO5 | 4 | 12 | 12 | - | - | - | 28 |
| CO6 | 4 | - | - | - | - | 12 | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2006** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG AND DIGITAL COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the frequency domain representation of a signal. | | CO1 | R | 1 |
| 2. | Define Modulation index of AM. | | CO1 | R | 1 |
| 3. | State the reason for referring Thermal noise as White noise. | | CO2 | R | 1 |
| 4. | Examine the need of Pre-emphasis. | | CO2 | U | 1 |
| 5. | State any one advantage of pulse modulation technique. | | CO3 | R | 1 |
| 6. | Interpret the term “Slope over load distortion”. | | CO3 | U | 1 |
| 7. | Define Sensitivity. | | CO4 | R | 1 |
| 8. | What is ‘Correct Rejection’ in signal detection theory/ | | CO4 | U | 1 |
| 9. | Recall the application of 16 QAM. | | CO5 | R | 1 |
| 10. | Define Adaptive Equalizer. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Indicate the bandwidth saving by the use of VSB in TV picture signal transmission, with a suitable figure. | | CO1 | U | 3 |
| 12. | Calculate the noise power when the temperature is 120°C and the noise bandwidth is 2.5 KHz. | | CO2 | A | 3 |
| 13. | Criticize what will happen if Nyquist rate is not obeyed? | | CO4 | An | 3 |
| 14. | List any four outcomes of signal detection. | | CO4 | R | 3 |
| 15. | Sketch the constellation diagram of 32 QAM. | | CO5 | A | 3 |
| 16. | Explain the various Synchronization methods. | | 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 DSBSC signal generation using Balanced Modulator. | CO1 | U | 6 |
|  | b. | Determine the following, if a base-band message signal *20sin 2πx500t* is used to amplitude modulate a carrier of *100sin 2πx105t*,   1. Modulation index 2. Sideband frequencies 3. Amplitude of each sideband frequencies | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Differentiate between pulse width Modulation and pulse position Modulation. | CO1 | An | 6 |
|  | b. | Summarize the concept of delta modulation. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Analyze the noise in a SSB-SC system. Derive the equation of the output SNR. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 20. | a. | Calculate the Nyquist rate and Nyquist interval for message waveform represented as follows. . | CO4 | A | 6 |
|  | b. | The message waveform with amplitude Vmin = -4 V and Vmax = +4 V is sampled uniformly is shown in fig.    Calculate the following with observed quantization level.   1. Quantization Zone Width 2. Number of Zones 3. Number of bits required to encode the zones 4. Quantization code 5. Encoded PCM sequence. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the impulse response of the matched filter. | CO4 | A | 6 |
|  | b. | Differentiate Hard and Soft decisions. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Sketch the Minimum Shift Keying signal for the given Data:  1 0 1 1 0 1 0 | CO5 | A | 6 |
|  | b. | Explain Frequency shift keying with waveforms. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Define QAM. What are the conditions for the high order QAM formats? | CO5 | R | 6 |
|  | b. | Compare 16 QAM, 32 QAM and 64 QAM. | CO5 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the need of Equalizer. What are the different categories of Equalizer? | CO6 | U | 6 |
|  | b. | Describe the operations during training period and decision directed mode. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 15 | 6 | 6 | - | - | 29 |
| CO2 | 1 | 1 | 3 | 12 | - | - | 17 |
| CO3 | 1 | 1 | 3 | - | - | - | 11 |
| CO4 | 4 | 1 | 9 | 9 | - | - | 23 |
| CO5 | 7 | 6 | 9 | 6 | - | - | 28 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Identify the rectifier with 1.21 as ripple factor. | | CO1 | R | 1 |
| 2. | Differentiate shunt and series voltage regulator. | | CO1 | U | 1 |
| 3. | Infer the biasing condition for perfect amplification by transistor. | | CO2 | U | 1 |
| 4. | State the maximum collector current that flows through the Voltage divider bias transistor circuit? | | CO2 | R | 1 |
| 5. | Write Schockley’s drain current equation. | | CO3 | R | 1 |
| 6. | Infer the reason for neglecting the gate resistor in the dc analysis of fixed bias FET amplifier. | | CO3 | U | 1 |
| 7. | List the features of power transistor. | | CO4 | R | 1 |
| 8. | Define Common mode rejection ratio. | | CO5 | R | 1 |
| 9. | Express the frequency of oscillation of wien bridge oscillator. | | CO6 | U | 1 |
| 10. | Indicate the advantages of tuned amplifier. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Sketch the output waveform for the following circuit. | | CO1 | A | 3 |
| 12. | Compare the characteristics of BJT and JFET amplifier. | | CO2 | U | 3 |
| 13. | Determine the input impedance, output impedance, voltage gain and current gain of common emitter amplifier using re model. | | CO3 | A | 3 |
| 14. | Discuss the performance criteria of power amplifiers. | | CO4 | U | 3 |
| 15. | Determine the voltage gain and input impedance with feedback for voltage series feedback having A= - 100, Zi = 10 KΩ and Beta= - 0.1 | | CO3 | A | 3 |
| 16. | Define current mirror and discuss the limitations and advantages of it. | | 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 the operation of Center tap full wave rectifier and derive the Ripple factor, Rectifier efficiency and Transformer Utilization Factor for the circuit. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate the voltage regulation provided by controlled transistor series voltage regulator with neat circuit diagram. | CO1 | U | 7 |
|  | b. | Construct a filter circuit with inductor for full wave rectifier and explain the process of ripple reduction. | CO1 | A | 5 |
|  |  |  |  |  |  |
| 19. | a. | Discuss the need for biasing. Derive IB, VCE, stability factor with load line analysis for BJT Fixed bias circuit. | CO2 | U | 8 |
|  | b. | Calculate the base current for a fixed bias circuit with Vcc=10V and RB=200KΩ. | CO2 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Determine VGSQ and IDQ for the following voltage divider biased FET circuit. | CO2 | A | 8 |
|  | b. | Explain voltage amplifier and with Thevenin equivalent circuit of two port network define the magnitude of source and load resistance. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Construct series fed class A mode power amplifier and trace the output voltage and current swing. Discuss the collector efficiency, power dissipation and distortion in the circuit. | CO4 | A | 9 |
|  | b. | Calculate the effective resistance seen looking into the primary of a 15:1 transformer connected to an 8 Ω load. | CO4 | An | 3 |
|  |  |  |  |  |  |
| 22. | a. | Sketch the voltage shunt feedback connection and derive the gain, input impedance and output impedance for the circuit. | CO3 | A | 8 |
|  | b. | Explain the various modes of operation of differential amplifier circuit. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 23. |  | Explain the construction of single stage amplifier and discuss the frequency response of the circuit. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Relate the condition under which a feedback amplifier works as an oscillator. With neat sketch explain the operation of RC phase shift oscillator and express the frequency of oscillation. | CO6 | U | 8 |
|  | b. | The tuned collector oscillator circuit used in the local oscillator of radio receiver makes use of an LC tuned circuit with L=58.6 µH and C=300 pF. Calculate the frequency of oscillation. | CO6 | An | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 20 | 8 | - | - | - | 29 |
| CO2 | 1 | 12 | 8 | 4 | - | - | 25 |
| CO3 | 1 | 20 | 14 | - | - | - | 35 |
| CO4 | 1 | - | 9 | 3 | - | - | 13 |
| CO5 | 1 | 4 | - | - | - | - | 5 |
| CO6 | 3 | 10 | - | 4 | - | - | 17 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Infer your perception on general purpose registers, list few of them. | | CO1 | U | 1 |
| 2. | Evaluate the contents of register -A, after executing all the following instructions.  MOV A, #0A5H  RR A  RR A | | CO2 | E | 1 |
| 3. | Develop an ALP to swap two numbers using 8051. | | CO2 | C | 1 |
| 4. | List the steps involved in programming. | | CO4 | R | 1 |
| 5. | Evaluate the time taken by the 8051 microcontroller to execute the instruction - ADD A, R1 if the crystal frequency is 12 MHz. | | CO2 | E | 1 |
| 6. | Justify the need of prescalar in PIC. | | CO4 | E | 1 |
| 7. | Recall the number of external interrupts that are available in PIC 18 series. | | CO4 | R | 1 |
| 8. | Infer your perception on duty cycle. | | CO4 | U | 1 |
| 9. | Identify the bit which indicates the status of ADC conversion. | | CO6 | R | 1 |
| 10. | Infer your perception on array. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Evaluate the content of Accumulator after the execution of the following instruction  SETB C  MOV A, #AA  RRC | | CO1 | E | 3 |
| 12. | Interpret on LABEL, OPCODE, OPERAND and COMMENT. | | CO1 | U | 3 |
| 13. | Illustrate PIC 18 Microcontroller Addressing modes in detail. | | CO3 | An | 3 |
| 14. | Infer your perception on watchdog timer and Brownout reset in PIC. | | CO4 | U | 3 |
| 15. | Describe about Storage Classes. | | CO5 | R | 3 |
| 16. | List the data types of Embedded C programming. | | CO5 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Illustrate the block diagram and pin diagram of 8051 microcontroller. | CO1 | U | 12 |
| 18. |  | Explain the serial communication modes of 8051 microcontroller with necessary diagrams. | CO1 | U | 12 |
| 19. |  | Illustrate the PIC 18 Microcontroller Architecture with a neat sketch and explain in detail. | CO3 | An | 12 |
| 20. |  | Articulate the features and functions of SPI and I2C modules of PIC18 Microcontroller. | CO4 | A | 12 |
| 21. |  | Infer your perception on Watch Dog Timers and explain in detail. | CO4 | U | 12 |
| 22. | a. | Assess the circuit diagram of 8051 having 8Kb EPROM and an 8Kb RAM ICs. The starting address of EPROM is 0000H and RAM is 4000H | CO3 | E | 6 |
|  | b. | Develop an ALP to add two 16 bit numbers. The numbers are 3CE7H and 3B8DH. Store the lower byte in 4500H and higher Byte in 4501H | CO2 | A | 6 |
| 23. |  | Design the circuit diagram of Stepper motor interface and its program code. | CO6 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate and explain the interfacing of stepper motor with microcontroller with necessary diagrams. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 28 |  |  | 3 |  | 31 |
| CO2 |  |  | 6 |  | 2 | 1 | 9 |
| CO3 |  |  |  | 15 | 6 |  | 21 |
| CO4 | 2 | 16 | 12 |  | 1 |  | 31 |
| CO5 | 6 | 1 |  |  |  |  | 7 |
| CO6 | 1 | 12 |  |  |  | 12 | 25 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Predict the input bias current of the op-amp , if IB + = 500nA and  IB - = 100 Na. | | CO1 | U | 1 |
| 2. | Determine the gain of the given circuit if R1 = 10k ohm and  RF = 80k ohm | | CO1 | A | 1 |
| 3. | Name the comparator whose output is given below | | CO2 | R | 1 |
| 4. | Determine the output voltage if R1=R2=Rg=Rf, V1=10V and V2=20V | | CO2 | A | 1 |
| 5. | Recall the expression of frequency of oscillation of RC phase shift oscillator. | | CO3 | R | 1 |
| 6. | Infer the damping factor of a Chebyshev filter. | | CO4 | U | 1 |
| 7. | Define capture range in PLL. | | CO5 | R | 1 |
| 8. | List any two applications of Astable multivibrator using 555 IC. | | CO5 | R | 1 |
| 9. | Indicate the central frequency (f0)of wide-band pass filter having cut off frequencies fl=3 KHz and fh= 12 KHz. | | CO4 | U | 1 |
| 10. | Express the limitations of R-22 ladder type DAC. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Interpret the DC characteristics of op-amp | | CO1 | U | 3 |
| 12. | Illustrate the working of zero crossing detector. | | CO2 | A | 3 |
| 13. | Infer briefly about series op-amp regulator. | | CO3 | U | 3 |
| 14. | Design a first order high-pass filter for cut-off frequency of 2 KHz and pass-band gain of 2 and C=0.1µF. | | CO4 | C | 3 |
| 15. | List few application of PLL. | | CO5 | A | 3 |
| 16. | Illustrate the output of weighted resistor DAC if the input is 1100 and Vref=4V. | | 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 functions and determine the gain of the following  a. Inverting amplifier  b. Non-Inverting amplifier | CO1 | U | 8 |
|  | b. | Design an adder circuit using an op-amp to get the output expression as Vo= - (0.1V1+V2+100V3) | CO2 | C | 4 |
|  |  |  |  |  |  |
| 18. | a. | Explain the working principle of inverting and non-inverting comparator with positive reference. | CO2 | A | 6 |
|  | b. | Describe how op-amp is used as a differentiator. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Explain the working principle of Monostable Multivibrator using op-amp and derive the frequency of oscillation. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Predict the output of first order low pass filter with necessary diagrams and expressions. | CO4 | U | 6 |
|  | b. | Design a second order Butterworth low pass filter with the cut off frequency of 2 KHz and C=0.1µF. | CO4 | C | 6 |
|  |  |  |  |  |  |
| 21. |  | Explain the working principle of Astable multivibrator using 555 IC with necessary equations and waveforms. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the working principle of op-amp Schmitt trigger with relevant diagram and obtain the hysteresis voltage VH | CO5 | U | 6 |
|  | b. | Discuss in detail the 723 low voltage regulator. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Explain the working of successive approximation ADC with an example. | CO6 | A | 8 |
|  | b. | Indicate the circuit diagram of 3-bit weighted resistor DAC. | CO6 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss in detail the steps involved in basic planar process. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 13 | 1 | - | - | - | 14 |
| CO2 | 1 | 5 | 10 | - | - | 4 | 20 |
| CO3 | 1 | 9 | 12 | - | - | - | 22 |
| CO4 | 2 | 6 | - | - | - | 9 | 17 |
| CO5 | 2 | 6 | 15 | - | - | - | 23 |
| CO6 | - | 20 | 8 | - | - | - | 28 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2015 / 17EC2010** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL SIGNAL PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Illustrate the use of zero padding. | | CO1 | U | 1 |
| 2. | Recall the starting point of the linearly convolved sequence y[n], if the input sequence starts at n = -2 and the impulse response starts at n=0. | | CO1 | R | 1 |
| 3. | Locate the presence of twiddle factor in the radix-2 DIT and DIF FFT butterfly diagrams. | | CO2 | R | 1 |
| 4. | Observe the bit reversed order of the given 4-point sequence x(n) = {1,2, -3, -4}. | | CO2 | R | 1 |
| 5. | Identify the method of IIR filter design in which the mapping of frequency from analog to digital domain is one to one. | | CO3 | U | 1 |
| 6. | Visualize the frequency response of an ideal low pass filter and represent the filter specifications. | | CO3 | R | 1 |
| 7. | Express the equation for Blackman window of noncausal condition. | | CO4 | U | 1 |
| 8. | State the advantage of linear phase realization structure of an FIR system. | | CO4 | R | 1 |
| 9. | Represent (-0.45) in signed magnitude notation using 4 bits (including sign bit). | | CO5 | U | 1 |
| 10. | Explain any one drawback of LMS Algorithm. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Appraise the method “linear convolution via circular convolution”. | | CO1 | An | 3 |
| 12. | Estimate the DFT of the sequence 𝑥[𝑛] = [-1, 1, -1, 1] for N=4 using DIF-FFT algorithm. | | CO2 | U | 3 |
| 13. | Compare the analog and digital filters. | | CO3 | An | 3 |
| 14. | Analyze whether the given filter with h[n]= {0.2, 0.3, 0.5,0.3, 0.2} is a linear phase filter or not. | | CO4 | An | 3 |
| 15. | Differentiate the floating point and fixed-point number representation. | | CO5 | U | 3 |
| 16. | Show the list of operations performed by MACD in one cycle with an organized manner. | | 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. |  | Estimate convolution for the given two input sequences using overlap save method. x [n] = [1,2,1,2,1,2,1,2,1,2] & h[n] = [1,2,1]. | CO1 | E | 12 |
| 18. |  | Compute 8-point DFT of the sequence using the radix-2 decimation-in-time FFT algorithm. Draw the flow graph and show all the intermediate results. | CO2 | A | 12 |
| 19. |  | Design a Butterworth filter for the following specifications using the bilinear transformation technique. Assume T = 1 sec. | CO3 | C | 12 |
| 20. |  | Predict a linear phase FIR digital filter’s coefficient for the given specifications using Hamming window of length N=7.    Find Z transform and draw the direct form realization of h(n). | CO4 | E | 12 |
| 21. |  | Explain the coefficient quantization effects for the given second order IIR filter in direct form (I or II) realization and Cascade realization. (Consider only 3 bits after truncation). | CO5 | An | 12 |
| 22. |  | Construct a digital Chebyshev IIR low pass filter using the impulse-invariant transformation by taking T=1 second. | CO3 | C | 12 |
| 23. |  | Determine the filter coefficients h (n) obtained by frequency sampling for N=7.  Draw the linear phase realization of h(n). | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | A multiplier-accumulator, with three pipe stages, is required for a digital signal processor. With the aid of a timing diagram, explain how the MAC works. Also sketch a block diagram of a suitable configuration for the MAC. | CO6 | An | 12 |

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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 |  | 3 |  | 24 | 29 |
| CO4 | 1 | 1 | 12 | 3 | 12 |  | 29 |
| CO5 |  | 4 |  | 12 |  |  | 16 |
| CO6 |  | 4 |  | 12 |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2017** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER NETWORK** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define the term data communication. | | CO1 | U | 1 |
| 2. | State the types of guided media. | | CO1 | R | 1 |
| 3. | Name the switch that connects n inputs to m outputs in a grid. | | CO2 | R | 1 |
| 4. | In which switching systems, resources are allocated on demand? | | CO2 | R | 1 |
| 5. | What are the functions of data link layer? | | CO1 | U | 1 |
| 6. | Why cannot Ethernet and token ring be used in a WAN? | | CO3 | U | 1 |
| 7. | Name different protocols in the network layer. | | CO4 | R | 1 |
| 8. | What are the parameters of QoS? | | CO5 | R | 1 |
| 9. | What are the elements of transport layer? | | CO5 | R | 1 |
| 10. | What are the applications of application layer? | | CO6 | R | 1 |
|  | | | | | |
| 11. | Explain the following terms in connection with data communication systems.  (i) Simplex system.  (ii) Half duplex system. | | CO1 | U | 3 |
| 12. | List the phases in a switched virtual circuit. | | CO2 | R | 3 |
| 13. | Summarize two transfer modes used in HDLC protocol. | | CO3 | U | 3 |
| 14. | Define unicast, multicast and broadcast routing protocols. | | CO4 | R | 3 |
| 15. | Brief any three policies involved in open loop congestion control. | | CO5 | U | 3 |
| 16. | Write the types of domain names in Domain Name 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. | a. | Explain any three topologies with a neat diagram and list its advantages and disadvantages. | CO1 | U | 6 |
|  | b. | List any four comparisons between twisted pair, co-axial and fiber optic cable. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate time division switching with necessary diagram. | CO2 | U | 6 |
|  | b. | Describe circuit switching with necessary diagrams. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Summarize the concept of IEEE 802.5 token ring with frame format. | CO3 | U | 6 |
|  | b. | Compare IPV6 and IPV4 addressing methods. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. |  | Explain distance vector routing with suitable example. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | Describe the function of Transmission control protocol with necessary  diagram. | CO5 | U | 10 |
|  | b. | What is the difference between end to end delay and jitter? | CO5 | An | 2 |
|  |  |  |  |  |  |
| 22. | a. | Give short notes on a) FIFO queuing b) Priority queuing c) Weighted fair queuing in QoS. | CO5 | U | 9 |
|  | b. | Brief about backpressure type closed loop congestion control mechanism in QoS. | CO5 | U | 3 |
|  |  |  |  |  |  |
| 23. |  | Explain the principle of operation of HTTP. | CO6 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Describe the functions of each layer in OSI model with neat sketch. | CO1 | C | 10 |
|  | b. | Interpret the information associated with 10 Base 5. | CO3 | U | 2 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
|  | At the end of this course students will demonstrate the ability to. |
| 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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 7 | 11 | - | - | - | 10 | 28 |
| CO2 | 5 | 12 | - | - | - | - | 17 |
| CO3 | - | 12 | - | 6 | - | - | 18 |
| CO4 | 4 | - | - | 12 | - | - | 16 |
| CO5 | 2 | 25 | 2 | - | - | - | 29 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2019** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL IC DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List the active elements in Integrated Circuits (IC). | | CO1 | R | 1 |
| 2. | Identify the law where the number of transistors embedded on the chip doubles for every 18 to 24 months. | | CO1 | R | 1 |
| 3. | Define Periodic time. | | CO2 | U | 1 |
| 4. | Define Fan out. | | CO3 | U | 1 |
| 5. | Write the equation to find the average propagation delay of a single gate. | | CO3 | A | 1 |
| 6. | Write the truth table of XOR gate. | | CO3 | R | 1 |
| 7. | Represent the on-resistance of the PMOS transistor in Saturation region to find the delay in Transfer Gate. | | CO4 | U | 1 |
| 8. | State the value of clock signal (Ф) to operate dynamic CMOS logic in Precharge phase. | | CO4 | R | 1 |
| 9. | Identify the circuit that takes m inputs and produces 2m bitline access signals in memory module. | | CO5 | U | 1 |
| 10. | List the type of ASIC in which the logic cells are predesigned and some of the mask layers are customized. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Sketch the architecture of PMOS transistor and examine all its terminals. | | CO1 | A | 3 |
| 12. | Summarize in detail about Noise Margin with suitable equations. | | CO2 | U | 3 |
| 13. | Determine the syntax of specifying the MOS transistor with MOS layout and schematic in SPICE. | | CO2 | A | 3 |
| 14. | Design using CMOS Logic. | | CO4 | C | 3 |
| 15. | Describe about ROM and its types. | | CO5 | U | 3 |
| 16. | Discuss about Channeled Gate array with proper diagram. | | 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 in detail the construction and operation of enhancement mode NMOS transistor in three operating modes. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Illustrate in detail the thin oxide and pn-junction capacitance of MOS transistor. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Illustrate in detail the various process involved in making transistors in deep submicron CMOS process. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe the various steps involved in IC fabrication Process with neat diagrams and explanation. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Establish the Latch-up problem, its occurrence in MOS transistor and its prevention techniques with neat diagram. | CO3 | A | 6 |
|  | b. | Design using CMOS Logic. | CO4 | C | 6 |
|  |  |  |  |  |  |
| 22. | a. | Describe in detail about Transmission Gate (TG) Logic and design 2X1 Multiplexer using TG. | CO4 | U | 4 |
|  | b. | Illustrate about Domino CMOS Logic and design  Using Domino CMOS Logic. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 23. |  | Explain the read and write cycle of 1-T and 6-T based SRAM with neat diagrams. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Estimate in detail about Channel less and Structured Gate array with proper diagram. | CO6 | U | 8 |
|  | b. | Sketch the ASIC design flow by including all the steps till fabrication. | CO6 | A | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of MOS transistor. |
| CO2 | I Illustrate different second order effects of MOS transistor. |
| CO3 | Analyse static and dynamic behavior of CMOS inverter. |
| CO4 | Design combinational logic circuits in CMOS. |
| CO5 | Interpret different logic style for design of sequential logic circuits. |
| CO6 | Comprehend the significance of optimising the logic circuit design. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 12 | 3 | - | - | - | 17 |
| CO2 | - | 4 | 27 | - | - | - | 31 |
| CO3 | 1 | 1 | 7 | 12 | - | - | 21 |
| CO4 | 1 | 5 | 8 | - | - | 9 | 23 |
| CO5 | - | 4 | 12 | - | - | - | 16 |
| CO6 | 1 | 11 | 4 | - | - | - | 16 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Infer the condition of directivity for isotropic antenna. | | CO1 | U | 1 |
| 2. | Define scattering ratio and give the value of it. | | CO1 | R | 1 |
| 3. | Write an application of loop antenna. | | CO2 | A | 1 |
| 4. | Give the value of directivity for small loop antenna. | | CO2 | U | 1 |
| 5. | Relate the relation between aperture number and angular aperture. | | CO4 | A | 1 |
| 6. | Identify why we go for non-uniform amplitude distribution. | | CO3 | R | 1 |
| 7. | Classify the different types of horn antennas. | | CO4 | U | 1 |
| 8. | Write applications of smart antenna. | | CO5 | A | 1 |
| 9. | Justify the concept of fixed weight beamforming. | | CO5 | C | 1 |
| 10. | Define ground wave propagation. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Evaluate the current does an antenna draw when radiating 1000 W and is having Rr of 300Ω. | | CO1 | E | 3 |
| 12. | Discuss about the ferrite loop. | | CO2 | U | 3 |
| 13. | Calculate power gain in dB of a paraboloidal reflector of open mouth aperture 10λ. | | CO4 | An | 3 |
| 14. | Explain about spill over the effect of parabolic reflector. | | CO3 | U | 3 |
| 15. | Compare resonant and non resonant antenna. | | CO5 | An | 3 |
| 16. | Distinguish the different modes of radio wave propagations. | | 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. | a. | Relate the expression between effective aperture and gain with the necessary condition. | CO1 | R | 8 |
|  | b. | An antenna has radiation resistance of 72Ω, loss resistance of 8Ω and Gain as 12db. Find k and D. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 18. | a. | Compare radian and steradian. | CO1 | E | 2 |
|  | b. | Illustrate the reciprocity principle and prove that E12 = E21. | CO1 | U | 10 |
| 19. | a. | Show that the radiation resistance of elementary dipole with linear current distribution is Rr = , with the power distribution calculation. | CO2 | U | 8 |
|  | b. | Find radiation resistance of short current element for the length λ/8 and λ/4. | CO2 | E | 4 |
| 20. | a. | Illustrate an array of two point source with equal amplitude and same phase with the radiation pattern. | CO3 | U | 7 |
|  | b. | Evaluate array factor expression for linear array with ‘n’ isotropic point source of equal amplitude and spacing. | CO3 | E | 5 |
| 21. | a. | Explain the construction of log periodic dipole antenna with a neat sketch. | CO4 | U | 10 |
|  | b. | Describe about travelling antenna. | CO4 | R | 2 |
| 22. |  | Construct the design, general characteristics of Yagi-Uda antenna. Express the condition of voltage and current characteristics of yagi-uda antenna. | CO5 | A | 12 |
| 23. | a. | Write short notes on smart antenna with an example. | CO6 | A | 8 |
|  | b. | Describe the concept of beam forming techniques. | CO6 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the structure of atmosphere and brief about the chemical components in each layer with a neat sketch. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 13 | 11 | - | - | 5 | - | 29 |
| CO2 | - | 12 | 1 | - | 4 | - | 17 |
| CO3 | 1 | 10 | - | - | 5 | - | 16 |
| CO4 | 2 | 11 | 1 | 3 | - | - | 17 |
| CO5 | - | - | 13 | 3 | - | 1 | 17 |
| CO6 | 1 | 16 | 8 | - | 3 | - | 28 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | | **Questions** | **CO** | **BL** | **Marks** |
|  | **PART – A (10 X 1 = 10 MARKS)** | | | | |
| 1. | | Relate Beam solid angle and directivity. | CO1 | R | 1 |
| 2. | | Find the efficiency of the antenna if its radiation resistance is 72 Ω and loss resistance is 8Ω. | CO1 | R | 1 |
| 3. | | Identify the radiation resistance of an infinitesimal dipole whose overall length is l=λ/50. | CO1 | A | 1 |
| 4. | | Recall the conditions of small and large loop antenna. | CO1 | R | 1 |
| 5. | | Infer the method used to calculate the total field pattern in antenna arrays. | CO2 | U | 1 |
| 6. | | Construct the amplitudes of Binomial array with 4 sources using Pascal’s triangle. | CO2 | A | 1 |
| 7. | | Explain Babinet’s principle. | CO3 | U | 1 |
| 8. | | Name a parasitic array antenna. | CO3 | R | 1 |
| 9. | | Model the basic structure of microstrip patch antenna. | CO4 | A | 1 |
| 10. | | Outline the importance of beamforming technique in smart antenna design. | CO6 | U | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Explain the following terms:  i) Directivity ii) Gain iii) HPBW | CO1 | U | 3 |
| 12. | List the advantages of array antenna. | CO2 | R | 3 |
| 13. | Show the concept of pattern multiplication with an example. | CO4 | U | 3 |
| 14. | Outline the concept of aperture antennas using Huygens principle. | CO4 | U | 3 |
| 15. | Define Travelling wave antenna and sketch its radiation pattern. | CO3 | R | 3 |
| 16. | Summarize on the different types of radio wave propagation used in practice. | CO5 | U | 3 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23)** | | | | | |
| 17. | a. | | Show that the properties of an antenna remain unchanged when the same antenna is operated as a transmitter or as a receiver. | CO1 | U | | 8 |
| b. | | Explain the following terms  a. Radiation pattern b. Beam efficiency c. Radiation resistance  d. Antenna efficiency | CO1 | U | | 4 |
|  |  | |  |  |  | |  |
| 18. | a. | | Examine the electric field characteristics of a short dipole antenna using retarded vector potential. | CO1 | An | | 12 |
|  |  | |  |  |  | |  |
| 19. | a. | | Explain about Broad Side Array and sketch its field pattern by determining the maxima and minima directions. | CO2 | U | | 12 |
|  |  | |  |  |  | |  |
| 20. | a. | | Classify horn antenna based on the direction of flaring and also construct its design equations. | CO3 | U | | 12 |
|  |  | |  |  |  | |  |
| 21. | a. | | Explain the geometry and operation of the Yagi-Uda antenna, and also derive the voltage-current relations associated with parasitic antennas. | CO4 | U | | 12 |
|  |  | |  |  |  | |  |
| 22. | a. | | Show that the resultant field in a direction making an angle  with the line of an array consisting of N aerials equally spaced ‘d’ apart and carrying equal aerial currents and in phase is given by , where .  Inspect on its significance in antenna design. | CO2 | U | | 9 |
| b. | | Examine the advantages and disadvantages of Binomial Array. | CO2 | An | | 3 |
|  |  | |  |  |  | |  |
| 23. | a. | | Inspect on the following characteristics of microstrip patch antenna:   1. Structure 2. Feeding Methods 3. Analysis of rectangular patch antenna | CO6 | An | | 8 |
| b. | | Explain about space wave propagation. | CO5 | U | | 4 |
|  | **Compulsory** | | | | |
| 24. | a. | | Explain in detail about smart antenna concepts, benefits and its types. | CO6 | E | | 12 |

|  |  |
| --- | --- |
|  | **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 type antennas |
| CO5 | Categorize the radio wave propagation regions |
| CO6 | Design and analyze various types of antennas using simulation tools |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 15 | 1 | 12 | - | - | 31 |
| CO2 | 3 | 22 | 1 | 3 | - | - | 29 |
| CO3 | 4 | 13 | - | - | - | - | 17 |
| CO4 | - | 18 | 1 | - | - | - | 19 |
| CO5 | - | 7 | - | - | - | - | 07 |
| CO6 | - | 1 | - | 8 | 12 | - | 21 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2021** | **Duration** | **3hrs** |
| **Course Name** | **MICROWAVE AND OPTICAL COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the passive microwave components. | | CO1 | R | 1 |
| 2. | Construct the S-matrix of matched termination. | | CO4 | C | 1 |
| 3. | Define transit time. | | CO3 | R | 1 |
| 4. | Classify the different types of magnetron oscillator. | | CO3 | U | 1 |
| 5. | Indicate the importance of Schottky barrier diode in power measurement. | | CO2 | R | 1 |
| 6. | Interpret the advantages of optical fiber. | | CO5 | U | 1 |
| 7. | Justify the action of GUNN diode as transferred electron devices. | | CO2 | U | 1 |
| 8. | Interpret the advantages of optical fiber. | | CO5 | U | 1 |
| 9. | Define bipolar transistor. | | CO6 | R | 1 |
| 10. | Name the light sources used in fiber optic communication. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List the properties of S-matrix. | | CO4 | R | 3 |
| 12. | Compare two cavity klystron and travelling wave tube amplifier. | | CO3 | U | 3 |
| 13. | Illustrate the negative resistance concept of GUNN diode. | | CO2 | A | 3 |
| 14. | Compare single-mode fiber and multi-mode fiber. | | CO5 | E | 3 |
| 15. | A step-index fiber has specified parameters for refractive index of fiber core and cladding as 1.50 and 1.46, respectively. Calculate numerical aperture. | | CO5 | An | 3 |
| 16. | Classify the different LED structures. | | 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 Scattering matrix of E-plane Tee. | CO4 | U | 8 |
|  | b. | Illustrate with an example of waveguide flange. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Write short notes on twist, bend and corner. | CO1 | A | 3 |
|  | b. | Enumerate the properties of scattering matrix with a necessary condition. | CO4 | R | 9 |
|  |  |  |  |  |  |
| 19. |  | Describe the construction and operation of two cavity klystron with a neat schematic diagram and Applegate diagram. | CO3 | R | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the operation of TRAPATT diode with necessary diagrams. | CO2 | U | 8 |
|  | b. | Discuss the construction and operation of calorimeter method in the measurement of microwave power. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the optical fiber communication system with the block diagram in detail. | CO5 | U | 8 |
|  | b. | Explain the need for the optical fiber communication. | CO5 | A | 4 |
|  |  |  |  |  |  |
| 22. |  | Determine the impedance Zo and Zl for rectangular waveguide section using slotted line method. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Examine the numerical aperture of an optical fiber with a neat sketch. | CO5 | R | 8 |
|  | b. | Explain the characteristics of single mode fiber. | CO5 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss the operation of LED and LASER diode with a neat diagram. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 | 3 | - | - | - | 8 |
| CO2 | 1 | 13 | 15 | - | - | - | 29 |
| CO3 | 13 | 4 | - | - | - | - | 17 |
| CO4 | 12 | 8 | - | - | - | 1 | 21 |
| CO5 | 8 | 14 | 4 | 3 | 3 | - | 32 |
| CO6 | 2 | 15 | - | - | - | - | 17 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2022** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED CONCEPTS USING C++** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Construct a simple program to display ‘Excellent’ if a variable ‘mark’ is between 50 and 100, and display ‘Can do better’ otherwise. | | CO1 | A | 1 |
| 2. | State the purpose of using a Scope Resolution Operator in C++. | | CO1 | R | 1 |
| 3. | Explain about the accessibility of private members of a class. | | CO2 | U | 1 |
| 4. | Discuss about the ‘new’ operator in C++. | | CO1 | U | 1 |
| 5. | Write the syntax of ‘Function Templates’. | | CO4 | A | 1 |
| 6. | Explain about ‘abstract class’. | | CO3 | U | 1 |
| 7. | Describe the concept of Polymorphism. | | CO3 | R | 1 |
| 8. | Define File pointers. | | CO4 | R | 1 |
| 9. | Compare Linked list and an Array. | | CO5 | U | 1 |
| 10. | Describe the concept of ‘Merge Sort’. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | State the difference between a constructor and a destructor. | | CO1 | R | 3 |
| 12. | List and explain about the access specifiers. | | CO2 | R | 3 |
| 13. | Describe about class templates. | | CO4 | R | 3 |
| 14. | Write any three classes of file stream. | | CO4 | A | 3 |
| 15. | Compare singly and doubly linked list. | | CO5 | U | 3 |
| 16. | Explain why sorting helps in searching. | | CO3 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Explain about the Input and Output Functions using C++ with a program. | CO1 | U | 8 |
|  | b. | Discuss in detail about control statements in C++. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. |  | Discuss about Single Inheritance and Multiple Inheritance with an object-oriented program. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Discuss in detail about Virtual functions and Pure virtual functions highlighting the concept of polymorphism with a program. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Write a short note on Exceptions. | CO6 | A | 4 |
|  | b. | Write a simple C++ program for writing and reading data using fstream class. | CO4 | A | 8 |
|  |  |  |  |  |  |
| 21. |  | Explain the following operations of Linked list in Arrays: a. Node Structure of a Linked List Representation.  b. Insert a new entry into the Linked list.  c. Delete an entry from the Linked list. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Discuss the user defined functions with following constraints and example demonstrations.  • Function with no parameters and no return value  • Function with parameters and no return value  • Function with parameters and return value | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Describe about Static function and static data with an object-oriented program. | CO4 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss in detail about Linear Search with an example | CO5 | U | 6 |
|  | b. | Explain in detail about bubble sort with an example. | CO5 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 13 | 1 |  |  |  |  |
| CO2 | 3 | 13 |  |  |  |  |  |
| CO3 | 1 | 16 |  |  |  |  |  |
| CO4 | 4 | 24 | 12 |  |  |  |  |
| CO5 | 1 | 28 |  |  |  |  |  |
| CO6 |  |  | 4 |  |  |  |  |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Find the divergence of vector function = | | CO1 | R | 1 |
| 2. | Interpret the Cartesian coordinate x = 2, y = 1 and z= 3 in to spherical coordinate system. | | CO1 | U | 1 |
| 3. | Solve the summation of the vectors. | | CO1 | A | 1 |
| 4. | Infer energy density of capacitor. | | CO3 | U | 1 |
| 5. | Write the value of permittivity of free space. | | CO2 | A | 1 |
| 6. | Name the unit of self-inductance. | | CO4 | R | 1 |
| 7. | Interpret the force equation between two parallel conductors where wires carry I1 and I2 in opposite direction. | | CO4 | U | 1 |
| 8. | Write the equation of propagation velocity. | | CO5 | A | 1 |
| 9. | State the quality factor of transmission lines. | | CO6 | R | 1 |
| 10. | Express intrinsic impedance of the medium. | | CO6 | C | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Show that the vector E = is irrotational. | | CO1 | R | 3 |
| 12. | Express the compact form of energy stored in the system. | | CO3 | C | 3 |
| 13. | Define Ampere’s circuital law. | | CO4 | R | 3 |
| 14. | Infer the condition of general equation of transmission line. | | CO5 | U | 3 |
| 15. | Illustrate impedance matching using quarter wave transmission lines. | | CO5 | A | 3 |
| 16. | Explain the properties of TE and TM modes. | | 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. | What are the conditions for two vectors A and B to parallel and perpendicular? | CO1 | R | 4 |
|  | b. | Analyze and prove the given condition below, | CO2 | An | 8 |
| 18. | a. | Express the condition for the capacitance of parallel plate capacitor with two media with a neat sketch. | CO3 | C | 8 |
|  | b. | A charge q2 = 121nC is located at P2 (-0.03, 0.01, 0.04). Find the force on q2 due to q1 of 110μC at P1 (0.03, 0.08, - 0.02). | CO2 | E | 4 |
| 19. | a. | Express the condition for the magnetic field intensity due to infinite conductor, with a neat sketch. | CO3 | C | 10 |
|  | b. | Infer the condition of energy stored in inductor. | CO4 | C | 2 |
| 20. | a. | State and prove the Coulomb’s law with a neat sketch. | CO2 | R | 8 |
|  | b. | Explain any one of the applications in Coulomb’s law. | CO2 | U | 4 |
| 21. |  | Define Maxwell’s equation. Derive any two equations with justification. | CO5 | R | 12 |
| 22. | a. | State and prove Poynting vector with power flow equation. | CO5 | R | 10 |
|  | b. | Explain the concept of uniform plane waves. | CO5 | U | 2 |
| 23. | a. | Describe the wave propagation in a free space. | CO6 | R | 4 |
|  | b. | Explain the different types of polarization with a neat sketch. | CO6 | U | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Write a short notes on VSWR. | CO6 | A | 4 |
|  | b. | Explain about half and quarter wave transmission lines. | CO6 | U | 4 |
|  | c. | Discuss about the Smith chart and its applications. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 8 | 1 | 1 | - | - | - | 10 |
| CO2 | 8 | 4 | 1 | 8 | 4 | - | 25 |
| CO3 | - | 1 | - | - | - | 21 | 22 |
| CO4 | 4 | 1 | - | - | - | 2 | 07 |
| CO5 | 22 | 5 | 4 | - | - | - | 31 |
| CO6 | 5 | 19 | 4 | - | - | 1 | 29 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2028** | **Duration** | **3hrs** |
| **Course Name** | **MICROPROCESSOR AND MICROCONTROLLER** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Select the principle followed in STACK memory. | | CO1 | R | 1 |
| 2. | Show how 8085 microprocessor executes multiplication. | | CO1 | U | 1 |
| 3. | State the importance of EA pin in 8051. | | CO2 | R | 1 |
| 4. | Determine the machine cycle for XTAL = 16MHz in 8051. | | CO2 | A | 1 |
| 5. | Examine in BSR mode, which port is affected on set/reset? | | CO3 | A | 1 |
| 6. | Interpret the number of channels are present in ADC 0808/0809 chip | | CO4 | U | 1 |
| 7. | Recall an example for real time embedded system. | | CO4 | R | 1 |
| 8. | Write the size of unsigned integer in C. | | CO5 | A | 1 |
| 9. | List the two wire protocol for serial communication. | | CO5 | U | 1 |
| 10. | Recite an application of stepper motor. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss branching instructions in 8085 with examples. | | CO1 | U | 3 |
| 12. | Recall the alternate functions of PORT 0, PORT 2, and PORT 3. | | CO2 | R | 3 |
| 13. | Interpret the I/O Mode of 8255 to configure Port A as i/p in mode 0, Port B as o/p mode 0, Port C (lower) as o/p and Port C (upper) as i/p ports. | | CO3 | A | 3 |
| 14. | Rewrite any three features of 8051 microcontroller. | | CO4 | U | 3 |
| 15. | Discuss the various signals of SPI protocol. | | CO6 | U | 3 |
| 16. | Sketch the Common Cathode LED interface in LED with its ON & OFF states. | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Summarize the characteristics of an Embedded system. | CO1 | U | 2 |
|  | b. | Discuss the features of Intel 8085 microprocessor with a neat architectural diagram. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 18. |  | Explain the architecture of 8051 microcontroller with a neat functional block diagram. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Discuss any four addressing modes of 8051 microcontroller with examples for each. | CO3 | R | 8 |
|  | b. | Write an ALP to count the number of FF’s in an array of 5 numbers. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Connect 4Kb ROM memory with 8051 microcontroller. | CO4 | An | 6 |
|  | b. | Examine the features of ADC 0808 and summarize the steps to interface ADC with 8051 microcontroller. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Explain the various modes of 8255 I/O interface with its control word. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Discuss the function of Timer/counter with its special function registers. | CO3 | U | 6 |
|  | b. | Distinguish Mode 1 and Mode 2 of Timer/counter with its internal diagram. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Discuss on the working of synchronous serial protocols  Serial Peripheral Interface (SPI)  Inter-Integrated Circuit (I2C) | CO6 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate and design a circuit to interface DC motor with 8051 microcontroller. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 16 | - | - | - | - | 17 |
| CO2 | 4 | - | 13 | - | - | - | 17 |
| CO3 | 8 | 12 | 4 | 4 | - | - | 28 |
| CO4 | 1 | 4 | - | 6 | - | - | 11 |
| CO5 | - | - | 11 | - | - | - | 11 |
| CO6 | 1 | 27 | 12 | - | - | - | 40 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2028** | **Duration** | **3hrs** |
| **Course Name** | **MICROPROCESSOR AND MICROCONTROLLER** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Select the function of Program Counter. | | CO1 | R | 1 |
| 2. | Show how 8085 microprocessor executes division. | | CO1 | U | 1 |
| 3. | State the importance of EA pin in 8051. | | CO2 | R | 1 |
| 4. | Determine the machine cycle for XTAL = 12MHz in 8051. | | CO2 | A | 1 |
| 5. | Examine in BSR mode, which port is affected on set/reset? | | CO3 | A | 1 |
| 6. | Interpret the number of channels are present in ADC 0808/0809 chip | | CO4 | U | 1 |
| 7. | Recall an application of zigbee protocol. | | CO4 | R | 1 |
| 8. | Predict the size of character in C. | | CO5 | A | 1 |
| 9. | Interpret the four wire protocol for serial communication. | | CO5 | A | 1 |
| 10. | Recite an application of DC motor. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss control instructions in 8085 with examples. | | CO1 | U | 3 |
| 12. | Recall the alternate functions of PORT 1, PORT 2, and PORT 3. | | CO2 | R | 3 |
| 13. | Interpret the I/O Mode of 8255 to configure Port A as i/p in mode 0, Port B as o/p mode 0, Port C (lower) as o/p and Port C (upper) as i/p ports. | | CO3 | A | 3 |
| 14. | MOV R0,80H  MOV R0,#80H  MOV @R0,A  Examine the addressing modes for the above program. | | CO4 | A | 3 |
| 15. | Discuss the various signals of I2C protocol. | | CO6 | U | 3 |
| 16. | Sketch the Common Anode LED interface with its ON & OFF states. | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the architecture of 8085 microprocessor with a neat block diagram. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Summarize the features of 8051 microcontroller with a neat functional block diagram. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Discuss any four addressing modes of 8051 microcontroller with examples for each. | CO3 | R | 8 |
|  | b. | Write an ALP to a) Clear A register b) ADD 3 to the A register 10 times. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Connect 16Kb RAM memory with 8051 microcontroller. | CO4 | An | 6 |
|  | b. | Examine the features of ADC 0808 and summarize the steps to interface ADC with 8051 microcontroller. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the control word of 8255. Explain Mode 1 and Mode 2 with the necessary diagrams. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Discuss the function of Timer/counter with its Special function registers. | CO3 | U | 6 |
|  | b. | Distinguish Mode 0 and Mode 1 of Timer/counter with its internal diagram. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Discuss on the wireless communication protocols  ZigBee  Bluetooth | CO6 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate and design a circuit to interface stepper motor with 8051 microcontroller. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 16 | - | - | - | - | 17 |
| CO2 | 4 | - | 13 | - | - | - | 17 |
| CO3 | 8 | 12 | 4 | 4 | - | - | 28 |
| CO4 | 1 | 1 | 3 | 6 | - | - | 11 |
| CO5 | - | - | 11 | - | - | - | 11 |
| CO6 | 1 | 27 | 12 | - | - | - | 40 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC2030** | **Duration** | **3hrs** |
| **Course Name** | **DIGITAL ELECTRONICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the number system which uses alphabets as well as numerals. | | CO1 | R | 1 |
| 2. | Which logic gate is represented by the following circuit? | | CO1 | U | 1 |
| 3. | How many cells are there on an n- variable K- map? | | CO2 | U | 1 |
| 4. | What is the maximum number represented by a 4 bit BCD code? | | CO2 | U | 1 |
| 5. | Describe the operation performed by half adder. | | CO3 | R | 1 |
| 6. | List two examples for combinational circuits. | | CO3 | R | 1 |
| 7. | What is meant by flip flop? | | CO4 | R | 1 |
| 8. | Name the two types of counters. | | CO4 | R | 1 |
| 9. | Expand PAL. | | CO5 | R | 1 |
| 10. | Name the different technologies that are used to fabricate ICs. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Draw the symbol of NOR gate and write the truth table. | | CO1 | U | 3 |
| 12. | Write a procedure to reduce K – map. | | CO2 | R | 3 |
| 13. | Design a half subtractor. | | CO3 | A | 3 |
| 14. | Sketch the logic diagram of SR latch using NOR gates. | | CO4 | U | 3 |
| 15. | Design a 2 bit asynchronous up counter. | | CO4 | A | 3 |
| 16. | Mention 3 differences between PAL and PLA. | | CO5 | 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. | State and prove Demorgans theorem. | CO2 | A | 8 |
|  | b. | Simplify the following expression using Boolean algebra techniques.  AB+A(B+C)+B(B+C) | CO2 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Express the following function as the minimal sum of products using K map.  F (a,b,c,d) =∑m(0,2,4,5,6,8,10,15) + ∑Φ(7,13,14) | CO2 | A | 6 |
|  | b. | Design a 3 bit even parity generator circuit. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Draw and explain half adder circuit. | CO3 | U | 6 |
|  | b. | Explain the working of 4 to1 multiplexer and write the truth table. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Design BCD to Excess-3 code converter and draw the logic diagram. | CO3 | A | 6 |
|  | b. | Draw the block schematic of Magnitude comparator and explain its operation | CO3 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the operation of S-R flipflop with logic diagram. | CO4 | U | 8 |
|  | b. | Write difference between Combinational & Sequential circuits. | CO4 | An | 4 |
|  |  |  |  |  |  |
| 22. | a. | Realize T Flip flop using J-K flipflop. | CO4 | A | 8 |
|  | b. | Write short notes on state table and state diagram. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 23. | a. | With logic diagram explain 3-bit synchronous up counter. | CO4 | U | 6 |
|  | b. | Explain the operation of MOD-6 counter. | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the functioning of Programmable Logic Array using neat diagram. | CO5 | U | 6 |
|  | b. | Discuss the operation of schottky TTL. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
|  | The students will be able to: |
| CO1 | Compute The Number System Conversions |
| CO2 | Simplify The Boolean Expression 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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 4 |  |  |  |  | 5 |
| CO2 | 3 | 2 | 18 |  |  |  | 23 |
| CO3 | 2 | 18 | 15 |  |  |  | 35 |
| CO4 | 2 | 27 | 11 | 4 |  |  | 44 |
| CO5 | 1 | 6 |  | 3 |  |  | 10 |
| CO6 |  | 7 |  |  |  |  | 7 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3005** | **Duration** | **3hrs** |
| **Course Name** | **ANTENNAS AND RADIATION SYSTEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Deduce the expression for the radiation power density and radiation intensity. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Criticize the issues of polarization and the types of polarization. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Deduce the array factor of N- isotropic element linear array with uniform amplitude and spacing along z-axis. | CO2 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Illustrate the principle of pattern multiplication with example. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Discuss the working principle of Horn antenna and give the steps followed in the EM simulation tool for the designing of horn antenna. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | State and articulate Huygen’s principle. | CO3 | R | 15 |
|  | b. | Illustrate the reasons for the following:  i) Micro-strip antennas can be used only for low power radiation.  ii) For diversity reception, patch antennas are more suitable in mobile units. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Express the field equivalence principle of aperture antennas with neat sketches. | CO4 | U | 10 |
|  | b. | State and articulate Babinet’s principle for slot antennas. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Summarize the construction and characteristics of micro-strip antennas for mobile phone application. | CO6 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Illustrate the working principle of parabolic reflector antenna and explain the feeds used in parabolic reflector. | CO5 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Compute the far field distance, radiation pattern and gain of an antenna for given current distribution. |
| CO2 | Estimate the input impedance, efficiency and ease of match for linear wire antennas. |
| CO3 | Explain the array factor for an array of antennas. |
| CO4 | Use aperture concept for efficient antenna design |
| CO5 | Design Micro strip antennas for various desired radiation pattern characteristics. |
| CO6 | Determine the desired parameters of reflector antennas for specific application. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | - | 40 | - | - | 40 |
| CO2 | - | - | 20 | 20 | - | - | 40 |
| CO3 | 15 | 25 | - | - | - | - | 40 |
| CO4 | 10 | 10 | - | - | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3013** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED DIGITAL IMAGE PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the fundamental steps involved in digital image processing. | CO1 | U | 10 |
|  | b. | Describe the concepts of spatial and intensity resolution. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Let 𝑓(𝑥,𝑦) denote a digital image of size 𝑀×𝑁 pixels that is zero outside 0≤𝑥≤𝑀−1, 0≤ 𝑦≤𝑁−1, where 𝑀 and 𝑁 are integers and powers of 2. In the case of 𝑀=𝑁=2 and 𝑓(𝑥,𝑦)=, calculate the Hadamard transform coefficients of 𝑓(𝑥,𝑦). | CO2 | A | 10 |
|  | b. | Explain the properties of DFT. | CO5 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the various edge detection models with suitable examples. | CO2 | An | 8 |
|  | b. | Binary image X and structuring element B are given as follows. Calculate Y1=X⊖B and Y2=X⊕B, where ⊖ denotes morphological erosion operator and ⊕ denotes morphological dilation operator.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **X** | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 1 | 0 | 0 | 0 | 0 | | 0 | 1 | 0 | 0 | 0 | | 0 | 0 | 1 | 0 | 0 | | 0 | 0 | 0 | 1 | 0 | | 0 | 0 | 0 | 0 | 1 | | |  |  |  | | --- | --- | --- | | 1 | 1 | 1 | | **B** | | CO3 | A | 12 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the spatial filtering process and state the advantages of various spatial smoothening filter. | CO2 | An | 10 |
|  | b. | Explain the significance of localized feature extraction techniques. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Discuss the various transformation functions involved in image registration. | CO4 | U | 10 |
|  | b. | Discuss the working principle of wavelet-based segmentation. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Discuss the need of image registration and explain the fusion methods adopted to improve the image quality. | CO4 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the concept of active contour segmentation and its advantages. | CO3 | An | 10 |
|  | b. | Discuss the image segmentation techniques in frequency domain. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Illustrate the concepts of slicing 3D data sets, volumetric display and stereo viewing in 3D image processing. | CO5 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 9. | a. | Explain the importance of image processing for object detection in SAR images. | CO6 | An | 10 |
|  | b. | Describe the importance of scene understanding in natural images with a suitable case study. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Explain the basic concepts of image formation and representation. |
| CO2 | Design techniques for enhancing the quality of the images. |
| CO3 | Frame morphology-based methodologies for image segmentation. |
| CO4 | Assess the performances of various image registration approaches. |
| CO5 | Differentiate the concepts of 2D and 3D image processing approaches. |
| CO6 | Solve practical problems using image processing techniques. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 |  | 10 | 20 | 18 |  |  | 48 |
| CO3 |  | 10 | 12 | 20 |  |  | 42 |
| CO4 |  | 30 |  |  |  |  | 30 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  | 10 |  | 10 |  |  | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3014** | **Duration** | **3hrs** |
| **Course Name** | **PATTERN RECOGNITION AND MACHINE LEARNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | |
| 1. | a. | | Summarize the procedures involved in designing a pattern recognition system. | CO1 | U | 10 |
|  | b. | | Prove that the Bayesian classifier is optimal with respect to minimizing the classification error probability. | CO1 | E | 10 |
|  |  | | **(OR)** |  |  |  |
| 2. | a. | | Organize the methods employed to prevent overfitting in machine learning. | CO2 | A | 10 |
|  | b. | | Classify the types of Logistic Regression and discuss the steps involved in implementing them. | CO2 | An | 10 |
|  |  | |  |  |  |  |
| 3. | a. | | Summarize the boosting strategy used in classifier ensembles. Describe the Adaboost algorithm in detail. | CO3 | U | 10 |
|  | b. | | Examine the reason for the continuous piecewise linear cost function in perceptron. | CO3 | An | 10 |
|  |  | | **(OR)** |  |  |  |
| 4. | a. | | Formulate support vector machines (SVM) as an optimization problem. Elaborate on the methodology with which SVM can be used to classify data that are not linearly separable. | CO4 | C | 10 |
|  | b. | | Analyze Fisher’s linear discriminant function for two classes of observations. | CO4 | An | 10 |
|  |  | |  |  |  |  |
| 5. | a. | | Determine the procedure of Jackknife approach for evaluating the classification accuracy. | CO5 | E | 10 |
|  | b. | | Analyze the need for the combination of classifiers in machine learning. | CO5 | An | 10 |
|  |  | | **(OR)** |  |  |  |
| 6. | a. | | Examine the reasons for the less accurate results of uniformly distributed training sets from maximum likelihood estimation. | CO1 | An | 10 |
|  | b. | | Utilize the naive-bayes algorithm for solving the learning and classifying text data problems. | CO2 | A | 10 |
|  |  | |  |  |  |  |
| 7. | a. | | Make use of the XOR function to explain the fully functioning feed-forward network. | CO3 | A | 10 |
|  | b. | | Estimate the weight vector to minimize the mean square error (MSE) between the desired and true output. | CO4 | E | 10 |
|  |  | | **(OR)** |  |  |  |
| 8. | a. | | Examine the significance of Bias and variance in the context of regression. | CO5 | An | 10 |
|  | b. | | Analyze the divisive algorithm of clustering for unsupervised applications. | CO6 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. | a. | Develop 3 clusters using the k-means algorithm for the given 7 two-dimensional patterns.  A= (1,1), B= (1,2), C= (2,2), D= (6,2), E= (7,2), F= (6,6), G= (7,6). | | CO6 | C | 10 |
|  | b. | “Clustering can be used to improve the accuracy of supervised machine learning algorithms”. Justify the statement. | | CO6 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 10 |  | 10 | 10 |  | 30 |
| CO2 |  |  | 20 | 10 |  |  | 30 |
| CO3 |  | 10 | 10 | 10 |  |  | 30 |
| CO4 |  |  |  | 10 | 10 | 10 | 30 |
| CO5 |  |  |  | 20 | 10 |  | 30 |
| CO6 |  |  |  | 10 | 10 | 10 | 30 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3019** | **Duration** | **3hrs** |
| **Course Name** | **WIRELESS SENSOR NETWORKS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the functional architecture of Wireless Sensor Networks with a neat sketch and list the individual components of WSN. | CO1 | A | 15 |
|  | b. | Compare Sensor Networks with the Traditional Networks. | CO1 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Distinguish Imote2 and tmote with their complete hardware and software details. | CO2 | An | 10 |
|  | b. | Examine the functions of RetOS operating systems. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. |  | Write the need of time synchronization in wireless sensor networks and discuss in detail the following protocols.   1. Transport Layer protocol. 2. Network layer protocol. 3. Data link protocol. | CO3 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Estimate the position of an object using the principle of Trilateration method and Multilateration method. | CO4 | E | 10 |
|  | b. | Discuss the design challenges in sensor network database. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 5. |  | Define data aggregation and summarize the different types of data aggregation methods in wireless sensor networks. | CO5 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write the significance of S-MAC protocol. | CO3 | A | 5 |
|  | b. | Describe the basics of Probability Based Routing Algorithm for WSN. | CO4 | U | 15 |
|  |  |  |  |  |  |
| 7. |  | Discuss on Angle of Arrival (AOA) and Time difference of Arrival (TDOA) based tracking mechanisms. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Analyze the importance of pattern matching in wireless sensor networks with a help of Nearest Neighbor algorithm. | CO4 | An | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Propose any two applications of wireless sensor networks in detail. | CO6 | C | 10 |
|  | b. | Interpret Energy management and security levels followed in Bluetooth Technology. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 15 | 5 |  |  | 20 |
| CO2 |  |  | 10 | 10 |  |  | 20 |
| CO3 |  |  | 5 |  |  | 20 | 25 |
| CO4 |  | 35 |  | 20 | 10 |  | 65 |
| CO5 | 20 | 10 |  |  |  |  | 30 |
| CO6 |  |  | 10 |  |  | 10 | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3024** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED COMMUNICATION NETWORKS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Distinguish OSI Reference Model and TCP/IP Model, describe the functions of each layer and their protocols. | CO1 | An | 8 |
|  | b. | Compare Internet and ATM networks. Express the significance of ATM networks. | CO1 | An | 8 |
|  |  |  |  |  |  |
| 2. | a. | Solve the problem of resource reservation in Integrated Services using RSVP. Highlight its special features. | CO1 | A | 8 |
|  | b. | Compare Leaky bucket and Token bucket algorithms. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the basic requirements of Packet scheduler. | CO2 | U | 8 |
|  | b. | Illustrate the arrival and departure process of two flows sharing a server equally. | CO2 | A | 8 |
|  |  |  |  |  |  |
| 4. | a. | Compare the following active queue management methods: Random Early Discarding and Weighted Random Early Discarding | CO2 | U | 8 |
|  | b. | Compare Grid of Tries and Cross-Producting approaches used for packet classification. | CO2 | E | 8 |
|  |  |  |  |  |  |
| 5. |  | Apply Controlled prefix expansion in the given IP database to reduce the prefixes to lengths of 2, 5 and 7. | CO3 | A | 16 |
|  |  |  |  |  |  |
| 6. | a. | Infer the consequence, if the hash value has collision bit set, in packet processing. Illustrate with suitable figures and tables. | CO4 | An | 8 |
|  | b. | Create DSCP for AF high drop precedence with minimum bandwidth of 4 Mbps. | CO4 | C | 8 |
|  |  |  |  |  |  |
| 7. | a. | Distinguish Differentiated services from Integrated services. State the significance of DS in QoS. | CO5 | An | 8 |
|  | b. | Explain metering and marking of traffic in differentiated services for AF classes using Token bucket algorithm. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Discuss the problems with overlaying. | CO6 | U | 10 |
|  | b. | Explain IP switching in traffic engineering. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

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



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3025** | **Duration** | **3hrs** |
| **Course Name** | **RF AND MICROWAVE CIRCUIT DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe Single stub and double stub impedance matching. | CO1 | U | 10 |
|  | b. | Recall the concept of N port scattering matrix representation. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Enumerate the properties of scattering matrix. | CO2 | R | 10 |
|  | b. | Predict the reflection coefficient at the load, the standing-wave ratio on a 50-Ω lossless transmission line is terminated in a load with impedance ZL = (30− j50) Ω. The wavelength is 8 cm. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Express the working principle of Directional coupler with its scattering matrix. | CO2 | U | 10 |
|  | b. | Illustrate the applications of power divider as splitter and combiner. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Recite transmission matrices. | CO2 | R | 8 |
|  | b. | Explain signal flow graph representation in microwave network with example. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 5. |  | Discuss the working principle of isolator with neat diagram. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Recall Inter symbol interference. | CO4 | R | 8 |
|  | b. | Discuss the types of noises in RF communication. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 7. |  | Examine different types of microwave transistors and its applications in the field of RF communication. | CO5 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Paraphrase the performance characteristics of Schottky diode. | CO5 | U | 10 |
|  | b. | Recall the importance of GUNN diode as Microwave source. | CO5 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain mixer in RF communication with neat block diagram. | CO6 | U | 10 |
|  | b. | Enumerate the working principle of Trapatt diode. | CO6 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the behavior of RF passive components and model active components. |
| CO2 | Perform transmission line analysis. |
| CO3 | Demonstrate use of Smith Chart for high frequency circuit design. |
| CO4 | Justify the choice/selection of components from the design aspects. |
| CO5 | Design and simulate microwave circuits. |
| CO6 | Select suitable measurement methodologies to characterize and verify the performance of RF and microwave circuits. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | 10 |  |  |  | 30 |
| CO2 | 8 | 22 | 20 |  |  |  | 50 |
| CO3 |  | 20 |  |  |  |  | 20 |
| CO4 | 8 | 12 |  |  |  |  | 20 |
| CO5 | 30 | 10 |  |  |  |  | 40 |
| CO6 | 10 | 10 |  |  |  |  | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3026** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF THINGS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Relate the terms digitization and IoT in the current world scenario and explain the evolution from IT to IoT. | CO1 | A | 10 |
|  | b. | Explain with neat diagram, the one M2M IoT standardized architecture. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Differentiate between IPv4 and IPv6. Justify its part in IoT revolution. | CO1 | U | 10 |
|  | b. | Report on the protocols that support IoT communications and modular design. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate the principles of EDGE /P2P computing with respect to IoT. | CO2 | A | 10 |
|  | b. | Discuss on the technologies that support IoT from cloud to fog computing. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain in detail wireless sensors network, communication protocol and its limitations. | CO3 | U | 10 |
|  | b. | Discriminate the LAN, PAN and WAN IOT networks with relevant examples. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe in detail about the concept of edge resource pooling and caching. | CO3 | U | 10 |
|  | b. | Explain various open-source hardware and embedded system platforms used for IoT. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | List and describe the characteristics and attributes concerned when selecting and dealing with connecting smart object. | CO4 | U | 10 |
|  | b. | Differentiate the concepts of multi-threaded and event-driven programming. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Criticize on the various operating system requirements to have an IoT environment. | CO5 | An | 10 |
|  | b. | Write short notes on RIoT and Contiki operating systems. | CO5 | C | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe IT Act 2000 and various legal considerations used for implementing IoT. | CO6 | U | 10 |
|  | b. | Recommend the concepts of big data used for IoT applications. | CO5 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss about the use of IoT application in health care sectors. | CO6 | U | 10 |
|  | b. | Illustrate an IoT based architecture used for connected vehicle and smart transportation. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 20 | 10 | - | - | - | 30 |
| CO2 | - | 10 | 20 | - | - | - | 30 |
| CO3 | - | 20 | - | 10 | - | - | 30 |
| CO4 | - | 20 | - | 10 | - | - | 30 |
| CO5 | - | - | - | 10 | 10 | 10 | 30 |
| CO6 | - | 20 | - | 10 | - | - | 30 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3028** | **Duration** | **3hrs** |
| **Course Name** | **SOLID STATE DEVICE MODELING AND SIMULATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How to distinguish the poisson equation and continuity equation for device simulation? Justify with examples. | CO1 | R | 10 |
|  | b. | Demonstrate the finite difference solutions to these equations in 1D and 2D space with justifications. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain in detail the following:  a. Diffusion equation.  b. Schrodinger equation.  c. Hydrodynamic equation. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Outline the concept based on Quantum mechanical with a neat sketch. List out the application of quantum mechanics. | CO2 | U | 10 |
|  | b. | Recall the avalanche process in quantum concept with any two use cases. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Distinguish injection and transport model for quantum mechanics. | CO2 | An | 8 |
|  | b. | Explain the study of diode small and large signal with a neat sketch and its applications. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 5. | a. | Discuss briefly about the bipolar devices and explain ideal IC – VCE characteristics with a neat diagram. | CO3 | C | 10 |
|  | b. | What is breakdown voltage and how it works. List its applications. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Define saturation current in a transistor. Relation between BVCEO and BVCBO. | CO4 | R | 10 |
|  | b. | Explain emitted diffusion capacitance theory with a neat sketch. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Discuss brief about MOS capacitor with a neat sketch. Explain surface potential, accumulation, depletion and inversion of MOS capacitor. | CO4 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | How source drain series resistance works in MOSFET? | CO4 | R | 12 |
|  | b. | Explain MOSFET I-V characteristics with a neat diagram. | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain non scaling effects and its function of CMOS device design with a neat sketch. | CO6 | E | 10 |
|  | b. | What is the difference between quantum effect on threshold voltage and discrete dopant effects on threshold voltage? | CO6 | R | 10 |

CO – COURSE OUTCOME BL – BLOOMS LEVEL

|  |  |
| --- | --- |
|  | **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 capacitor. |
| CO5 | Illustrate the performance and characterize MOS devices. |
| CO6 | Determine and develop CMOS design. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 30 | - | - | - | - | 40 |
| CO2 | 10 | 22 | - | 8 | - | - | 40 |
| CO3 | 10 | - | - | - | - | 10 | 20 |
| CO4 | 22 | 10 | - | - | - | 20 | 52 |
| CO5 | - | 8 | - | - | - | - | 8 |
| CO6 | 10 | - | - | - | 10 | - | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3042** | **Duration** | **3hrs** |
| **Course Name** | **CAD FOR VLSI CIRCUITS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Estimate the design methodology flow for the design automation for the Y-chart. | CO1 | A | 10 |
|  | b. | Explain the fabrication process and its impact on the VLSI physical design automation. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 2. |  | Organize the types of ASIC in detail used in CAD VLSI circuits? Give an illustration of the various types of ASIC with neat diagram. | CO1 | An | 16 |
|  |  |  |  |  |  |
| 3. |  | Assess the Dijkstra’s shortest path algorithm for the graph given below.  a. Write the Dijkstra’s Pseudo Code for the graph.  b. Write the Dijkstra’s Shortest path algorithm for the graph and give the output for shortest path from vertex A-G.  c. Compute the time complexity and space complexity for the graph. | CO2 | C | 16 |
|  |  |  |  |  |  |
| 4. | a. | Assess the DFS algorithm for the graph given below.  a. Write the DFS Pseudo Code for the graph.  b. Write the DFS python program for the graph and give the output  c. Calculate the time complexity and space complexity | CO2 | C | 12 |
|  | b. | Interpret the design flow for the design automation for the physical design automation of FPGAS. | CO6 | U | 4 |
|  |  |  |  |  |  |
| 5. |  | Organize the types of Floor planning used in CAD VLSI circuits in detail. Give an illustration of the various types of Floorplans with neat diagram. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 6. | a. | Explain the steps involved in Binary decision diagram reduction with one example. | CO3 | A | 12 |
|  | b. | Summarize the types of placement techniques. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 7. | a. | Organize the Back Tacking Algorithm (BTA) used in CAD VLSI circuits for the given graph.   1. Write the BTA Pseudo Code for the graph 2. Write the BTA algorithm for the graph and give the output Calculate the cost of the BTA with starting node as A. | CO5 | C | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Explain in detail the classical routing model used for channel routing.  Route the following netlist using Left Edge algorithm:  U={I1,I2,I3…I7};I1={1,4},I2={2,6},I3={3,8},I4={5,10},I5={7,1  1},I6={9,12}.Draw the interval graph corresponding to the solution | CO5 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | To design the circuit using Floor planning, Placement and Routing concepts. |
| CO2 | To design and implement various algorithms onto FPGA. |
| CO3 | To verify Simulation and Synthesis process in the circuit design. |
| CO4 | Explain the concept of portioning and floor planning. |
| CO5 | Explain various techniques related to Placement, Routing, Circuit extraction and  DRC. |
| CO6 | Impact of various algorithm on FPGA. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 6 | 10 | 16 | - | - | 32 |
| CO2 | - | - | - | - | - | 28 | 28 |
| CO3 | - | - | 12 | - | - | - | 12 |
| CO4 | - | - | - | 16 | - | - | 16 |
| CO5 | - | 4 | - | 20 | - | 16 | 40 |
| CO6 | - | 4 | - |  | - | - | 4 |
|  | | | | | | | **132** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3048** | **Duration** | **3hrs** |
| **Course Name** | **DESIGN OF SEMICONDUCTOR MEMORIES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Dissect with a neat diagram explain the read, write operation of a conventional SRAM cell and the operation of its peripheral circuits (write circuitry and sense amplifier). | CO1 | An | 15 |
|  | b. | Differentiate between hard error and soft error in Memories. | CO1 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Interpret with neat diagram explain the operation of a 3T and 1T DRAM cell. | CO2 | An | 14 |
|  | b. | Justify the need for OTP EPROM for the semiconductor memory design. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 3. | a. | Elaborate define the Fowler-Nordheim tunneling mechanism with diagram. | CO3 | C | 6 |
|  | b. | Estimate how programming and reading is done in NAND structured cell EEPROM architecture. | CO4 | E | 14 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Describe with necessary diagrams, different types of  (i) EEPROM Technology and Architecture -  (ii)Non volatile SRAM  (iii)Flash memories  (iv)Flash Architectures. | CO3 | C | 20 |
|  |  |  |  |  |  |
| 5. | a. | Explain how programming and reading is done in NAND structured cell EEPROM architecture. | CO3 | E | 10 |
|  | b. | List the differences between volatile and non-volatile memories with examples. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail about parametric testing in memories. | CO4 | E | 15 |
|  | b. | List three types of observable degradation effects upon exposing memories to ionizing radiation. | CO5 | An | 5 |
|  |  |  |  |  |  |
| 7. | a. | Explain in detail about parametric testing in memories. | CO4 | An | 10 |
|  | b. | List three types of observable degradation effects upon exposing memories to ionizing radiation. | CO5 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | With state diagram, indicate how a 0 to 1 transition fault occur in a memory cell | CO5 | A | 10 |
|  | b. | Explain about IDDQ Fault modeling and Testing. | CO6 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Mention the difference between digital memories and analog memories. | CO6 | C | 10 |
|  | b. | With neat diagram of FRAM hysteresis curve, explain the polarization effect, FRAM cell and memory operation. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design the architecture of Random Access Memory. |
| CO2 | Choose the type of memory for a specific application. |
| CO3 | Illustrate different types of faults that occur in memories. |
| CO4 | Illustrate various reliability and radiation effects that occur in memories. |
| CO5 | Prove the radiation effects that occur in memories. |
| CO6 | Comprehend the significance of technology development in memories. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 5 | 15 |  |  | 20 |
| CO2 |  |  |  | 14 | 6 |  | 20 |
| CO3 |  |  |  |  | 10 | 26 | 36 |
| CO4 |  |  | 10 | 20 | 29 |  | 59 |
| CO5 |  |  | 10 | 5 | 10 |  | 25 |
| CO6 |  |  |  | 20 |  | 10 | 30 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **18EC3049** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEM ON CHIP DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the overview of basic System on Chip. Give the block diagram of the various Components of the System on Chip. | CO1 | A | 10 |
|  | b. | Find an actual VLIW instruction format. Describe the layout and the constraints on the program in using the applications in a single instruction. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Infer in details the architectural model of the following   1. Sequential Processor Model 2. Pipelined Processor Model 3. Superscalar Processor Model 4. VLIW Processor Model 5. Array Processor Model 6. Vector Processor Model | CO2 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Design validation is a very important SOC design consideration. Find several approaches specific to SOC designs. Evaluate each from the perspective of a small SOC vendor. | CO2 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Estimate the Processor design trade - offs of the different general classes of processors: Area – time – power trade - offs in processor design. | CO3 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Discover Processor Selection for SOC with the basic Concepts in Processor Architecture with the neat diagram explain the functionality. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Find an SOC configuration that uses a superscalar processor and describe the architecture of the processor — register sets, number of rename registers, control flow or dataflow, instruction format, and so on. | CO4 | C | 20 |
|  |  |  |  |  |  |
| 7. | a. | Deduct outline for memory design with the neat block diagram and explain the methodology of design in detail. | CO4 | E | 10 |
|  | b. | Examine for current products that use the AMBA bus; find at least three distinct systems and tabularize their respective parameters (AHB and APB): bus width, bandwidth, and maximum number of IP users per bus. Provide additional details as available. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Compare recent commercially available flash (NAND and NOR) with recent eDRAM offerings. | CO5 | E | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | How fast would a 32 - bit processor with the ARM7 instruction set need to run to be able to support AES for Wi - Fi 802.11b? How about a 64 - bit processor? | CO6 | E | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Summarize Combinational logic function, Switch logic. |
| CO2 | Illustrate Power optimization and combinational logic testing. |
| CO3 | Demonstrate Power optimization and sequential logic testing. |
| CO4 | Examine subsystem design. |
| CO5 | Outline system using various floor planning. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | 10 | 10 | - | - | 20 |
| CO2 | - | - | - | 20 | - | 20 | 40 |
| CO3 | - | - | - | 20 | - | 20 | 40 |
| CO4 | - | - | - | - | 10 | 20 | 30 |
| CO5 | - | - | - | 10 | 20 | - | 30 |
| CO6 | - | - | - | - | 20 | - | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC1001** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | State ohms law. | | CO1 | R | 1 |
| 2. | List the advantages of LED. | | CO1 | R | 1 |
| 3. | Name the electromechanical device that converts electrical energy into mechanical energy. | | CO2 | R | 1 |
| 4. | Identify the process of removing heat from a substance and cooling it to a temperature below the actual temperature. | | CO2 | U | 1 |
| 5. | Find the equivalent resistance in the below circuit.  Find the current in the circuit | | CO3 | A | 1 |
| 6. | Mention the process of adding electron-rich or electron-deficient impurity to the intrinsic semiconductor to improve its conductivity. | | CO3 | R | 1 |
| 7. | Interpret when will the output of two-input OR gate be high. | | CO4 | U | 1 |
| 8. | Suggest a sensor which can be used to model an automotive to detect the driving behaviour and driving patterns such as sharp turns, sudden acceleration, hard braking, drifting and speeding. | | CO5 | U | 1 |
| 9. | Name the technique which allows the base-station to take control of the mobile unit travelling through different cells. | | CO6 | R | 1 |
| 10. | Report anyone application of satellite communication. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | The electricity tariff in a town is Rs. 3.00 per unit. Calculate the cost of running an 80W fan for 10 hours a day for the month of June. | | CO1 | A | 3 |
| 12. | Draw a labelled diagram of an electric motor. | | CO2 | A | 3 |
| 13. | Distinguish intrinsic semiconductor and extrinsic semiconductor. | | CO3 | U | 3 |
| 14. | Define embedded system and give its advantages. | | CO4 | R | 3 |
| 15. | Define biosensors. Give its applications. | | CO5 | R | 3 |
| 16. | List any three advantages of 3G mobile network. | | 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 a thermal power plant with neat diagram. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Deduce the functional block of the electric motor and explain its working | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Discuss the colour coding concept of carbon resistor and explain the procedure to calculate resistance value with an example | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | With schematic sketch, truth table and characteristics discuss on various basic logic gates. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Illustrate an overhead tank water level system with sensor and explain in detail. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Elaborate the principle of operation of an ultrasound scanner with block diagram | CO5 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the working of Hydro Power plant with neat illustration | CO1 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate a satellite communication system and explain its functioning. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | - | 27 | - | - | - | 29 |
| CO2 | 1 | 1 | 3 | 12 | - | - | 17 |
| CO3 | 1 | 15 | 1 | - | - | - | 17 |
| CO4 | 3 | 13 | - | - | - | - | 16 |
| CO5 | 3 | 13 | - | 12 | - | - | 28 |
| CO6 | 4 | 1 | - | 12 | - | - | 17 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC1003** | **Duration** | **3hrs** |
| **Course Name** | **BASIC PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Estimate the Power in 250V bulb passes a current of 0.3A. | | CO1 | U | 1 |
| 2. | Define Fluorescent lamp. | | CO1 | U | 1 |
| 3. | Name the types of Motors. | | CO2 | R | 1 |
| 4. | Infer on Implanted blood pumps. | | CO2 | U | 1 |
| 5. | State Ohm’s law. | | CO3 | R | 1 |
| 6. | Identify any one difference between single phase and three phase transformer. | | CO3 | U | 1 |
| 7. | Give examples for arithmetic logic gates. | | CO4 | U | 1 |
| 8. | Define ROM. | | CO4 | R | 1 |
| 9. | Interpret Aircrafts Gyro. | | CO5 | U | 1 |
| 10. | Define Simplified reference model. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Summarize Electricity Tariff. | | CO1 | U | 3 |
| 12. | Categorize the applications of Motor. | | CO2 | An | 3 |
| 13. | Differentiate Diodes and Transistors. | | CO3 | U | 3 |
| 14. | Explain the block diagram of Sequential circuits. | | CO4 | An | 3 |
| 15. | List the types of Sensors. | | CO5 | R | 3 |
| 16. | Sketch the General block diagram of 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. | a. | Distinguish the Concept of voltage, power and energy. | CO1 | E | 6 |
|  | b. | Differentiate Fluorescent lamp, CFL, LED. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain the Construction and Working of an Electrical Motor. | CO2 | An | 8 |
|  | b. | Criticize on Solar Powered Airplane, Personal Flying Cars. | CO2 | E | 4 |
|  |  |  |  |  |  |
| 19. | a. | Justify the evolution and impact of electronics in industry and society. | CO3 | E | 8 |
|  | b. | Discriminate relays and switches. | CO3 | An | 4 |
|  |  |  |  |  |  |
| 20. | a. | Describe the Block diagram of ALU in detail. | CO4 | U | 6 |
|  | b. | Differentiate any two types of Flipflops with its definition. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Predict the applications of any three types of sensors in IOT. | CO5 | E | 6 |
|  | b. | Discuss in detail about the need of ultrasound scanner. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Recommend the Star Rating for Electrical Appliances. | CO1 | E | 6 |
|  | b. | Dramatize motors in Robots. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Categorize the types of resistors. | CO3 | An | 6 |
|  | b. | Discuss in detail about the embedded systems. | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Summarize the benefits of wireless transmission. | CO6 | U | 6 |
|  | b. | Predict wireless transmission beyond 4G. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 |  | 5 |  | 6 | 12 |  | 23 |
| CO2 | 1 | 1 | 6 | 11 | 4 |  | 23 |
| CO3 | 1 | 4 |  | 10 | 8 |  | 23 |
| CO4 | 1 | 13 |  | 9 |  |  | 23 |
| CO5 | 3 | 7 |  |  | 6 |  | 16 |
| CO6 |  | 7 | 3 | 6 |  |  | 16 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Mention the term that characterizes the third industrial revolution. | | CO1 | R | 1 |
| 2. | Give examples of Cyber Physical Systems. | | CO1 | U | 1 |
| 3. | Define Intelligence. | | CO2 | R | 1 |
| 4. | State few advantages of Edge Computing. | | CO2 | R | 1 |
| 5. | List few examples of Consumer IoT. | | CO3 | R | 1 |
| 6. | Define IoT. | | CO3 | R | 1 |
| 7. | List the different types of sensors. | | CO4 | R | 1 |
| 8. | Identify the sensor used in TV remote module. | | CO4 | U | 1 |
| 9. | Define cloud computing. | | CO5 | R | 1 |
| 10. | Interpret the challenges of cloud computing. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Interpret the developments of Industry 4.0. | | CO1 | A | 3 |
| 12. | Describe the evolution of machine intelligence. | | CO2 | R | 3 |
| 13. | State few applications of IoT. | | CO3 | R | 3 |
| 14. | Infer the characteristics of Sensors. | | CO4 | U | 3 |
| 15. | Compare Public and Private Cloud. | | CO5 | U | 3 |
| 16. | Interpret the design process of intelligent machines. | | 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 impact of various industrial revolutions with suitable examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Interpret the features and applications of intelligent machines. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Discuss the functions of different IOT communication models. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Infer the working principle of GSM and GPS interface modules. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Paraphrase the features of cloud deployment models with suitable examples. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the variants of IOT and its applications. | CO3 | A | 6 |
|  | b. | Explain the functional blocks of IOT with a neat diagram. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Compare the features and applications of IAAS, PAAS and SAAS. | CO5 | U | 6 |
|  | b. | Describe the evolution of big data with suitable examples. | CO5 | R | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate the applications of intelligent machines with a case study example. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 13 | 3 | - | - | - | 17 |
| CO2 | 5 | 12 | - | - | - | - | 17 |
| CO3 | 5 | 12 | 12 | - | - | - | 29 |
| CO4 | 1 | 16 | - | - | - | - | 17 |
| CO5 | 7 | 22 | - | - | - | - | 29 |
| CO6 | - | - | 15 | - | - | - | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2005** | **Duration** | **3hrs** |
| **Course Name** | **FIBER OPTIC COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Identify the optical ray which doesn’t pass through fiber axis. | | CO1 | R | 1 |
| 2. | List the types of bending losses. | | CO1 | R | 1 |
| 3. | Quote the importance of splicers in optical communication. | | CO2 | R | 1 |
| 4. | Name any one material used in making photodetector. | | CO3 | R | 1 |
| 5. | State any one application of laser. | | CO3 | R | 1 |
| 6. | Tell the feature of star optical coupler. | | CO4 | R | 1 |
| 7. | Mention the data rate of OC4. | | CO6 | R | 1 |
| 8. | Write the formula for calculating energy of the photon. | | CO5 | R | 1 |
| 9. | Recall thermalization in EDFA. | | CO4 | R | 1 |
| 10. | State any one advantage of wavelength division multiplexing. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List 3 differences between single mode and multimode fiber. | | CO1 | R | 3 |
| 12. | Identify the number of modes in multimode graded index fiber with parabolic profile for normalized frequency 80. | | CO2 | U | 3 |
| 13. | Differentiate Laser and LED. | | CO3 | R | 3 |
| 14. | Illustrate the structure of APD photodetector. | | CO4 | U | 3 |
| 15. | Recall the working of Raman Amplifier. | | CO5 | R | 3 |
| 16. | Write about the data link layer in SONET. | | 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. | Estimate numerical aperture of optical fiber. | CO1 | U | 6 |
|  | b. | Draw and explain the block diagram of optical communication system. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 18. |  | Describe the degradation of signals in optical fiber through intrinsic & Extrinsic Absorptions. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Discuss the working principle of semiconductor Laser Diode. | CO3 | U | 6 |
|  | b. | Briefly explain the noises available in detectors. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Justify that the stimulated emission helps in achieving high gain in EDFA. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Describe the passive components used in wavelength division multiplexer | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Recall the working principle of optical isolator. | CO5 | R | 5 |
|  | b. | Analyze the frame format of synchronous optical network. | CO6 | An | 7 |
|  |  |  |  |  |  |
| 23. | a. | Justify the importance of PIN photodetector. | CO3 | E | 6 |
|  | b. | Discuss Mach -Zehnder optical modulator. | CO3 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Recite Li-Fi technology with neat diagram stating its applications. | CO6 | R | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 | 12 | - | - | - | - | 17 |
| CO2 | 1 | 15 | - | - | - | - | 16 |
| CO3 | 5 | 21 | - | - | 6 | - | 29 |
| CO4 | 5 | - | - | - | 12 | - | 17 |
| CO5 | 11 | 12 | - | - | - | - | 23 |
| CO6 | 12 | - | - | 7 | - | - | 19 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2005** | **Duration** | **3hrs** |
| **Course Name** | **FIBER OPTIC COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | | | |
| 1. | List the optical frequency range. | | | CO1 | R | | 1 |
| 2. | Recite the importance of repeater. | | | CO1 | R | | 1 |
| 3. | Quote the formula for calculating refractive index | | | CO2 | R | | 1 |
| 4. | State the importance of BER in optical communication. | | | CO3 | R | | 1 |
| 5. | Recognize the advantage of multimode fiber. | | | CO4 | R | | 1 |
| 6. | Tabulate the type of switching used in optical networks. | | | CO4 | R | | 1 |
| 7. | Name anyone optical coupler. | | | CO4 | R | | 1 |
| 8. | Enumerate the importance of Faraday rotator in optical isolator. | | | CO5 | R | | 1 |
| 9. | Recite the multiplexer used in Sonnet network. | | | CO5 | R | | 1 |
| 10. | Recall the layers in OSI model. | | | CO6 | R | | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | | | |
| 11. | Evaluate the number of modes does a fiber with numerical aperture of 0.20, core radius 30.25µm and wavelength 1320nm supports? | | | CO1 | | E | 3 |
| 12. | List the difference between Linear and Non-linear scattering. | | | CO2 | | R | 3 |
| 13. | Summarize the structure of APD photo detector | | | CO3 | | U | 3 |
| 14. | Describe the types of Semiconductor Optical Amplifier. | | | CO4 | | R | 3 |
| 15. | Record ISI in optical signal through Eye diagram | | | 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. | | a. | Illustrate the degradation of optical fiber through scattering and bending | CO2 | | U | 12 |
|  | |  |  |  | |  |  |
| 18. | | a. | Analyze different types of optical fibers based on its index profile and propagation of optical signal inside fiber | CO1 | | An | 12 |
|  | |  |  |  | |  |  |
| 19. | | a. | Categorize the types of LEDs based on its working principle. | CO3 | | An | 12 |
|  | |  |  |  | |  |  |
| 20. | | a. | Describe the working principle of Erbium Doped Fiber Amplifier. | CO4 | | R | 12 |
|  | |  |  |  | |  |  |
| 21. | | a. | Justify the importance of PIN photo detector | CO3 | | E | 6 |
|  | | b. | Summarize the working principle of optical circulator. | CO5 | | U | 6 |
|  | |  |  |  | |  |  |
| 22. | | a. | Discuss the Sonet system and its frame structure with neat sketch. | CO6 | | U | 12 |
|  | |  |  |  | |  |  |
| 23. | | a. | Describe different types of couplers used in optical networks | CO5 | | R | 6 |
|  | | b. | Explain spontaneous and stimulated emission with example. | C04 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | | |
| 24. | | a. | Discuss Li-Fi technology and state its advantages compared to Wi-Fi technology. | CO6 | | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 |

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



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2007** | **Duration** | **3hrs** |
| **Course Name** | **EMBEDDED SYSTEM DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List few characteristics of embedded system. | | CO1 | R | 1 |
| 2. | Define superscalar execution. | | CO1 | R | 1 |
| 3. | Describe the importance of cache memory in a real time system. | | CO2 | U | 1 |
| 4. | Identify the relation between clock speed of a processor and access time. | | CO2 | U | 1 |
| 5. | Name the controller which multiplexes the possible interrupt sources. | | CO3 | R | 1 |
| 6. | List the applications of watchdog timer. | | CO3 | R | 1 |
| 7. | Superloop based approach doesn’t require an OS. Justify. | | CO4 | E | 1 |
| 8. | List few advantages of using Java programming in embedded system. | | CO4 | R | 1 |
| 9. | Define multi-threading. | | CO5 | R | 1 |
| 10. | Describe deadlock condition in task scheduling. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Analyze the requirements of an automatic coffee vending machine. | | CO1 | An | 3 |
| 12. | Discover the function of read/write and chip select signal in a memory chip. | | CO2 | A | 3 |
| 13. | Explain the role of DS12887 RTC in embedded systems. | | CO3 | A | 3 |
| 14. | Interpret the role of “MISRA C” standards in automobile industry. | | CO4 | A | 3 |
| 15. | Illustrate the advantages of using an RTOS in real time embedded systems. | | CO5 | U | 3 |
| 16. | Summarize the five task states with the state transition diagram. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Develop an application with the design steps involved in the embedded system design process in top–down approach. | CO1 | C | 8 |
|  | b. | Infer the significance of multi-core CPUs in embedded design. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Infer cache coherency and its challenges with necessary justifications and diagrams. | CO2 | An | 8 |
|  | b. | Explain shared memory technology in a memory system. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 19. | a. | Interpret the operation of CAN bus and relate with an embedded application and also sketch the frame format of CAN bus. | CO3 | A | 8 |
|  | b. | Explain the operation of reset circuit in embedded system with necessary diagrams. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 20. | a. | Interpret the different “C” program elements used in embedded software design with examples. | CO4 | A | 8 |
|  | b. | Explain the software/firmware development tool kit used in host and target machines. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Interpret the significance of RTX Real-Time Operating System in ARM based systems. | CO5 | A | 8 |
|  | b. | Explain process and threads in RTOS. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Examine the functions of CPU accelerators in a system. | CO1 | A | 7 |
|  | b. | Explain the applications of dual port and shared memory. | CO2 | U | 5 |
|  |  |  |  |  |  |
| 23. | a. | Summarize the master-slave relationship in I2C bus and compare I2C with SPI. | CO3 | U | 6 |
|  | b. | Explain the function of emulator and debugger in an IDE. | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Design a system to control the speed of a stepper motor in clockwise and anti-clockwise direction. Illustrate the design with necessary diagrams and algorithm. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Acquire knowledge about the embedded system architecture |
| CO2 | Gain knowledge on the types of memories. |
| CO3 | Design the hardware required for embedded systems |
| CO4 | Develop good programming skills to develop embedded software |
| CO5 | Demonstrate the OS design for embedded firmware |
| CO6 | Apply the acquired knowledge to develop closed loop embedded system |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 4 | 7 | 3 | - | 8 | 24 |
| CO2 | - | 7 | 7 | 8 | - | - | 22 |
| CO3 | 2 | 10 | 11 | - | - | - | 23 |
| CO4 | 1 | 10 | 11 | - | 1 | - | 23 |
| CO5 | 1 | 8 | 8 | - | - | - | 17 |
| CO6 | - | 3 | - | - | - | 12 | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2012** | **Duration** | **3hrs** |
| **Course Name** | **WIRELESS SENSOR NETWORKS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List any two applications of wireless sensor networks. | | CO1 | R | 1 |
| 2. | Recall any two design challenges of wireless sensor networks. | | CO1 | R | 1 |
| 3. | What is the function of Network layer? | | CO2 | U | 1 |
| 4. | Name the two types of errors in Reference Broadcast Synchronization. | | CO2 | R | 1 |
| 5. | Write the other name of Pattern matching. | | CO3 | R | 1 |
| 6. | Give examples of transport protocols. | | CO2 | U | 1 |
| 7. | Recall the IEEE standard for Zigbee protocol. | | CO3 | R | 1 |
| 8. | Infer the desired properties of Sensor Network Database. | | CO4 | U | 1 |
| 9. | What is the IEEE Standard for Bluetooth? | | CO3 | A | 1 |
| 10. | List the advantages of Honeypots. | | CO6 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Interpret the major components of sensor node architecture. | | CO1 | A | 3 |
| 12. | Illustrate the hidden terminal problem with an example. | | CO2 | A | 3 |
| 13. | Justify the following statement “GPS is not suitable for WSN applications”. | | CO3 | An | 3 |
| 14. | Estimate the position of the new location (X, Y) using NNSS-AVG algorithm if X1=8, Y1= 6, X2= 8, Y2 = 12. | | CO4 | An | 3 |
| 15. | Express the disadvantages of Centralized Warehouse in WSN. | | 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. | Briefly explain the Layered Architecture in wireless sensor networks. | CO1 | A | 8 |
|  | b. | Interpret the operational Challenges of wireless sensor networks. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Describe the factors influencing the time synchronization protocol. | CO2 | R | 6 |
|  | b. | Explain the contention-based MAC protocols with necessary diagrams. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Estimate the position of an unknown object with the following methods (i) Trilateration (ii) Multilateration | CO4 | An | 8 |
|  | b. | Discuss the two phases involved in pattern matching with necessary diagrams. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 20. | a. | Express the challenges in the Sensor Network Data Base. | CO5 | U | 4 |
|  | b. | Describe the different types of Data Aggregation Strategies. | CO5 | R | 8 |
|  |  |  |  |  |  |
| 21. | a. | Explain the dynamic power management in WSN with relevant diagram. | CO6 | U | 6 |
|  | b. | Illustrate the functional elements of Bluetooth Architecture with appropriate diagrams. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Enumerate the concepts of LEACH protocol with necessary diagrams. | CO2 | R | 6 |
|  | b. | Discuss the following Traditional routing technique in detail.   * 1. Flooding   2. Gossiping | CO4 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Estimate the distance between two objects using the following n techniques (i) Time of Arrival (TOA) (ii) Time difference of Arrival (TDOA) (iii) Angle of Arrival (AoA) (iv) The Received Signal Strength Indictor (RSSI) | CO4 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate any two application of wireless sensor networks in health monitoring with appropriate diagrams. | CO6 | An | 6 |
|  | b. | Explain briefly the Power Saving Mode in IEEE 802.11. protocol. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | - | 15 | - | - | - | 17 |
| CO2 | 13 | 8 | 3 |  | - | - | 24 |
| CO3 | 2 | - | 7 | 3 |  | - | 12 |
| CO4 | - | 11 | - | 11 | 12 | - | 34 |
| CO5 | 8 | 7 | - | - | - | - | 15 |
| CO6 | - | 9 | 1 | 12 |  | - | 22 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the term used to represent the orbit in which the satellite moves in the same direction as the earth’s rotation. | | CO1 | R | 1 |
| 2. | The apogee and perigee distances of a satellite orbiting in an elliptical orbit are 45,000 km and 7,000 km respectively. Determine the semi-major axis of the elliptical orbit. | | CO1 | A | 1 |
| 3. | State the principle of working of the propulsion system. | | CO2 | R | 1 |
| 4. | Identify the subsystem that determines the position of the spacecraft and follows its travel and velocity information | | CO2 | R | 1 |
| 5. | Classify the Earth station based on the type of service provided. | | CO3 | U | 1 |
| 6. | Recite the important parameter which decides the uplink performance of the Earth station. | | CO3 | R | 1 |
| 7. | List the commonly used multiple access techniques. | | CO4 | R | 1 |
| 8. | Name the modulation technique used in the digital form of the single channel per carrier system. | | CO4 | R | 1 |
| 9. | Define noise figure. | | CO5 | R | 1 |
| 10. | Name the satellite which is owned by the Indian Department of Space. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Define Kepler’s second law with a neat diagram. | | CO1 | R | 3 |
| 12. | Indicate the fundamental criteria required to design a perfect power system for satellites. | | CO2 | U | 3 |
| 13. | Express the purpose of testing an Earth Station. | | CO3 | U | 3 |
| 14. | Differentiate between different transponder assignment modes. | | CO4 | U | 3 |
| 15. | Compute the free-space path loss in decibels for the following specifications Earth station transmitting antenna EIRP= 50dBW, satellite receiving antenna gain= 20 dB, and received power at satellite= −120 dBW. | | CO5 | A | 3 |
| 16. | List the various advantages of the VSAT network. | | 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. | Indicate the basic concepts needed to determine the look angles of the satellite in a Geostationary orbit. Relate with mathematical expression. | CO1 | U | 7 |
|  | b. | The semi-major axes of the two satellites are 18,000 km (satellite-1) and 24,000 km (satellite-2). Apply Kepler’s law to determine the relationship between their orbital periods (T2/T1). | CO1 | A | 5 |
| 18. |  | Explain in detail about various antennae used for satellite applications with necessary diagrams. | CO2 | U | 12 |
| 19. |  | Describe Earth station architecture with a neat block diagram.  Discuss the major system parameters related to Earth station design. | CO3 | U | 12 |
| 20. |  | Explain the time division multiple access (TDMA) technique used simultaneously by multiple Earth stations with neat diagrams. | CO4 | U | 12 |
| 21. |  | Discuss the important parameters that influence the design of a satellite communication link. | CO5 | U | 12 |
| 22. |  | Compare and contrast the orbital mechanics of LEO, MEO, and GEO with the necessary diagrams. | CO1 | U | 12 |
| 23. | 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. Calculate the effective noise temperature and noise figure of the system. Take the reference temperature to be 290K. | CO5 | A | 7 |
|  | b. | Discuss the Friis transmission equation used in the design of a satellite communication link. | CO5 | U | 5 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Give examples of international satellite missions that provide international communication services. Discuss any two international satellite services with a neat communication network block diagram. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 | 4 | 19 | 6 | - | - | - | 29 |
| CO2 | 2 | 15 | - | - | - | - | 17 |
| CO3 | 1 | 16 | - | - | - | - | 17 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | 1 | 17 | 10 | - | - | - | 28 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the satellite orbit closest to the earth. | | CO1 | R | 1 |
| 2. | State Kepler’s third law of planetary motion. | | CO1 | R | 1 |
| 3. | List any two active control techniques in thermal subsystem. | | CO2 | R | 1 |
| 4. | Identify the payload for weather forecasting satellites. | | CO2 | U | 1 |
| 5. | Define the preferred polarisation technique in satellite communication. | | CO3 | R | 1 |
| 6. | Recall the two key parameters for Earth station design. | | CO3 | R | 1 |
| 7. | Identify the multiple access technique that the Earth stations are able to access the total available bandwidth in the satellite transponder. | | CO4 | U | 1 |
| 8. | Give examples of digital modulation used in single channel per carrier system. | | CO4 | U | 1 |
| 9. | Define noise figure. | | CO5 | R | 1 |
| 10. | Identify the number of geo-stationary satellites used in INMARSAT network. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Distinguish between Centripetal and Centrifugal force. | | CO1 | U | 3 |
| 12. | Illustrate the sub-satellite point with neat diagram. | | CO2 | U | 3 |
| 13. | In an equivalent single stage satellite system, the noise figure is F and noise temperature is Te. Relate F and Te. | | CO3 | U | 3 |
| 14. | Differentiate Harmonic and Intermodulation distortion. | | CO4 | U | 3 |
| 15. | Infer on Friss’s transmission equation. | | CO2 | U | 3 |
| 16. | List down any three navigational satellites in the world. | | 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. | Define the following orbital elements.   1. Perigee 2. Line of Episides 3. Prograde Orbit 4. Descending Node 5. Argument of Perigee 6. Right Ascension of Ascending Nodes | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain the four orbit stages involved in launching satellite with necessary diagrams. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | List the fundamental criteria and design preliminaries that must be met for power system design for satellites. | CO2 | R | 5 |
|  | b. | With neat sketch, explain the satellite power subsystem. | CO2 | A | 7 |
|  |  |  |  |  |  |
| 20. | a. | Explain the spinning satellite stabilization and momentum wheel stabilization with neat sketch. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | With a neat block diagram, explain the Earth station architecture | CO3 | An | 7 |
|  | b. | Discuss the major system parameters related to Earth station design. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 22. | a. | Explain any two types of multiple access techniques with necessary diagrams. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the power balance equation and steps involved in satellite link design. | CO5 | U | 8 |
|  | b. | List down the important parameters in link budget design. | CO5 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the following satellite services.   1. INTELSAT 2. IRIDIUM SAT | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 14 | 15 | - | - | - | - | 29 |
| CO2 | 6 | 7 | 7 | 12 | - | - | 32 |
| CO3 | 2 | 8 | - | 7 | - | - | 17 |
| CO4 | - | 17 | - | - | - | - | 17 |
| CO5 | 5 | 8 | - | - | - | - | 13 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2015** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF DIGITAL IMAGE PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Indicate the significance of cones in human eye. | | CO1 | U | 1 |
| 2. | Define blind spot. | | CO1 | R | 1 |
| 3. | Recall the use of image histogram. | | CO2 | R | 1 |
| 4. | Define a notch filter. | | CO2 | R | 1 |
| 5. | Differentiate image restoration and image enhancement tasks. | | CO3 | U | 1 |
| 6. | Define white noise. | | CO3 | R | 1 |
| 7. | Indicate the effect of (A •B) •B. | | CO4 | U | 1 |
| 8. | Define structuring element. | | CO4 | R | 1 |
| 9. | Express the difficulty in image segmentation. | | CO5 | U | 1 |
| 10. | Cite the use of principle components. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Criticize the limitation of human visual system. | | CO1 | An | 3 |
| 12. | Discuss the use of bit plane slicing. | | CO2 | U | 3 |
| 13. | Analyze the strategy of image restoration based on its model diagram. | | CO3 | An | 3 |
| 14. | Compare and contrast the use of dilation and erosion. | | CO4 | U | 3 |
| 15. | Assess the effect of non-illumination of objects during thresholding. | | CO5 | An | 3 |
| 16. | Discuss the types of chain codes. | | 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. | Criticize the effect of insufficiency in image sampling and quantization processes. | CO1 | An | 6 |
|  | b. | Explain how mixed adjacency is better than other adjacencies. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate gray level distribution of an image is improved using histogram processing. | CO2 | U | 8 |
|  | b. | Appraise the preprocessing involved in frequency domain filtering. | CO2 | E | 4 |
|  |  |  |  |  |  |
| 19. | a. | Describe the spatial transformation procedure in restoring an image. | CO3 | U | 6 |
|  | b. | Assess the effect of harmonic and contra-harmonic filters. | CO3 | E | 6 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate the extraction of connected components in an image based on mage morphology. | CO4 | U | 8 |
|  | b. | Criticize the function of hit-or-miss transform. | CO4 | E | 4 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the basic global thresholding method along with its merits and demerits regarding image segmentation. | CO5 | U | 8 |
|  | b. | Asses the performance of first and second order derivative towards edge detection. | CO5 | E | 4 |
|  |  |  |  |  |  |
| 22. | a. | Describe HSI model with suitable diagram. | CO1 | U | 7 |
|  | b. | Criticize the limitation of human eye based on simultaneous contrast phenomena. | CO1 | An | 5 |
|  |  |  |  |  |  |
| 23. | a. | Justify the use of average and median filters. | CO2 | E | 6 |
|  | b. | Criticize the histogram for dark, glare, poor and good contrast images. | CO2 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate the representation of a boundary based on chain code. | CO6 | U | 7 |
|  | b. | Discuss the application of image classification. | CO6 | U | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 8 | 6 | 14 |  |  | 29 |
| CO2 | 2 | 11 |  | 6 | 10 |  | 29 |
| CO3 | 1 | 7 |  | 3 | 6 |  | 17 |
| CO4 | 1 | 12 |  |  | 4 |  | 17 |
| CO5 |  | 9 |  | 3 | 4 |  | 16 |
| CO6 |  | 16 |  |  |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2016** | **Duration** | **3hrs** |
| **Course Name** | **MULTIMEDIA COMPRESSION TECHNIQUES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the types of compression techniques. | | CO1 | R | 1 |
| 2. | List the advantages of lossless compression methods. | | CO1 | R | 1 |
| 3. | List the types of adaptive dictionary techniques. | | CO2 | R | 1 |
| 4. | List the text compression methods. | | CO2 | R | 1 |
| 5. | Summarize the technical concepts of psycho acoustic modelling. | | CO3 | U | 1 |
| 6. | Illustrate the steps of G.722 algorithm. | | CO3 | U | 1 |
| 7. | Summarize the advantages of transform coding. | | CO4 | U | 1 |
| 8. | Name the compression algorithm used for motion pictures. | | CO4 | R | 1 |
| 9. | Illustrate the significance of wavelet transform in EZW algorithm. | | CO5 | U | 1 |
| 10. | “Image 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. | Distinguish between LZW and LZ77 algorithms. | | CO2 | An | 3 |
| 13. | Summarize the significance of analysis filters in sub band coding. | | CO3 | U | 3 |
| 14. | “Accuracy of SPIHT 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. |  | Illustrate 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 image compression methods. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. |  | Estimate the code for the sequence A=[f, g, h, k, m, n] with the probability values [0.3, 0.1, 0.1, 0.2, 0.15, 0.15] using minimum variance Huffman coding approach. | CO2 | E | 12 |
|  |  |  |  |  |  |
| 20. |  | Estimate the code for the sequence A=[a, b, c, d, e, f, g] with the probability values [0.25, 0.15, 0.05, 0.1, 0.2, 0.2, 0.05] respectively using Shannon-Fano coding technique. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | 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 subband coding algorithm for audio compression with a neat diagram. | CO4 | U | 6 |
|  | b. | Illustrate the JPEG methodology of compression of still images. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the process of EZW algorithm with a numerical example. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | With neat block diagram, summarize the compression methodology of H.261 algorithm. Include mathematical equations wherever necessary. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2018** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEM VERILOG AND FUNCTIONAL VERIFICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the design model for System Verilog code for classes. | | CO1 | R | 1 |
| 2. | Construct the Multilevel inheritance with neat design flow for System Verilog. | | CO1 | A | 1 |
| 3. | Define the simple system Verilog code to display “Hello World”. | | CO2 | R | 1 |
| 4. | Relate string data type to concatenate string in system Verilog Programming. | | CO2 | U | 1 |
| 5. | Visualize and provide the design structure for System Verilog code for classes. | | CO3 | R | 1 |
| 6. | Construct the Multilevel inheritance with neat design flow for System Verilog. | | CO3 | A | 1 |
| 7. | Define the System Verilog Randomization. | | CO4 | R | 1 |
| 8. | Represent the constraint block to syntax for System Verilog Programming. | | CO4 | U | 1 |
| 9. | Justify the need of System Verilog Events. | | CO5 | E | 1 |
| 10. | Write the need of the System Verilog Mod port. | | CO6 | An | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss the two input AND gate with behavioral modelling of Verilog. | | CO1 | U | 3 |
| 12. | Distinguish between Blocking and Non-Blocking assignment. | | CO2 | An | 3 |
| 13. | Articulate the correct syntax to create a file named Student and write the content in the file. | | CO3 | A | 3 |
| 14. | Consider the benefits of packed and unpacked structure. | | CO4 | E | 3 |
| 15. | Prioritize the significance of the clocking events and clocking skew in System Verilog. | | CO5 | An | 3 |
| 16. | Employ the Semaphores method and give the significance of them in the build in function. | | 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. | Examine in detail various levels of abstraction in Verilog code with the illustration of 2x1 Multiplexer code. | CO1 | An | 6 |
|  | b. | Justify testbench in combinational circuit and give all the test cases of full adder. | CO2 | E | 6 |
| 18. |  | Explain various types of arrays of the System Verilog with the illustration of QUEUE program. | CO2 | E | 12 |
| 19. | a. | Analyze various types of inheritance in System Verilog code with the illustration of system Verilog code. | CO3 | An | 6 |
|  | b. | Justify pointer in class and give a system Verilog program to explain memory garbage. | CO4 | E | 6 |
| 20. |  | Describe various types of constrained randomization of the System Verilog with the illustration program. | CO4 | E | 12 |
| 21. |  | Devise the functional coverage in System Verilog. Give the types of various Coverage in System Verilog. Why are the coverage metrics missing in the simulation? | CO5 | An | 12 |
| 22. |  | Explain the Mailbox that is used for communication between generator and driver and provide the system Verilog code.  Process-1(Generator class) will generate (created and randomize) the packet and put into the mailbox mb\_box  Process-2(Driver class) gets the generated packet from the mailbox and display the fields. | CO5 | E | 12 |
| 23. |  | Analyze the system Verilog testbench code to Memory Model TestBench Without Monitor, Agent, and Scoreboard.  a. the topmost file, which connects the DUT and TestBench.  b. TestBench top consists of DUT, Test and Interface instances.  c. The interface connects the DUT and TestBench. | CO6 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Justify the system need of Verilog Virtual Interface in System Verilog Testcase receives the interface handle from the testcase and passes it to environment | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand concept of Verilog programming in Functional Verification. |
| CO2 | Illustrate the concept of System Verilog. |
| CO3 | Analyze different classes in System Verilog. |
| CO4 | Code in System Verilog using constraint and randomization. |
| CO5 | Interpret coverage methods and interprocess synchronization. |
| CO6 | Comprehend test bench concept in System Verilog. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 3 | 1 | 6 |  |  | 11 |
| CO2 | 1 | 1 |  | 3 | 18 |  | 23 |
| CO3 | 1 |  | 4 | 6 |  |  | 11 |
| CO4 | 1 | 1 |  |  | 21 |  | 23 |
| CO5 |  |  |  | 15 | 13 |  | 28 |
| CO6 |  |  | 3 | 13 | 12 |  | 28 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2019** | **Duration** | **3hrs** |
| **Course Name** | **ASIC DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the concept “transistor sizing”. | | CO1 | R | 1 |
| 2. | Define λ-rules in layout design rules. | | CO2 | R | 1 |
| 3. | Predict the colour code used for polysilicon. | | 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. | Show the logic symbol of NOR1-1 | | CO3 | U | 1 |
| 8. | Label the components of ACTEL FPGA. | | CO4 | R | 1 |
| 9. | Write the syntax of EDIF file. | | CO6 | U | 1 |
| 10. | Recall the length of an identifier. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Design the latch circuit using CMOS multiplexer. | | CO1 | C | 3 |
| 12. | Distinguish the difference between channeled gate array and structured gate array. | | CO1 | An | 3 |
| 13. | Compare full custom and semi custom ASIC design. | | CO2 | An | 3 |
| 14. | Apply the transistor sizing in CMOS NAND gate. (PMOS:4:1, NMOS:2:1) | | CO4 | A | 3 |
| 15. | Show the block diagram of AND cascade chain. | | CO3 | U | 3 |
| 16. | Describe the advantages of XC3000 over XC2000. | | 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. | Construct the transmission gate based CMOS circuit for the function F=(A.B)+(B.C.E)+(C’.E’.F)+(A.B’) . | CO1 | C | 7 |
|  | b. | Sketch the design flow of ASIC. | CO1 | A | 5 |
| 18. |  | Distinguish the difference between FPGA and ASIC. | CO2 | An | 12 |
| 19. |  | Explain in detail about Altera Max with a necessary diagrams. | CO3 | A | 12 |
| 20. |  | Illustrate the input/output blocks of Xilinx FPGA. | CO3 | U | 12 |
| 21. |  | Recall and reproduce the block diagrams and features of Altera MAX. | CO4 | R | 12 |
| 22. |  | Reproduce the architecture of Altera 7000 and point out its feature. | CO5 | R | 12 |
| 23. |  | Describe the five box model of electrical connectivity. | CO4 | R | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate the floor planning in ASIC design. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 |  | 5 | 3 |  | 10 | 19 |
| CO2 | 2 | 1 |  | 15 |  |  | 18 |
| CO3 | 1 | 16 | 12 |  |  |  | 29 |
| CO4 | 25 | 4 | 4 |  |  |  | 33 |
| CO5 | 13 |  |  |  |  |  | 13 |
| CO6 |  | 12 |  |  |  |  | 12 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

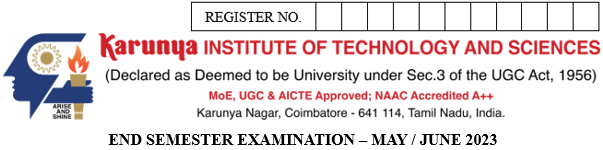
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2019** | **Duration** | **3hrs** |
| **Course Name** | **ASIC DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 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 color 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)**  **(Answer all the questions)** | | | | | |
| 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 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **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** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2020** | **Duration** | **3hrs** |
| **Course Name** | **ANALYSIS AND DESIGN OF DIGITAL IC** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List the 4 terminals of MOSFET. | | CO1 | R | 1 |
| 2. | Name the region of operation of the MOS transistor in which Ids is independent of Vds. | | CO1 | R | 1 |
| 3. | Predict the potential of the gate voltage to be applied to NMOS to turn it ON. | | CO2 | U | 1 |
| 4. | Examine the operating region of the NMOS transistor, Vt = 0.7 V, Vg= 0.5 V, Vd = 1.8 V. | | CO2 | A | 1 |
| 5. | Fig 1.  Identify the values of IN-1, IN-2, IN-3 in Fig 1 for OUT to be ‘0’. | | CO3 | U | 1 |
| 6. | State the level of noise margin for errorless transmission. | | CO3 | U | 1 |
| 7. | List two properties of Complementary Static CMOS gates. | | CO4 | R | 1 |
| 8. | Name the logic that combines domino logic and np CMOS logic while cascading dynamic gates. | | CO4 | R | 1 |
| 9. | **Fig 2**  Identify the type of latch for the waveform shown in Fig 2. | | CO5 | U | 1 |
| 10. | Define Clock Skew. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Classify three levels of MOSFET models based on their physics. | | CO1 | U | 3 |
| 12. | Justify the statement “PMOS transistors pass strong one but not strong zero”. | | CO2 | E | 3 |
| 13. | Explain dynamic power dissipation with a mathematical equation. | | CO3 | U | 3 |
| 14. | Construct a 2:1 Multiplexer using transmission gate logic. | | CO4 | A | 3 |
| 15. | Sketch the schematic of CMOS Schmitt trigger. | | CO5 | A | 3 |
| 16. | Distinguish between mesochronous and plesiochronous signals. | | 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. |  | Explain different regions of operation of the NMOS transistor with a neat diagram and equation. Obtain the characteristic curve for the same. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Analyze the impact of velocity saturation and DIBL second-order effects in the short channel and long channel device of the MOS transistor. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Estimate the CMOS gate transistor sizing for the function F= A+B, when (W/L) p=10 and (W/L)n=15. | CO3 | E | 6 |
|  | b. | Analyze the voltage transfer curve of the CMOS inverter and indicate the status of PMOS and NMOS transistors in different regions. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. | a. | Construct a 2:1 Multiplexer using Pass transistor logic and justify the design with the operation. | CO4 | A | 6 |
|  | b. | Analyze the problem associated with cascading dynamic gates with a timing diagram and provide a solution for the same. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the operation of the CMOS Schmitt trigger with a neat diagram. | CO5 | U | 6 |
|  | b. | Construct a NORA CMOS logic style for pipelined structure and tabulate its operation modes. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Construct a MUX-based negative edge-triggered register with a neat diagram and timing waveform. | CO4 | A | 6 |
|  | b. | Explain the np-CMOS logic style of cascading dynamic gates with a neat diagram. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Construct a pipelined datapath for the computation of log (la+bl) and explain its operation by comparing it with the conventional design. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the operation of PLL and its application with a neat block diagram. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 15 |  |  |  |  | 17 |
| CO2 |  | 1 | 1 | 12 | 3 |  | 17 |
| CO3 |  | 5 |  | 6 | 6 |  | 17 |
| CO4 | 2 | 6 | 15 | 6 |  |  | 29 |
| CO5 |  | 7 | 21 |  |  |  | 28 |
| CO6 | 1 | 12 |  | 3 |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2020** | **Duration** | **3hrs** |
| **Course Name** | **ANALYSIS AND DESIGN OF DIGITAL IC** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the minimum voltage required to turn ON the transistor. | | CO1 | R | 1 |
| 2. | What should be the potential of the body of the NMOS transistor when it is ON? | | CO1 | R | 1 |
| 3. | Predict the potential of the gate voltage to be applied to PMOS to turn it ON. | | CO2 | U | 1 |
| 4. | Examine the operating region of the NMOS transistor, Vt = 0.8 V, Vg= 0.8 V, Vd = 1.8 V. | | CO2 | A | 1 |
| 5. | **Fig 1**  Identify the values of IN-1, IN-2, IN-3 in Fig 1 for OUT to be ‘1’. | | CO3 | U | 1 |
| 6. | List the types of power dissipation in CMOS. | | CO3 | R | 1 |
| 7. | Infer the type of input transitions that are allowed at the inputs when cascading dynamic gates. | | CO4 | U | 1 |
| 8. | Name the type of logic that is always implemented in Domino logic. | | CO4 | R | 1 |
| 9. | Predict the design technique that increases the speed of operation of data paths in digital processors. | | CO5 | U | 1 |
| 10. | Define Clock Jitter. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Show MOS structure capacitances with a neat diagram. | | CO1 | R | 3 |
| 12. | Explain the impact of the channel length modulation coefficient in the output current of the NMOS transistor. | | CO2 | U | 3 |
| 13. | Explain static power dissipation and list the reasons for the same. | | CO3 | U | 3 |
| 14. | **Fig 2**  Examine the Out1 and Out2 waveforms for the circuit shown in Fig 2. | | CO4 | An | 3 |
| 15. | Sketch the schematic of Voltage Controlled Oscillator. | | CO5 | A | 3 |
| 16. | Distinguish between mesochronous and plesiochronous signals. | | 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. | Explain different regions of operation of the NMOS transistor with a neat diagram and equation. Obtain the characteristic curve for the same. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Analyze the impact of velocity saturation and DIBL second-order effects in the short channel and long channel device of the MOS transistor. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Estimate the CMOS gate transistor sizing for the function F= A**.**B, when (W/L)p=15 and (W/L)n=10. | CO3 | E | 6 |
|  | b. | Analyze the different types of power dissipation that occur in CMOS inverter design with mathematical equations. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. | a. | Construct a 2 input OR / NOR logic gate using complementary pass transistor logic and justify the design with the operation. | CO4 | A | 6 |
|  | b. | Deduce any 3 issues that happen in cascading dynamic gates. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain clocked version of SR latch with neat diagram and truth table. | CO5 | U | 6 |
|  | b. | Construct a 2 input AND gate using a true single-phase clocked approach and explain its operation. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Construct a MUX-based positive edge-triggered register with a neat diagram and timing waveform. | CO4 | A | 6 |
|  | b. | Explain the domino logic style of cascading dynamic gates with a neat diagram. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Design a pipelined datapath for the computation of log (la+bl) and explain its operation by comparing it with the conventional design. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Construct a simple synchronizer and discuss its operation and challenges. | CO6 | A | 6 |
|  | b. | Sketch the CMOS arbiter and discuss its operation. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 12 | 0 | 0 | 0 | 0 | 17 |
| CO2 | 0 | 4 | 1 | 12 | 0 | 0 | 17 |
| CO3 | 1 | 4 | 0 | 6 | 6 | 0 | 17 |
| CO4 | 1 | 7 | 12 | 9 | 0 | 0 | 29 |
| CO5 | 0 | 19 | 9 | 0 | 0 | 0 | 28 |
| CO6 | 1 | 0 | 12 | 3 | 0 | 0 | 16 |
|  | | | | | | | **124** |



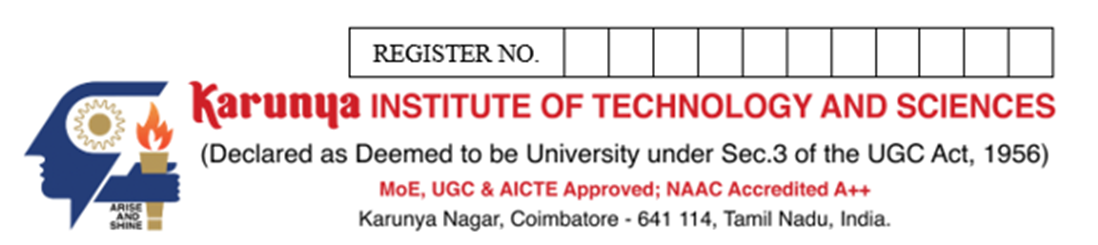
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2021** | **Duration** | **3hrs** |
| **Course Name** | **LOW POWER TECHNIQUES IN VLSI DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify the time that is the difference between the signal required time and the signal arrival time at the output of a gate. | | CO1 | U | 1 |
| 2. | State the two major sources of leakage current? | | CO2 | R | 1 |
| 3. | Name the power caused by signal switching. | | CO2 | R | 1 |
| 4. | Name the signal drives a large load as it has to reach many sequential elements distributed throughout the chip. | | CO3 | R | 1 |
| 5. | Identify the scheme used in older microprocessor to reduce the power consumption. | | CO3 | R | 1 |
| 6. | List the technique that recycles the charge for reuse at the lower bit. | | CO3 | U | 1 |
| 7. | Identify thedevice composed of an odd number of NOT gates in a ring, whose output oscillates between two voltage levels. | | CO4 | U | 1 |
| 8. | State the amplifier used to detect differential voltages developed across bit lines in SRAM. | | CO5 | R | 1 |
| 9. | State the normal mode of operation in SRAM. | | CO5 | R | 1 |
| 10. | Trace the logic implemented using two transmission gates and the output is dual-rail encoded. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Indicate the short circuit current of an Inverter. | | CO1 | U | 3 |
| 12. | Estimate the Dynamic current of an inverter driving a capacitor of 0.6pF operating at 3.3V, 25MHz. | | CO2 | E | 3 |
| 13. | Define clock masking. | | CO3 | R | 3 |
| 14. | Construct Z= (A.B.C+ DE) using Dynamic CMOS Logic. | | CO4 | C | 3 |
| 15. | Sketch the basic circuit diagram for four transistor SRAM bit cell | | CO5 | A | 3 |
| 16. | Determine the steps to implement the Boolean function using adiabatic logic gate. | | 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. | Illustrate the Gate Reorganization technique in the gate-level network. | CO1 | U | 8 |
|  | b. | Summarize about switching frequency and show the techniques to reduce and alter the switching frequency. | CO1 | U | 4 |
| 18. |  | Develop the Power dissipation of the system using the concept of charging and discharging capacitance. | CO2 | A | 12 |
| 19. | a. | Explain in detail about the Equivalent Pin Ordering. | CO2 | U | 8 |
|  | b. | Examine about the Oscillator Circuit for Clock Generation | CO1 | R | 4 |
| 20. | a. | Estimate the various techniques involved in switching activity reduction in CMOS digital systems | CO2 | U | 9 |
|  | b. | Discuss the basic need of frequency Division and Multiplexing | CO3 | U | 3 |
| 21. |  | Determine the performance measures of flip-flops with all the conventional and MOCF techniques and apply the MOCF technique in Dynamic Flip-flop. | CO4 | A | 12 |
| 22. |  | 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 |
| 23. | a. | Design Z= (A.(B+C)+D.E.F) using C2MOS Logic. | CO4 | C | 6 |
|  | b. | Illustrate the organization of a Static RAM with neat block diagram. | CO5 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate in detail about the step-wise charging circuits in Adiabatic Logic. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 16 | - | - | - | - | 20 |
| CO2 | 2 | 17 | 12 | - | 3 | - | 34 |
| CO3 | 5 | 4 | - | - | - | - | 9 |
| CO4 | - | 1 | 24 | - | - | 9 | 34 |
| CO5 | 2 | - | 3 | 6 | - | - | 11 |
| CO6 | - | 1 | 3 | 12 | - | - | 16 |
|  | | | | | | | **124** |

****

**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2021** | **Duration** | **3hrs** |
| **Course Name** | **LOW POWER TECHNIQUES IN VLSI DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the time that is the difference between the signal required time and the signal arrival time at the output of a gate. | | | CO1 | U | 1 |
| 2. | State the two major sources of leakage current. | | | CO2 | R | 1 |
| 3. | Name the power caused by signal switching. | | | CO2 | R | 1 |
| 4. | Name the signal drives a large load as it has to reach many sequential elements distributed throughout the chip. | | | CO3 | R | 1 |
| 5. | Identify the scheme used in older microprocessor to reduce the power consumption. | | | CO3 | R | 1 |
| 6. | List the technique that recycles the charge for reuse at the lower bit. | | | CO3 | U | 1 |
| 7. | Identify thedevice composed of an odd number of NOT gates in a ring, whose output oscillates between two voltage levels. | | | CO4 | U | 1 |
| 8. | State the amplifier used to detect differential voltages developed across bit lines in SRAM. | | | CO5 | R | 1 |
| 9. | State the normal mode of operation in SRAM. | | | CO5 | R | 1 |
| 10. | Trace the logic implemented using two transmission gates and the output is dual-rail encoded. | | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Indicate the short circuit current of an Inverter. | | | CO1 | U | 3 |
| 12. | Estimate the Dynamic current of an inverter driving a capacitor of 0.6pF operating at 3.3V, 25MHz. | | | CO2 | E | 3 |
| 13. | Define clock masking. | | | CO3 | R | 3 |
| 14. | Construct Z= (A.B.C+ D) using Dynamic CMOS Logic. | | | CO4 | C | 3 |
| 15. | Sketch the basic circuit diagram for four transistor SRAM bit cell | | | CO5 | A | 3 |
| 16. | Determine the steps to implement the Boolean function using adiabatic logic gate. | | | 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. | Illustrate the Gate Reorganization technique in the gate-level network. | CO1 | U | 8 |
|  | | b. | Summarize about switching frequency and show the techniques to reduce and alter the switching frequency. | CO1 | U | 4 |
|  | |  |  |  |  |  |
| 18. | | a. | Develop the Power dissipation of the system using the concept of charging and discharging capacitance. | CO2 | A | 12 |
|  | |  |  |  |  |  |
| 19. | | a. | Explain in detail about the Equivalent Pin Ordering. | CO2 | U | 8 |
|  | | b. | Examine about the Oscillator Circuit for Clock Generation | CO1 | R | 4 |
|  | |  |  |  |  |  |
| 20. | | a. | Estimate the various techniques involved in switching activity reduction in CMOS digital systems | CO2 | U | 9 |
|  | | b. | Discuss the basic need of frequency Division and Multiplexing | CO3 | U | 3 |
|  | |  |  |  |  |  |
| 21. | | a. | Determine the performance measures of flip-flops with all the conventional and MOCF techniques and apply the MOCF technique in Dynamic Flip-flop. | CO4 | A | 12 |
|  | |  |  |  |  |  |
| 22. | | 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 |
|  | |  |  |  |  |  |
| 23. | | a. | Design Z= (A.(B+C)+D.E.) using C2MOS Logic. | CO4 | C | 6 |
|  | | b. | Illustrate the organization of a Static RAM with neat block diagram. | CO5 | An | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Illustrate in detail about the step-wise charging circuits in Adiabatic Logic. | CO6 | An | 12 |

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 16 | - | - | - | - | 20 |
| CO2 | 2 | 17 | 12 | - | 3 | - | 34 |
| CO3 | 5 | 4 | - | - | - | - | 9 |
| CO4 | - | 1 | 24 | - | - | 9 | 34 |
| CO5 | 2 | - | 3 | 6 | - | - | 11 |
| CO6 | - | 1 | 3 | 12 | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2022** | **Duration** | **3hrs** |
| **Course Name** | **NANOELECTRONICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Write the fundamental material used in Nanoelectronics. | | CO1 | R | 1 |
| 2. | What is the short channel effect? | | CO1 | U | 1 |
| 3. | What is the difference between Classical mechanism and Quantum mechanism. | | CO2 | R | 1 |
| 4. | What is Degeneracy in Nanotechnology? | | CO2 | R | 1 |
| 5. | Identify two approaches for nanoscale synthesis? | | CO5 | U | 1 |
| 6. | State the importance of C60 molecules in electronic system. | | CO3 | R | 1 |
| 7. | List the basic growth methods available for crystal growth? | | CO4 | U | 1 |
| 8. | Interpret the important properties taken in account for atomistic device simulation. | | CO4 | R | 1 |
| 9. | Interpret Tunneling Diode in detail. | | CO5 | U | 1 |
| 10. | List the structural types of Carbon Nanotubes . | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Recall the expression for Schrodinger wave equation. | | CO1 | R | 3 |
| 12. | Explain the density of States with required diagram. | | CO2 | U | 3 |
| 13. | Define Band Theory of solid materials with diagram. | | CO2 | R | 3 |
| 14. | Examine the top-down approach for nanoscale material synthesis in detail? | | CO5 | U | 3 |
| 15. | Recall the types of Composite materials. | | CO1 | R | 3 |
| 16. | List the conditions to maintain 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 involved in PMOS fabrication process and its fabrication challenges in detail. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Analyze the expression of Schrodinger wave time dependent equations and discuss its impact in Nano systems. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Demonstrate the operation of the Nanoscale MOSFET and explain its Voltage- Current characteristics with suitable diagram | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Interpret the operation of Chemical Vapor Deposition method in detail with an example. | CO6 | A | 8 |
|  | b. | Write short notes on Ball milling. | CO5 | An | 4 |
|  |  |  |  |  |  |
| 21. |  | What is Carbon Nano Tube? List the types of CNTFETs and Interpret its operation in detail | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Design the constructional diagram of Single Electron Transistors. Inspect its operation. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Examine the working of Resonant Tunneling Diode and its I-V characteristics with three operating points | CO4 | An | 8 |
|  | b. | Draw Band Diagram RTD for VDD = 0 and VDD > 0. | CO4 | C | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | What is Crystal Growth process? Explain czochralski crystal growth technique method with diagram. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 1 |  | 12 |  |  | 20 |
| CO2 | 5 | 3 |  | 12 |  |  | 20 |
| CO3 | 1 |  | 12 |  |  |  | 13 |
| CO4 | 1 | 4 |  | 20 |  | 4 | 29 |
| CO5 |  | 5 | 12 | 4 |  |  | 21 |
| CO6 |  | 1 | 8 | 12 |  |  | 21 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2022** | **Duration** | **3hrs** |
| **Course Name** | **NANOELECTRONICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the fundamental material used in Nanoelectronics. | | CO1 | R | 1 |
| 2. | Predict the latest technology node used in nanofabrication process. | | CO1 | U | 1 |
| 3. | Write the schrodinger wave equation used in nanoelectronics. | | CO2 | A | 1 |
| 4. | Define Degeneracy in Nanotechnology. | | CO2 | R | 1 |
| 5. | List the different types of transport mechanisms in semiconductor devices. | | CO3 | R | 1 |
| 6. | Interpret the mobility in Ballistics transport mechanism. | | CO3 | U | 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. | Recall the concept 2D material? | | CO5 | R | 1 |
| 10. | Define Coulomb blockade. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write the expression for Schrodinger wave equation. | | CO1 | A | 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 | R | 3 |
| 14. | List the examples for 1D nanoscale material. | | CO4 | R | 3 |
| 15. | Recall the steps involved in Nanofabrication process. | | CO5 | R | 3 |
| 16. | Write the conditions for Coulomb blockade? | | CO4 | 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 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. | Sketch 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 | U | 5 |
| 20. | a. | Interpret the operation of Electro Deposition method in detail with an example. | CO6 | U | 8 |
|  | b. | Write a short notes on Sol gel method. | CO1 | A | 4 |
| 21. |  | Sketch the constructional diagram of Single Electron Transistors. Inspect its operation. | CO4 | A | 12 |
| 22. | a. | Develop a carbon based field effect transistor and discuss its operation with neat diagram. | CO5 | C | 8 |
|  | b. | Compare CNTFET with MOSFET. | CO5 | E | 4 |
| 23. |  | Examine the working of Resonant Tunneling Diode and its I-V characteristics with band diagram. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe the Crystal Growth process and explain any one crystal growth technique method with neat diagram. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 1 | 7 | 12 |  |  | 21 |
| CO2 | 1 | 1 |  | 12 | 8 |  | 22 |
| CO3 | 4 | 9 | 7 |  |  |  | 20 |
| CO4 | 3 | 1 | 15 |  | 1 |  | 20 |
| CO5 | 4 |  | 12 |  | 4 |  | 20 |
| CO6 | 1 | 20 |  |  |  |  | 21 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2024** | **Duration** | **3hrs** |
| **Course Name** | **MACHINE LEARNING TECHNIQUES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Recall the application of AI that allows a system to automatically learn and improve experience. | | | CO1 | R | 1 |
| 2. | Identify the type of learning in which labeled training data is used.   1. Supervised learning 2. Unsupervised learning 3. Semi unsupervised learning 4. Reinforcement Learning | | | CO1 | U | 1 |
| 3. | Overfitting is a type of modelling error which results  in the failure to predict future observations effectively or  fit additional data in the existing model. Yes/No?  Overfitting is a type of modelling error which results  in the failure to predict future observations effectively or  fit additional data in the existing model. Yes/No?  Overfitting is a type of modelling error which results  in the failure to predict future observations effectively or  fit additional data in the existing model. Yes/No?  Illustrate on overfitting, the type of modeling error which results in the failure to predict future observations effectively or fit the additional data in the existing model. | | | CO2 | U | 1 |
| 4. | Recall the percentage of correct predictions for the test data. | | | CO2 | R | 1 |
| 5. | Tell the regression that makes predictions for continuous/real or numeric variables such as sales, salary, age and product price. | | | CO3 | R | 1 |
| 6. | State whether the decision tree, a Supervised learning technique can be used for both classification and Regression problems. | | | CO3 | R | 1 |
| 7. | Label the parameters on which the dimension of the hyperplane depends upon. | | | CO4 | R | 1 |
| 8. | Name the decision boundary created by SVMs. | | | CO4 | R | 1 |
| 9. | Identify the error that is the average of the difference between the Original Values and the Predicted Values. | | | CO5 | U | 1 |
| 10. | Tell the component that normally represents the strength of the interconnection between neurons inside the artificial neural network. | | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Name the types of machine learning. | | | CO1 | R | 3 |
| 12. | Write the differences between Classification & Regression Algorithms. | | | CO2 | U | 3 |
| 13. | Briefly explain the types of Linear regression. | | | CO3 | U | 3 |
| 14. | Illustrate on the maximum margin in SVM with 2-D hyper plane. | | | CO4 | A | 3 |
| 15. | Define the following terms:   1. Precision 2. Sensitivity 3. Area under the curve ( AUC)­ | | | CO5 | R | 3 |
| 16. | List the basic components of perceptron. | | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | | a. | Explain the following:   1. Binary Classification 2. Multi-Class Classification 3. Multi-Label Classification | CO1 | U | 9 |
|  | | b. | Show the schematic diagram of Machine Learning. | CO1 | U | 3 |
| 18. | | a. | Classify the factors that reduce the efficiency and performance of the ML models and how we can overcome those problems? | CO2 | A | 8 |
|  | | b. | Interpret the need for confusion matrix. | CO2 | A | 4 |
| 19. | | a. | Explain the decision tree classification algorithm of Machine Learning. | CO3 | U | 8 |
|  | | b. | Write the differences between Probabilistic Measures and Resampling Methods | CO3 | A | 4 |
| 20. | | a. | Write the applications of SVM. | CO4 | A | 5 |
|  | | b. | Differentiate linear SVM and non-linear SVM | CO4 | U | 7 |
| 21. | |  | Briefly explain the evaluation matrices for classification and regression algorithm. | CO5 | U | 12 |
| 22. | |  | List the basic component of Pattern Recognition system and explain working of Pattern Recognition. | CO6 | R | 12 |
| 23. | | a. | Write the advantages and disadvantages of decision tree. | CO3 | A | 6 |
|  | | b. | Write the steps to split a decision tree using Information Gain. | CO3 | A | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Explain the following:   * ReLu Activation Function * Sigmoid Activation Function * Softmax Activation Function | CO6 | U | 9 |
|  | | b. | Calculate the output for a 4-input neuron having weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 3, 5 and 1 respectively. | CO6 | A | 3 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **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 | | 4 | 13 |  |  |  |  | 17 |
| CO2 | | 1 | 4 | 12 |  |  |  | 17 |
| CO3 | | 2 | 11 | 16 |  |  |  | 29 |
| CO4 | | 2 | 7 | 8 |  |  |  | 17 |
| CO5 | | 3 | 13 |  |  |  |  | 16 |
| CO6 | | 16 | 9 | 3 |  |  |  | 28 |
|  | | | | | | | | **124** |



**SUPPLEMENTARY EXAMINATION – JUNE 2023**

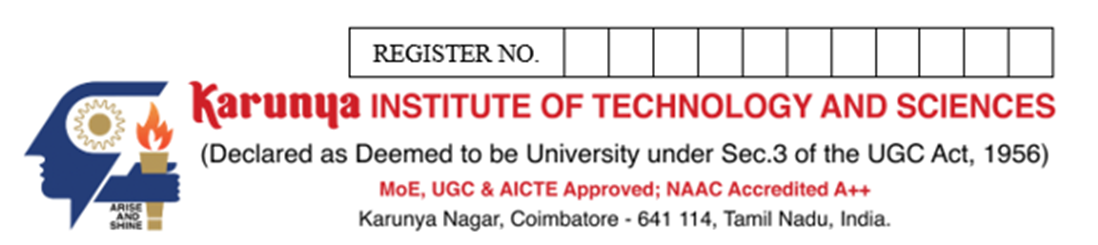
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2024** | **Duration** | **3hrs** |
| **Course Name** | **MACHINE LEARNING TECHNIQUES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List the term on which the machine learning model can be built based on sample data. | | CO1 | R | 1 |
| 2. | Which is a subset of Machine learning? | | CO1 | R | 1 |
| 3. | Infer the feature vector techniques used for training and prediction process. | | CO2 | U | 1 |
| 4. | Show the 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. | | CO3 | R | 1 |
| 6. | Identify the relation between Information gain and Entropy. | | CO3 | A | 1 |
| 7. | Name the three input features leads to a hyperplane of 3-D plane. | | CO4 | R | 1 |
| 8. | List the nearest points from the optimal decision boundary that maximize the distance features. | | CO4 | R | 1 |
| 9. | Write the expression of Mean Square Error and how to solve for the real problems. | | CO5 | A | 1 |
| 10. | Identify ReLu activation function for build the system. | | CO6 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Construct the various schemes in Supervised and Unsupervised learning algorithm. | | CO1 | A | 3 |
| 12. | Estimate cross validation method used for ML. | | CO2 | E | 3 |
| 13. | Classify the difference between Linear and Logistic regression. | | CO3 | A | 3 |
| 14. | Outline the need for kernel function in SVM algorithms. | | CO4 | U | 3 |
| 15. | Relate the following performance measures:   1. Precision 2. Sensitivity 3. Area under the curve (AUC) | | CO5 | R | 3 |
| 16. | Choose the multi-layer perceptron for building the ML model and justify with anyone use case. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain various real time applications of Machine Learning techniques. Discuss with any one use case in reality. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Construct and discuss 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. | Solve logistic regression for real time problems with an 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. | a. | 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. | Construct the confusion matrix for two way classification and explain each element. | CO2 | A | 7 |
|  | b. | Write the steps to split a decision tree using Information Gain. | CO3 | A | 5 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain in detail about the discrete and continuous Hopfield neural network model. | CO6 | U | 6 |
|  | b. | Explain Kohonen neural network algorithm with a neat sketch. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 problems |
| 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 Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **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** |

****

**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2027** | **Duration** | **3hrs** |
| **Course Name** | **MATLAB PROGRAMMING FOR ENGINEERS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Identify the commands that are used to give label to the axis. | | | CO1 | R | 1 |
| 2. | Recall the command that is used to clear the contents of workspace. | | | CO1 | R | 1 |
| 3. | List the loop control statements used in MATLAB. | | | CO2 | R | 1 |
| 4. | Differentiate the functions ceil (x) and floor (x). | | | CO2 | U | 1 |
| 5. | Express 6x2 -150 as a MATLAB representation. | | | CO3 | U | 1 |
| 6. | Identify the function that calculates the value of a polynomial. | | | CO3 | R | 1 |
| 7. | Recall any three tool boxes available in MATLAB Simulink. | | | CO4 | R | 1 |
| 8. | Indicate the function of scope block in MATLAB Simulink. | | | CO4 | U | 1 |
| 9. | Define Histogram. | | | 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. | Summarize the different windows that are used in MATLAB. | | | CO1 | U | 3 |
| 12. | Construct a MATLAB code to perform the element-by-element multiplication operation between two vectors x and y, where  x = [3, -1, 2] and y = [1, 2, -3]. | | | CO2 | A | 3 |
| 13. | Build a MATLAB code that takes an input matrix and returns its transpose. | | | CO3 | A | 3 |
| 14. | Distinguish between scope and spectrum analyzer in a simulink model. | | | CO4 | An | 3 |
| 15. | Explain the MATLAB command hist(x) and histeq(x) with examples. | | | 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. | | a. | Discuss the MATLAB environment and how it is used as a scratch pad. | CO1 | U | 12 |
|  | |  |  |  |  |  |
| 18. | | a. | Explain the functions of following in-built functions in MATLAB with the help of a MATLAB code.  (i) ceil(x), (ii) subplot(x), (iii) imread(x), (iv) freqz(x), (v) disp(x), (vi) sin(x). | CO2 | U | 12 |
|  | |  |  |  |  |  |
| 19. | | a. | Implement a MATLAB function that takes two input matrices and computes their dot product. | CO3 | A | 4 |
|  | | b. | Explain polynomial curve fitting with MATLAB examples. | CO3 | U | 8 |
|  | |  |  |  |  |  |
| 20. | | a. | Create a model in MATLAB Simulink to generate a complex signal and to perform Fourier transform on it. | CO4 | C | 12 |
|  | |  |  |  |  |  |
| 21. | | a. | Summarize line plots with a MATLAB example. | CO5 | R | 6 |
|  | | b. | Illustrate the following MATLAB functions with an example.   1. meshgrid(x,y) 2. mesh(x,y,z) 3. surf(x,y,z) | CO5 | U | 6 |
|  | |  |  |  |  |  |
| 22. | | a. | Explain the different types of conditional statements and loop control statements with MATLAB examples. | CO2 | U | 12 |
|  | |  |  |  |  |  |
| 23. | | a. | Discuss about MATLAB arrays and explain the functions  zeros ( ), ones ( ) and eye ( ) used in MATLAB program with examples. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | | a. | Explain the steps required to create an efficient MATLAB GUI with an example. | CO6 | U | 12 |

|  |  |
| --- | --- |
|  | **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 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 1 | 28 | - | - | - | - | 29 |
| CO3 | 1 | 21 | 7 | - | - | - | 29 |
| CO4 | 1 | 1 | - | - | 3 | 12 | 17 |
| CO5 | 7 | 9 | - | - | - | - | 16 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2027** | **Duration** | **3hrs** |
| **Course Name** | **MATLAB PROGRAMMING FOR ENGINEERS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the advantages of MATLAB over other programming languages. | | CO1 | R | 1 |
| 2. | Recall the command that is used to clear the contents of workspace. | | CO1 | R | 1 |
| 3. | Identify the function which is used to read an image. | | CO2 | R | 1 |
| 4. | Differentiate the functions ceil (x) and floor (x). | | CO2 | U | 1 |
| 5. | Express 6x2 -150 as a MATLAB representation. | | CO3 | U | 1 |
| 6. | Give examples of a vector and a matrix. | | CO3 | R | 1 |
| 7. | Name the tool boxes available in MATLAB Simulink. | | CO4 | R | 1 |
| 8. | Indicate the function of scope block in MATLAB Simulink. | | CO4 | U | 1 |
| 9. | Define Histogram. | | CO5 | R | 1 |
| 10. | Recall the control that displays a series of text strings. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Express the function of the different windows used in MATLAB. | | CO1 | U | 3 |
| 12. | Distinguish between array multiplication and matrix multiplication. | | CO2 | U | 3 |
| 13. | Develop a MATLAB code for dividing 2x3 + 9x2 + 7x-6 by x + 3. | | CO3 | A | 3 |
| 14. | Justify the need of a spectrum analyzer in a Simulink model. | | CO4 | E | 3 |
| 15. | Distinguish between plot(x) and plot(x,y) with examples. | | CO5 | U | 3 |
| 16. | Paraphrase the importance of object properties. | | 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) floor(x), (ii) length(x), (iii) audioread(x,fs), (iv) stem(x), (v) disp(x), (vi) cos(x). | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Construct a MATLAB program to plot the polynomial for -1.5 ≤x ≤ 6.7 for the function f(x) = x5 -12.1x4 +4 0.59x3-17.015x2 -71.95x + 35.88 | CO3 | A | 4 |
|  | b. | Explain polynomial curve fitting with MATLAB examples. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 20. |  | Create a model in MATLAB Simulink to generate a frequency modulated signal. | CO4 | C | 12 |
|  |  |  |  |  |  |
| 21. | a. | Enumerate line plots with a MATLAB example. | CO5 | R | 6 |
|  | b. | Illustrate the following MATLAB functions with an example.   1. meshgrid(x,y) 2. mesh(x,y,z) 3. surf(x,y,z) | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | 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 |
|  |  |  |  |  |  |
| 23. |  | Discuss about MATLAB arrays and explain the functions  zeros ( ), ones ( ) and eye ( ) used in MATLAB program with examples. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Create a MATLAB GUI that can perform arithmetic operations and explain each component. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | - | - | - | - | 17 |
| CO2 | 1 | 28 | - | - | - | - | 29 |
| CO3 | 1 | 21 | 7 | - | - | - | 29 |
| CO4 | 1 | 1 | - | - | 3 | 12 | 17 |
| CO5 | 7 | 9 | - | - | - | - | 16 |
| CO6 | 1 | 3 | - | - | - | 12 | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2029** | **Duration** | **3hrs** |
| **Course Name** | **DATA SCIENCE AND DATA ANALYTICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write the significance of box plot. | | CO1 | R | 1 |
| 2. | Indicate the data quality issues. | | CO1 | U | 1 |
| 3. | Compare big data with data science. | | CO2 | U | 1 |
| 4. | Identify a service provider of API which is used by a popular game “Pokemon go” to find the location information. | | CO2 | A | 1 |
| 5. | Name any two factors that influence data analysis techniques. | | CO3 | R | 1 |
| 6. | Mention the significance of p-values. | | CO3 | R | 1 |
| 7. | List the advantages of One-Hot-Encoding. | | CO4 | U | 1 |
| 8. | List the different Visual encoding. | | CO4 | R | 1 |
| 9. | Define data visualization. | | CO5 | R | 1 |
| 10. | Recognize a python library package to handle multidimensional array. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | “Median is unaffected by extreme values”-Justify with below data.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 13 | 25 | 10 | 14 | 10 | 11 | 600 | | | CO1 | E | 3 |
| 12. | Define data cleaning. | | CO2 | U | 3 |
| 13. | Write the Central Limit Theorem (CLT) with a neat diagram. | | CO3 | U | 3 |
| 14. | Compare R and Python. | | CO4 | U | 3 |
| 15. | List any three data visualization tools. | | CO5 | R | 3 |
| 16. | Classify the different types of SQL commands. | | 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 the steps involved in exploratory data analysis. | CO1 | U | 07 |
|  | b. | Distinguish between quantitative and qualitative types of data. | CO1 | An | 05 |
|  |  |  |  |  |  |
| 18. | a. | List out the various challenges faced in big data. | CO2 | U | 07 |
|  | b. | Discuss the measures of shape and list out the practical uses. | CO2 | U | 05 |
|  |  |  |  |  |  |
| 19. | a. | Explain the Support Vector Machine classification. | CO3 | U | 09 |
|  | b. | Distinguish between supervised models and unsupervised models. | CO3 | An | 03 |
|  |  |  |  |  |  |
| 20. | a. | Explain different visualization tools in detail with an example. | CO4 | U | 07 |
|  | b. | Review about how to construct a bar chart for a data set and explain it. | CO4 | U | 05 |
|  |  |  |  |  |  |
| 21. |  | Summarize the visual encoding variables with necessary illustrations. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Establish the practical solutions offered by cloud services to store and handle big data for the problems associated with data warehouse and data lake. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Develop the K-nearest neighbor model in detail for classifying the dataset. | CO3 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Compose a case study of New York City (NYC) Parking. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 8 |  | 5 | 3 |  | 17 |
| CO2 |  | 16 | 13 |  |  |  | 29 |
| CO3 | 2 | 12 | 12 | 03 |  |  | 29 |
| CO4 | 1 | 16 |  |  |  |  | 17 |
| CO5 | 4 | 15 |  |  |  |  | 19 |
| CO6 | 1 |  |  |  |  | 12 | 13 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2029** | **Duration** | **3hrs** |
| **Course Name** | **DATA SCIENCE AND DATA ANALYTICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define data. | | CO1 | R | 1 |
| 2. | Name any two open-source data science toolkits. | | CO1 | R | 1 |
| 3. | Retell the purpose of a Spreadsheet. | | CO2 | R | 1 |
| 4. | Identify the sources of secondary data. | | CO2 | R | 1 |
| 5. | Explain the major categories of Machine Learning. | | CO3 | U | 1 |
| 6. | Differentiate Regression and Classification. | | CO3 | An | 1 |
| 7. | Indicate the different Visual encoding. | | CO4 | U | 1 |
| 8. | Create a chart that demonstrates Overfitting. | | CO4 | C | 1 |
| 9. | Classify the different visualization tools. | | CO5 | A | 1 |
| 10. | Can Data Science be used in Stock Market Analysis? Justify. | | CO5 | E | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss the advantages of python-the data science toolkit. | | CO1 | U | 3 |
| 12. | Name any 4 methods of primary data collection. | | CO2 | R | 3 |
| 13. | “Usually, the choice of a model involves a trade-off between precision and recall”-Justify. | | CO3 | E | 3 |
| 14. | Develop the line chart for the following data.  years = [1950, 1960, 1970, 1980, 1990, 2000, 2010]  GDP = [300.2, 543.3, 1075.9, 2862.5, 5979.6, 10289.7, 14958.3]. | | CO4 | C | 3 |
| 15. | Summarize the significance of Microsoft power BI. | | CO5 | E | 3 |
| 16. | Classify the different types of SQL commands. | | 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 various formats of data. | CO1 | U | 06 |
|  | b. | Illustrate about If, For & While loops in Python. | CO1 | U | 06 |
|  |  |  |  |  |  |
| 18. | a. | Describe Hadoop architecture and its components with proper diagram. | CO2 | R | 08 |
|  | b. | Recall about descriptive statistics. | CO2 | R | 04 |
|  |  |  |  |  |  |
| 19. | a. | Develop a routine for Naive Bayes model in detail. | CO3 | A | 08 |
|  | b. | Distinguish between supervised models and unsupervised models. | CO3 | An | 04 |
|  |  |  |  |  |  |
| 20. | a. | Explain different charts to visualize a data set of your choice and give the detailed explanation of observations from charts. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss in detail, the various Toolkits in Python used for Data Science. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Interpret the steps involved in exploratory data analysis. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Consider five datapoints belong to positive class, five datapoints belong to negative class and an outlier (negative data point present in the positive class). Utilize regression algorithm to find the best plane which separates the data points with high accuracy. | CO3 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Identify the data collection strategies to be carried out by the data analyst and discuss the practical advantages and disadvantages of the data collection strategies. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 27 |  |  |  |  | 29 |
| CO2 | 17 |  |  |  |  |  | 17 |
| CO3 |  | 1 | 20 | 5 | 3 |  | 29 |
| CO4 |  | 13 |  |  |  | 4 | 17 |
| CO5 |  | 15 | 1 |  | 4 |  | 20 |
| CO6 |  | 12 |  |  |  |  | 12 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2030** | **Duration** | **3hrs** |
| **Course Name** | **CLOUD COMPUTING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the father of cloud computing. | | CO1 | R | 1 |
| 2. | Infer a real time application for virtual machine. | | CO1 | U | 1 |
| 3. | Give examples for private and public cloud. | | CO2 | U | 1 |
| 4. | List out two differences between hybrid and community cloud. | | CO2 | R | 1 |
| 5. | Write the need for cloud security. | | CO3 | U | 1 |
| 6. | How is a server setup in host level security? | | CO3 | R | 1 |
| 7. | List the cloud responsibility in cloud management computing with real time application. | | CO4 | R | 1 |
| 8. | Write the success availability management metrics at service levels. | | CO4 | U | 1 |
| 9. | Identify the other name for cloud middleware. | | CO5 | R | 1 |
| 10. | Write the concept of semantic interoperability in IoT with real time applications. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Give an account on the managing agents present in VMware ESX Architecture. | | CO1 | U | 3 |
| 12. | List the various cloud service models involved in cloud computing with real time applications. | | CO2 | U | 3 |
| 13. | Recall the unique features of Infiltration Risk. | | CO3 | R | 3 |
| 14. | List out the trust principles that are used to demonstrate SOC 2 Audit Report. | | CO4 | R | 3 |
| 15. | Differentiate between grid computing and cloud computing. | | CO5 | U | 3 |
| 16. | Write the various implications of cloud computing. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Describe the classification of Hypervisor which allows the multiple operating system to share a single hardware host. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss on various cloud deployment models with necessary diagrams. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Illustrate on various types of network based cloud security with real time examples. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Discuss on various security management with independent tactics in cloud. | CO4 | U | 10 |
|  | b. | Recall availability management in Platform as a Service (PaaS)with real time examples | CO4 | R | 2 |
|  |  |  |  |  |  |
| 21. | a. | Draw the architecture of grid cloud computing technologies with neat diagrams and explain. | CO5 | R | 10 |
|  | b. | Define Cloud of Things (CoT) and discuss on various service issues in Cloud of Things with real time examples. | CO5 | R | 2 |
|  |  |  |  |  |  |
| 22. |  | Describe the architecture of Openstack with a neat diagram with its real time basic services. | CO2 | R | 12 |
|  |  |  |  |  |  |
| 23. |  | Discuss about IAM practices and relate it with cloud authorization management. | CO4 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Recall the issues present in deployment of amazon AWS reference architecture with a neat diagram. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 13 | 4 | - | - | - | - | 17 |
| CO2 | 13 | 16 | - | - | - | - | 29 |
| CO3 | 4 | 13 | - | - | - | - | 17 |
| CO4 | 6 | 23 | - | - | - | - | 29 |
| CO5 | 13 | 3 | - | - | - | - | 16 |
| CO6 | - | 16 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2033** | **Duration** | **3hrs** |
| **Course Name** | **CRYPTOGRAPHY AND NETWORK SECURITY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify the ciphertext :  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=13 and plaintext is 21. | | CO1 | U | 1 |
| 2. | Predict the condition for which integer a, b is relatively prime with each other. | | CO1 | U | 1 |
| 3. | Infer the condition for two numbers a, b is additive inverse of each other. | | CO2 | U | 1 |
| 4. | Recite Fermat’s little theorem. | | CO2 | R | 1 |
| 5. | State the key length of DES algorithm. | | CO3 | R | 1 |
| 6. | Identify the logical operation done in Add round key stage of AES. | | CO3 | U | 1 |
| 7. | Define authentication. | | CO4 | R | 1 |
| 8. | Express the full form of CMAC. | | CO4 | U | 1 |
| 9. | Show any one digital signature approach. | | CO5 | U | 1 |
| 10. | State the use of firewall. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Recall and write the definition for cryptography. | | CO1 | R | 3 |
| 12. | Construct an additive inverse table for Z5. | | CO2 | A | 3 |
| 13. | List the properties to be satisfied by Group. | | CO3 | R | 3 |
| 14. | Compare weak collision and strong collision. | | CO4 | U | 3 |
| 15. | Discuss the various types of key distribution 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 security services provided by X.800 | CO1 | U | 10 |
|  | b. | Differentiate Active and Passive attacks. | CO1 | U | 2 |
|  |  |  |  |  |  |
| 18. | a. | Show how a person can use a brute-force attack to break the cipher and has intercepted the ciphertext “UVACLYFZLJBYL”. | CO2 | U | 8 |
|  | b. | Discuss the types of Steganography. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. |  | Solve using Chinese Remainder Theorem, find X.  X= 2 mod 3  X= 3 mod 5  X= 2 mod 7 | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe the working of Advanced Encryption Standard. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Interpret the encryption, decryption process and key setup procedure of RSA algorithm. Assume p=3, q=11, e=7 | CO5 | A | 6 |
|  | b. | Reproduce the application and security of public key cryptosystem. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 22. | a. | Express the importance of Message Authentication Code and its properties. | CO4 | U | 8 |
|  | b. | List the important requirements of Hash Functions. | CO4 | R | 4 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the steps involved in Exchanging public key certificates. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Review the working of Multipurpose Internet Mail Extensions (MIME). | CO6 | U | 6 |
|  | b. | List the few Email threats and security protocols. | CO6 | R | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 14 | - | - | - | - | 17 |
| CO2 | 1 | 13 | 3 | - | - | - | 17 |
| CO3 | 4 | 1 | 12 | - | - | - | 17 |
| CO4 | 5 | 24 | - | - | - | - | 29 |
| CO5 | 1 | 28 | - | - | - | - | 29 |
| CO6 | 6 | 9 | - | - | - | - | 15 |
|  | | | | | | | **124** |



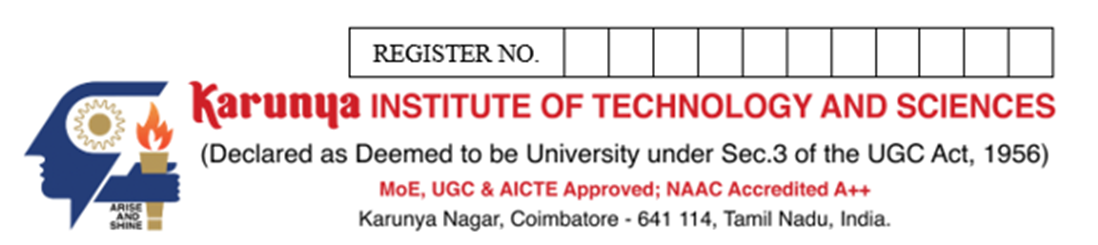
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2036** | **Duration** | **3hrs** |
| **Course Name** | **NEURAL NETWORKS AND DEEP LEARNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the processing element of artificial neuron. | | CO1 | R | 1 |
| 2. | List the different activation functions used in artificial neural networks. | | CO3 | R | 1 |
| 3. | List the different characteristics of biological neural network. | | CO1 | R | 1 |
| 4. | List the practical applications of artificial neural network. | | CO1 | R | 1 |
| 5. | Summarize the operation of biological neuron with neat diagram. | | CO3 | U | 1 |
| 6. | Illustrate the architecture of single layer network with neat diagram. | | CO3 | U | 1 |
| 7. | Summarize the advantages of unsupervised learning methodologies. | | CO2 | U | 1 |
| 8. | Name the digital gate whose data can be classified with perceptron. | | CO4 | R | 1 |
| 9. | Illustrate the significance of learning rate used in the training process of artificial neural networks. | | CO3 | U | 1 |
| 10. | “Deep learning models are more complex than artificial neural networks”. Justify this statement. | | CO5 | E | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Distinguish between dendrites and soma in a human neuron. | | CO1 | An | 3 |
| 12. | Distinguish between supervised and unsupervised training methods. | | CO2 | An | 3 |
| 13. | Summarize the significance of weights in artificial neural network. | | CO3 | U | 3 |
| 14. | “Automated feature extraction is adopted in deep learning models”. Justify this statement. | | CO5 | E | 3 |
| 15. | Summarize the importance of pre-processing in any pattern recognition applications. | | CO4 | U | 3 |
| 16. | Illustrate the operation of convolution layer in convolutional neural network. | | 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. |  | Illustrate the process of electrical communication and chemical communication inside human neuron with neat diagrams. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Summarize the functions of artificial neuron with neat diagrams. Include mathematical equations wherever necessary. | CO1 | U | 6 |
|  | b. | Distinguish between computer and human brain. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the training algorithm of perceptron with necessary mathematical equations. | CO2 | U | 6 |
|  | b. | Summarize the linear separable problem of perceptron and  suggest suitable solution to overcome the problem. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | 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. |  | Summarize the technical aspects of the following pretrained models. (a) AlexNet, (b) LeNet and (c) VGGNet. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Summarize the drawbacks of the back propagation neural network. Include diagrams wherever necessary. | CO3 | U | 6 |
|  | b. | Estimate the weight values of a 2-input AND gate using perceptron after 2 iterations with initial weight values of 0 and 1. The learning rate is 0.5. | CO4 | E | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the training algorithm and architecture of Hopfield neural network. Include mathematical equations wherever necessary. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate the functions of convolutional neural network with different layers of the architecture. Include neat diagrams and mathematical equations wherever necessary. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 18 | - | 3 | - | - | 24 |
| CO2 | - | 25 | - | 3 | - | - | 28 |
| CO3 | 1 | 24 | - | 6 | - | - | 31 |
| CO4 | 1 | 3 | - | - | 6 | - | 10 |
| CO5 | - | 3 | - | - | 4 | - | 7 |
| CO6 | - | 24 | - | - | - | - | 24 |
|  | | | | | | | **124** |

****

**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2036** | **Duration** | **3hrs** |
| **Course Name** | **NEURAL NETWORKS AND DEEP LEARNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define bias. | | CO1 | R | 1 |
| 2. | Sketch McCulloch-Pitts Neuron Model. | | CO1 | A | 1 |
| 3. | Recall activation function. | | CO1 | R | 1 |
| 4. | State reinforcement learning. | | CO2 | R | 1 |
| 5. | Cite the use of perceptron network. | | CO4 | U | 1 |
| 6. | Indicate the weights in a Hopfield network. | | CO2 | U | 1 |
| 7. | Define delta rule. | | CO2 | R | 1 |
| 8. | Express the limitation of Backpropagation neural network. | | CO3 | U | 1 |
| 9. | Write the use of gradient descent. | | CO6 | A | 1 |
| 10. | Recall stride in CNN. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss the three characteristics of ANN | | CO1 | U | 3 |
| 12. | Compare and contrast ANN architectures | | CO1 | U | 3 |
| 13. | Determine the weight matrix that stores the input vector (1,1,1,0) in a discrete Hopfield network | | CO4 | A | 3 |
| 14. | Differentiate forward and reverse phases of training in Backpropagation neural network | | CO2 | U | 3 |
| 15. | Describe the development of Deep learning networks | | CO5 | U | 3 |
| 16. | Appraise the function of convolution, pooling and fully connected layers | | CO5 | 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. | Compare biological and artificial neuron models | CO1 | U | 6 |
|  | b. | Explain the application of artificial neural networks in medicine | CO6 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the types of activation functions used in ANN | CO1 | U | 9 |
|  | b. | Distinguish between supervised and unsupervised learning | CO2 | U | 3 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the various operations involved in artificial neuron | CO1 | A | 4 |
|  | b. | Categorize the neural network in terms of architecture with necessary figures and details | CO2 | An | 8 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate the linear inseparable problem in single layer neural network | CO3 | U | 8 |
|  | b. | Chart the classification taxonomy of ANN | CO1 | A | 4 |
|  |  |  |  |  |  |
| 21. | a. | Describe the architecture and training algorithm of perceptron neural network | CO2 | U | 10 |
|  | b. | Criticize the energy function for the discrete Hopfield network | CO4 | An | 2 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the training of output and hidden layers in Backpropagation neural network | CO2 | U | 9 |
|  | b. | Report the ways to overcome the training difficulties in BPN | CO4 | A | 3 |
|  |  |  |  |  |  |
| 23. | a. | Assess the gradient descent and momentum based gradient descent algorithms | CO5 | E | 3 |
|  | b. | Explain the architecture and advantages of VGGnet | CO5 | U | 9 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Compare trained and pre-trained deep learning models | CO5 | U | 4 |
|  | b. | Criticize the functionality of each layer in convolutional neural network used for real time application | CO6 | An | 8 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 21 | 9 |  |  |  | 32 |
| CO2 | 2 | 26 |  | 8 |  |  | 36 |
| CO3 |  | 9 |  |  |  |  | 9 |
| CO4 |  | 1 | 6 | 2 |  |  | 9 |
| CO5 | 1 | 16 |  | 3 | 3 |  | 23 |
| CO6 |  | 6 | 1 | 8 |  |  | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2038** | **Duration** | **3hrs** |
| **Course Name** | **IOT BASED DATA ACQUISITION SYSTEMS AND PROTOCOLS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define IoT Gateway. | | CO1 | R | 1 |
| 2. | Define Multitenancy. | | CO1 | R | 1 |
| 3. | List the trends impacting IoT. | | CO2 | R | 1 |
| 4. | Define Licensed spectrum. | | CO2 | R | 1 |
| 5. | Define Protocol Data Units(PDUs). | | CO3 | R | 1 |
| 6. | Name the competitive technology for IEEE 1901.2a. | | CO3 | R | 1 |
| 7. | Define: Encapsulation. | | CO4 | R | 1 |
| 8. | Recall the size of Maximum Transmission Unit (MTU) of IPv6 networks. | | CO4 | R | 1 |
| 9. | Choose the type of ground points which are suitable for connecting IoT devices. | | CO5 | A | 1 |
| 10. | Infer the importance of smart grid. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the Data management layers in Simplified IoT Architecture. | | CO1 | R | 3 |
| 12. | Summarize Wireless Sensor Networks. | | CO2 | U | 3 |
| 13. | Identify the limitations of IEE802.15.4 WPAN | | CO3 | R | 3 |
| 14. | Compare mesh under and mesh over routing. | | CO4 | U | 3 |
| 15. | Illustrate the protocol stack of IP and IoT. | | CO5 | A | 3 |
| 16. | List the features of Google Cloud's IoT platform. | | 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. |  | Sketch the IoT World Forum (IoTWF) Standardized Architecture and explain the functions of each layer. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss the factors to be considered while connecting Smart objects. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe the functions of IEEE 802.15.4 WPAN in terms of the following   1. Physical layer 2. MAC layer 3. Topology 4. Security   Competitive Technologies | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain the Optimization of 6LoWPAN to 6 Lo in terms of   1. Header compression. 2. Fragmented Header. 3. Mesh Addressing. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate the types of Interfaces. Explain in detail about General Purpose Interface Bus (GPIB). | CO5 | A | 6 |
|  | b. | Discuss the different types of signal sources used in data acquisition system. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the importance of Constrained Application Protocol (CoAP). Explain the message types in detail. | CO3 | An | 8 |
|  | b. | Describe in detail IoT data broker. | CO3 | R | 4 |
|  |  |  |  |  |  |
| 23. | a. | Discuss in detail about the drivers behind IoT architecture. | CO1 | U | 9 |
|  | b. | List the benefits of edge computing. | CO1 | R | 3 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Recommend the factors to be considered, while designing an IoT based smart city. | CO6 | E | 8 |
|  | b. | Express the challenges in Industry IoT (IIoT). | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Acquire knowledge about the various network architectures of IoT. |
| CO2 | Understand the basic concepts of sensors and actuators. |
| CO3 | Gain knowledge in various network protocols . |
| CO4 | Gain knowledge in data acquisition methods and instruments. |
| CO5 | Articulate the various applications of IoT networked systems . |
| CO6 | Apply the acquired knowledge to develop an IoT networked application. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 9 | 12 | - | - | - | 29 |
| CO2 | 2 | 15 | - | - | - | - | 17 |
| CO3 | 9 | 12 | - | 8 | - | - | 29 |
| CO4 | 2 | 3 | - | 12 | - | - | 17 |
| CO5 | 1 | 6 | 9 | - | - | - | 16 |
| CO6 | 4 | 4 | - | - | 8 | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2040** | **Duration** | **3hrs** |
| **Course Name** | **INTERNET OF INTELLIGENT THINGS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define SIoT. | | CO1 | R | 1 |
| 2. | Name the relationship which gets established among objects belonging to the same manufacturer and produced in the same batch. | | CO1 | R | 1 |
| 3. | Define Relationship Management. | | CO1 | R | 1 |
| 4. | Name the Trust Model that is based on relationship with the Local nodes. | | CO1 | R | 1 |
| 5. | Recall Pooling in CNN. | | CO2 | R | 1 |
| 6. | Name the element which uses the eigenvectors of the graph laplacian to define the convolution operation. | | CO2 | U | 1 |
| 7. | Identify under which categroy does the FCNN learning algorithms be classified. | | CO2 | U | 1 |
| 8. | Define ReLU. | | CO3 | R | 1 |
| 9. | Illustrate the HMMs for the letter "i". | | CO3 | A | 1 |
| 10. | Mention the layer that has enormous data centers with high computing abilities. | | CO3 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | State the properties of Trustworthiness. | | CO1 | R | 3 |
| 12. | Enumerate the types of Intelligent sensing. | | CO1 | R | 3 |
| 13. | Identify 1,2, & 3 in the given image: | | CO2 | U | 3 |
| 14. | Explain the 4 main components of CNN. | | CO2 | A | 3 |
| 15. | Explain the main cloud services given in Fog computing. | | CO3 | A | 3 |
| 16. | Illustrate the data management layer in the smart gateway. | | 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 NLP with detailed step by step process. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate the feature Map for the number 9 using CNN. | CO2 | U | 8 |
|  | b. | Interpret the Max pooling and the average pooling for the given matrix | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. |  | Explain the Fog Computing Architecture for Remote Health  Monitoring application. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Create a solution of your own using an SBC that solves a day-to-day  problem. Explain the following in terms of your solution:  • Problem statement (20 words)  • Solution (50 words)  • Equipment required  • Block diagram  • The type of cloud used and  • The overall usage of the solution | CO4 | C | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the concept of Smart City application and the importance of IOT. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Illustrate and explain the establishment of Body Area Networks in the real time scenario. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the working of a BCI model with the help of diagrams. | CO6 | A | 8 |
|  | b. | List down the different types of approaches for a BCI model. | CO6 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Create an Intelligent Hospital and explain the following in terms of your solution:  • Problem statement (20 words).  • Reception of the hospital.  • Patient’s room.  • Block diagram,  • Nurse station and emergency room.  • The overall usage of the solution | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the concepts of intelligent things. |
| CO2 | Articulate the structure of Neural Networks in IoT. |
| CO3 | Understand the need of FOG computing services. |
| CO4 | Design and build IoT systems using Raspberry Pi. |
| CO5 | Apply the concepts and demonstrate various prototypes. |
| CO6 | Examine various real time applications and case studies. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | - | 12 | - | - | - | 22 |
| CO2 | 1 | 17 | 3 | - | - | - | 21 |
| CO3 | 2 | - | 16 | - | - | - | 18 |
| CO4 | - | 3 | - | - | - | 12 | 15 |
| CO5 | - | - | - | 12 | - | - | 12 |
| CO6 | 4 | 12 | 8 | - | - | 12 | 36 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2050** | **Duration** | **3hrs** |
| **Course Name** | **SENSORS FOR IOT APPLICATIONS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Internet of Things. | | CO1 | R | 1 |
| 2. | Infer an application for BAN. | | CO1 | U | 1 |
| 3. | Identify the three major properties of security. | | CO2 | R | 1 |
| 4. | Discuss the mechanism of Symmetric encryption in public keys. | | CO2 | U | 1 |
| 5. | Recall the salient characteristics of Sensor. | | CO3 | R | 1 |
| 6. | Describe about temperature sensor with an example. | | CO3 | U | 1 |
| 7. | Classify Sensor types with suitable examples. | | CO4 | U | 1 |
| 8. | Describe about PIR sensor with its description. | | CO4 | U | 1 |
| 9. | Describe about Smart dust. | | CO5 | R | 1 |
| 10. | Infer Smart parking with an example. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the Body Area Network architecture with a neat diagram. | | CO1 | U | 3 |
| 12. | Relate the overview of counter measures on Security basis. | | CO2 | U | 3 |
| 13. | Differentiate internal and external audit with an example. | | CO3 | U | 3 |
| 14. | Recall the components found in Smart Sensors. | | CO4 | R | 3 |
| 15. | List the types of motion sensors with an application. | | CO5 | R | 3 |
| 16. | Recall the concepts of Home Automation based IoT. | | 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 Internet of Things Communication pattern with a neat block diagram. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss about top 10 Internet of Things in Open Web Application Security Project Vulnerabilities in detail. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe the working principles of Sensors, equivalent circuit and its Unique features along with a neat diagram and suitable examples. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss on various types of thread modeling with static & dynamic vulnerability. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Recall on Node discovery, data aggregation & data dissemination with an example. | CO5 | R | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the physical design of IoT architecture pattern with its layers. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Describe about Core and design Security Concepts in IoT. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss how an automated smart irrigation is needed to optimize water use for agricultural crops. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the characteristics of IOT systems. |
| CO2 | Describe the security issues in IoT. |
| CO3 | Relate the various basic ideas behind sensors with respect to IOT. |
| CO4 | Choose appropriate sensors for measuring various parameters. |
| CO5 | Demonstrate the wireless sensor network in the aspects of IOT. |
| CO6 | Appraise sensors used in IOT for real life situations. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 4 | 24 | - | - | - | 29 |
| CO2 | 1 | 28 | - | - | - | - | 29 |
| CO3 | 1 | 16 | - | - | - | - | 17 |
| CO4 | 3 | 14 | - | - | - | - | 17 |
| CO5 | 16 | - | - | - | - | - | 16 |
| CO6 | 3 | 13 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2054** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF MEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Classify the mobility of GaAs with silicon. | | CO1 | U | 1 |
| 2. | Name the equipment used for testing biomolecular Laboratory samples. | | CO1 | R | 1 |
| 3. | Describe Volumetric Strain of a body. | | CO2 | R | 1 |
| 4. | Define Hook’s law of elasticity. | | CO2 | R | 1 |
| 5. | Examine the chemical reaction in CVD of SiO2 on silicon substrates. | | CO3 | R | 1 |
| 6. | Identify the carrier gas used in sputtering technique of manufacturing. | | CO3 | U | 1 |
| 7. | List out substrates which could be etched in bulk manufacturing. | | CO4 | R | 1 |
| 8. | Name few etchants for silicon and silicon components. | | CO4 | R | 1 |
| 9. | Describe the working of NEMS devices. | | CO5 | R | 1 |
| 10. | Identify a piezoelectric material. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List out and explain any three micro actuators. | | CO1 | R | 3 |
| 12. | Name and explain any three applications of MEMS in automotive industry. | | CO1 | R | 3 |
| 13. | Identify the governing differential equation for induced deflection of a plate w(x,y). | | CO2 | R | 3 |
| 14. | Compare and contrast the diffusion and ion implantation processes in manufacturing. | | CO3 | An | 3 |
| 15. | Explain three types of dry etching techniques. | | CO4 | U | 3 |
| 16. | Describe three different Smart Gel applications. | | 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. |  | Discuss the working of micro gyroscope in detail with illustration. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Illustrate and explain microsystem in detail with relevant examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Determine the minimum thickness of the circular diaphragm of a micro pressure sensor made of Silicon as shown in the figure with conditions: Diameter d = 600 μm; Applied pressure p = 20 MPa Yield strength of silicon σy = 7000 MPa E = 190,000 MPa and ν = 0.25. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss the physical vapor deposition technique in detail with a clear illustration. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain photolithography process in detail with illustration. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Illustrate and explain LIGA micromachining process in detail. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | List out and explain two types of MEMS switch in detail with illustration. | CO5 | R | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Compare and contrast between Fullerene and Graphene nanoscale allotropes of carbon. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Acquire knowledge on the basic concepts of MEMS Design. |
| CO2 | Understand the mechanics behind MEMS devices. |
| CO3 | Demonstrate on the rudiments of Micro fabrication techniques. |
| CO4 | Develop MEMS structures based on various Micromachining techniques. |
| CO5 | Design and model Smart devices. |
| CO6 | Apply smart materials to intelligent systems. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 25 | - | - | - | - | 32 |
| CO2 | 5 | - | 12 | - | - | - | 17 |
| CO3 | 1 | 25 | - | 3 | - | - | 29 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | 13 | - | - | - | - | - | 13 |
| CO6 | 3 | 1 | - | 12 | - | - | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2054** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF MEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the year of IC development. | | CO1 | R | 1 |
| 2. | Name the principle used for Airbags in automobiles. | | CO1 | R | 1 |
| 3. | Identify a tool used to determine whether the DNA from a particular individual contains a mutation in genes. | | CO1 | A | 1 |
| 4. | Recall a micro optoelectromechanical system which is part of DLP technology. | | CO1 | R | 1 |
| 5. | Recall a technique for doping silicon substrates. | | CO3 | R | 1 |
| 6. | State the chemical reaction in CVD of SiO2 on silicon substrates. | | CO3 | R | 1 |
| 7. | Identify the carrier gas used in sputtering. | | CO3 | U | 1 |
| 8. | Recall low pressure CVD. | | CO3 | R | 1 |
| 9. | Recall Volumetric Strain. | | CO2 | R | 1 |
| 10. | Identify a piezoelectric material. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Illustrate and explain the working of a micro sensor. | | CO1 | U | 3 |
| 12. | Explain the working of MEMS pressure sensor. | | CO1 | U | 3 |
| 13. | List out two applications of SiO2 layers. | | CO3 | R | 3 |
| 14. | List out the two major factors affect the rate of CVD. | | CO3 | R | 3 |
| 15. | Enumerate a few applications of shape memory alloys. | | CO6 | R | 3 |
| 16. | List out few applications of Smart Gel. | | CO5 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Illustrate and explain the process of ion implantation. | CO2 | U | 6 |
|  | b. | Justify on the statement “Silicon an ideal substrate material for MEMS”. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain the working of micro accelerometers in detail. | CO1 | U | 6 |
|  | b. | Classify on the 4 types of optical sensors. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate and explain the oxidation process in fabrication. | CO3 | U | 6 |
|  | b. | Discuss in detail on the physical vapor deposition method. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate and explain LIGA process. | CO4 | U | 6 |
|  | b. | Discuss in detail on the plasma etching process. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the Rheological materials with applications in engineering field. | CO6 | An | 6 |
|  | b. | Compare and contrast on Fullerene and Graphene materials. | CO6 | E | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the properties, advantages and disadvantages of SMA. | CO6 | An | 6 |
|  | b. | Discuss any two types of MEMS switch with illustration. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | A rectangular diaphragm, 13.887 µm thick has the plane dimensions as shown in the figure. The diaphragm is made of silicon. Determine the maximum stress and deflection when it is subjected to a normal pressure, P = 20 MPa. All 4 edges of the diaphragm are fixed.  Given: α = 0.0277 and β = 0.4974 with a/b = 752/376 = 2.0 | CO2 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate and explain with comparison on any two types of MEMS switches. | CO6 | An | 12 |

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Acquire knowledge on the basic concepts of MEMS Design. |
| CO2 | Understand the mechanics behind MEMS devices. |
| CO3 | Demonstrate on the rudiments of Micro fabrication techniques. |
| CO4 | Develop MEMS structures based on various Micromachining techniques. |
| CO5 | Design and model Smart devices. |
| CO6 | Apply smart materials to intelligent systems. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 3 | 18 | 1 | - | - | - | 22 |
| CO2 | 1 | 6 | 12 | - | 6 | - | 25 |
| CO3 | 9 | 13 | - | - | - | - | 22 |
| CO4 | - | 12 | - | - | - | - | 12 |
| CO5 | 3 | 6 | - | - | - | - | 9 |
| CO6 | 3 | 1 | - | 24 | 6 | - | 34 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2057** | **Duration** | **3hrs** |
| **Course Name** | **ARTIFICIAL NEURAL NETWORKS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recognize the two chemicals involved in synaptic transmission. | | CO1 | R | 1 |
| 2. | Name the types of unsupervised training algorithm. | | CO2 | R | 1 |
| 3. | Identify the specialized structure in neuron, receive signals from neighboring neurons and carry them back to the cell body. | | CO1 | R | 1 |
| 4. | Select the activation function to be used in the perceptron network. | | CO2 | An | 1 |
| 5. | Identify the rule used in BPN for weight adjustments. | | CO3 | R | 1 |
| 6. | Examine the non-linearly separable problem of perceptron with XOR gate example. | | CO1 | A | 1 |
| 7. | Identify the neural network that works based on pattern association. | | CO5 | R | 1 |
| 8. | Write the applications of continuous Hopfield network. | | CO5 | A | 1 |
| 9. | Select the neural network used for maintaining the stability of the network. | | CO5 | An | 1 |
| 10. | Choose a network, which uses “winner take all” rule for the weight adjustment process. | | CO2 | A | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Sketch the structure of neuron and mark the parts. | | CO1 | A | 3 |
| 12. | Compare humans and computers for their similarities. | | CO1 | U | 3 |
| 13. | Explain the network paralysis error in BPN network. | | CO1 | U | 3 |
| 14. | Estimate the output value with the given set of inputs and weight values for a simple perceptron network.  X=[ 2 , 4 , 1.5] and w=[ 0.5, 0.7, 1] | | CO3 | An | 3 |
| 15. | Differentiate Auto and hetero associative memory. | | CO5 | An | 3 |
| 16. | Write short notes on neural network applications for fault diagnosis. | | CO4 | 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. |  | Summarize the significance of activation function and explain the types. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the perceptron training algorithm in detail and illustrate the AND gate function operations with the network. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the forward and reverse pass training algorithm of BPN with a sketch of the architecture. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize the Binary Associative Memory neural network architecture and algorithm. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Illustrate the process of neuron communication with necessary diagrams. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Compare the differences, limitations, and advantages of single and multi-layer neural network. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Appraise the application of Artificial Neural Network for any real time engineering application. | CO6 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Examine the discrete Hopfield architecture with its training and testing algorithm. | CO5 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Summarize the pros and cons of different artificial neural networks. |
| CO2 | Discuss the principles of training methodologies of neural networks. |
| CO3 | Develop novel artificial neural networks. |
| CO4 | Formulate neural networks based expert systems. |
| CO5 | Analyze the single layer and multi-layer neural networks. |
| CO6 | Apply artificial neural networks for solving engineering problems. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 6 | 4 | - | - | - | 12 |
| CO2 | 1 | 36 | 1 | 1 | - | - | 39 |
| CO3 | 1 | - | - | 15 | - | - | 16 |
| CO4 | - | - | 3 | - | - | - | 3 |
| CO5 | 1 | 24 | 13 | 4 | - | - | 42 |
| CO6 | - | - | - | 12 | - | - | 12 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **19EC2059** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF SATELLITE COMMUNICATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the first passive Communication Satellite launched into space. | | CO1 | R | 1 |
| 2. | State Kepler’s first law. | | CO1 | R | 1 |
| 3. | Recall the L-Band frequency range. | | CO2 | R | 1 |
| 4. | Why is Aluminum used in Satellites? | | CO2 | R | 1 |
| 5. | Name the antenna that produce wide beams for global coverage. | | CO3 | R | 1 |
| 6. | Give examples of passive thermal components. | | CO3 | R | 1 |
| 7. | Define Modulation. | | CO4 | R | 1 |
| 8. | Identify the antenna beam used in satellite switched TDMA instead of a single antenna beam. | | CO4 | U | 1 |
| 9. | Define Transmission losses. | | CO5 | R | 1 |
| 10. | What is VSAT? | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Relate thrust generation by a rocket engine and Newton’s third law. | | CO1 | U | 3 |
| 12. | Compare regenerative and on-board processing transponders. | | CO2 | U | 3 |
| 13. | Name any four different types of Antennas. | | CO3 | R | 3 |
| 14. | List the different types of Analog modulation. | | CO4 | R | 3 |
| 15. | Illustrate the general model of spread spectrum digital communication system. | | CO5 | U | 3 |
| 16. | Determine EIRP in dBW for the following: A satellite downlink at 12 GHZ operates with a transmit power of 6W and an antenna gain of 48.2 dB. | | 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. | Examine in what way a rocket relates to Newton’s three laws of motion. | CO1 | A | 6 |
|  | b. | Distinguish Geosynchronous satellite and Geostationary satellite. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate Frequency spectrum. | CO1 | An | 6 |
|  | b. | Tabulate the applications of frequency bands used for satellite communications. | CO1 | R | 6 |
|  |  |  |  |  |  |
| 19. |  | Describe Earth station architecture with a suitable block diagram. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Discuss on Attitude control. | CO2 | U | 6 |
|  | b. | Compare Low noise amplifier and High power amplifier. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate the use of Magic-T for Power combining. | CO3 | A | 6 |
|  | b. | Describe Single amplifier HPA configuration for multi-carrier operation. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 22. |  | Sketch the Slow Frequency-Hop spread spectrum of 16 carrier frequencies for the following data and list the gains of spread spectrum:  PN Sequence : 00 11 01 10 00  Input Binary Data: 0111 0011 1101 1000 0011 | CO4 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the formation of Ionosphere. | CO5 | U | 6 |
|  | b. | Discuss the uses of Frequency reuse in satellite communication. | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe the technologies and configurations of VSAT. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 | 8 | 9 | 6 | 6 | - | - | 29 |
| CO2 | 2 | 21 | - | 6 | - | - | 29 |
| CO3 | 5 | 6 | 6 | - | - | - | 17 |
| CO4 | 4 | 1 | 12 | - | - | - | 17 |
| CO5 | 1 | 15 | - | - | - | - | 16 |
| CO6 | 1 | 12 | 3 | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC1001** | **Duration** | **3hrs** |
| **Course Name** | **PYTHON PROGRAMMING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define Indentation Error in Python language. | | CO1 | R | 1 |
| 2. | Predict the output for the following program.  >>>print(4\*4\*\*4) | | CO1 | U | 1 |
| 3. | Identify the output of the following code segment.  >>>s = "Welcomes"  >>>print("W"+ s[3:]) | | CO2 | R | 1 |
| 4. | Write Python code to print first 10 natural number in reverse order. | | CO2 | A | 1 |
| 5. | Recall the Python module to be imported to use the “sqrt()” function. | | CO3 | R | 1 |
| 6. | State the syntax to define function in Python. | | CO4 | R | 1 |
| 7. | Discover the output of the following Python code.  >>>t=(1,2,4,3)  >>>t[1:-1] | | CO4 | U | 1 |
| 8. | Identify the output of the following statements.  >>>s = "python rocks"  >>>print(len(s)) | | CO5 | R | 1 |
| 9. | State the Python statement for displaying title on chart. | | CO5 | R | 1 |
| 10. | Define Polymorphism. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List three features of Python which make it a unique language. | | CO1 | A | 3 |
| 12. | Write a loop statement that prints your name 20 times. Each output should begin on a new line. | | CO2 | A | 3 |
| 13. | Develop a Python code using math module to find the factorial of the given number. | | CO3 | A | 3 |
| 14. | Construct a Python user defined function to find the maximum of three numbers. | | CO4 | A | 3 |
| 15. | Write a Python program to count the number of characters (character frequency) in a string. | | CO5 | C | 3 |
| 16. | Develop a Python code to open a file named myfile.csv and write 3 names entered by the user. | | 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. |  | Explain any four types of operators used in the Python programming. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Develop a program to generate all odd numbers between 1 to 10. | CO2 | C | 6 |
|  | b. | Write a Python program to print first 100 numbers divisible by 5 using while loop. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the data types of Python with a suitable code. | CO3 | An | 6 |
|  | b. | Construct a Python code to check whether given string is a palindrome or not. | CO3 | C | 6 |
|  |  |  |  |  |  |
| 20. | a. | Describe the following methods of List with suitable Python code.           i)         count()         ii)         pop() | CO4 | U | 6 |
|  | b. | Construct a Python code by considering two tuples  a = (1, 2, 3,4,5), b = (6,7,8,9) and do the following operations.   1. Concatenate and print the above two tuples. 2. Repeat the elements of tuple ‘a’ three times. 3. Find the maximum value of the tuple ‘b’. | CO4 | C | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the functionalities of any three string operations with a suitable Python code. | CO5 | An | 6 |
|  | b. | Recommend a Python code to draw Bar Chart and Pie chart using matplotlib. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Create a Python program to find the average of 5 numbers entered by the user. | CO1 | C | 6 |
|  | b. | Develop a Python program to prepare a list  Cars=[‘Honda’, ‘Hyundai’, ‘Mahindra’] and do the following operations.   1. Print all the items in the list. 2. Find the length of the list 3. Remove the last item in the list and print the list. · | CO2 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Justify with an example Python function having multiple returns. | CO4 | E | 3 |
|  | b. | 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. | CO6 | A | 9 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the single and hybrid inheritance method in the OOP concept of Python. | CO6 | An | 6 |
|  | b. | Summarize the input and output operations in Text file using Python with suitable code. | CO6 | E | 6 |

CO – COURSE OUTCOME BL – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 13 | 3 | - | - | 6 | 23 |
| CO2 | 1 | - | 16 | - | - | 6 | 23 |
| CO3 | 1 | - | 3 | 6 | - | 6 | 16 |
| CO4 | 1 | 7 | 3 | - | 3 | 6 | 20 |
| CO5 | 2 | - | - | 12 | - | 3 | 17 |
| CO6 | 1 | - | 9 | 6 | 6 | 3 | 25 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC1003** | **Duration** | **3hrs** |
| **Course Name** | **PROGRAMMING FOR PROBLEM SOLVING WITH C** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write a C program to display ‘The purpose of our lives is to be happy’. | | CO2 | A | 1 |
| 2. | Identify the problem solving technique.  Difference Between Algorithm and Flowchart - GeeksforGeeks | | CO1 | U | 1 |
| 3. | List any 3 data types along with it’s format specifier used in C programming language. | | CO2 | R | 1 |
| 4. | Analyze the bugs and correct them.  include <iostream.h>  {  a=100;  b=16;  printf(“A is” ;a b);  } | | CO2 | An | 1 |
| 5. | Identify the expected Output.  #include<stdio.h>  int main()  {  int a[] = {1,2,3,4};  int b[4] = {5,6,7,8};  printf("%d,%d", a[0], b[2]);  } | | CO3 | U | 1 |
| 6. | Write the syntax for the initialization of an array variable. | | CO3 | U | 1 |
| 7. | Write about ‘Function Declaration’. | | CO4 | U | 1 |
| 8. | Name the operator that is used to display the address of a variable. | | CO5 | U | 1 |
| 9. | State the purpose of ‘strcat’. | | CO4 | R | 1 |
| 10. | Interpret a[2][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)**  **(Answer all the questions)** | | | | | |
| 11. | Compare Algorithm and Flowchart. | | CO1 | U | 3 |
| 12. | Construct a C program to display the numbers from 15 to 20. | | CO2 | A | 3 |
| 13. | Compare User defined functions and Library functions. | | CO4 | U | 3 |
| 14. | Write a C-program to find the Size of the given Variables/ data types such as int, float, double, char. | | CO4 | A | 3 |
| 15. | Distinguish Arrays and Structure. | | CO5 | U | 3 |
| 16. | Give an account on Pointers to Pointers. | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain in detail about the ‘Program development cycle’. | CO1 | A | 8 |
|  | b. | Compare Hardware and Software. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. |  | Construct a C program to print the multiplication table for the given numbers (2,3,4,5,6) using Switch Case statement. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Write a ‘C’ code for building an arithmetic calculator to perform Addition, Subtraction, Multiplication and Division using Switch-case statement. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Construct a C program to perform Matrix Addition. | CO3 | A | 8 |
|  | b. | Write a C program to compare two strings by adopting the library functions. | CO3 | A | 4 |
|  |  |  |  |  |  |
| 21. |  | Write a C program to swap two numbers using the concept of ‘Functions’. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Write a C program to sort a given array in both ascending and descending order by adopting the concept of structures. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Write a C program to create a login application. Initialize two strings user[]=”admin” and passwd[]=”karunya”. Allow the user to enter the username (case insensitive) and password. Then compare the entered user credentials with stored to print “Login Successful” or “Invalid username or Password”. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Write a C program that defines a structure employee containing the details such as Employee number, Employee name, department name and salary. The structure has to store 20 employees in an organization. Use the appropriate method to define the above details and define a function that will display the contents. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 8 | 8 |  |  |  | 16 |
| CO2 | 1 |  | 28 | 1 |  |  | 30 |
| CO3 |  | 2 | 12 |  |  |  | 14 |
| CO4 | 1 | 4 | 15 |  |  |  | 20 |
| CO5 |  | 5 | 15 |  |  |  | 20 |
| CO6 |  |  | 24 |  |  |  | 24 |
|  | | | | | | | **124** |



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Show the energy band diagram of a semiconductor. | | CO1 | U | 1 |
| 2. | Define barrier potential. | | CO2 | R | 1 |
| 3. | Define Fermi energy level. | | CO1 | R | 1 |
| 4. | Name the terminals of Bipolar Junction Transistor. | | CO3 | R | 1 |
| 5. | State the widely used configuration of Bipolar Junction Transistor. | | CO3 | R | 1 |
| 6. | Compare PN diode and Schottky diode in forward bias condition. | | CO5 | An | 1 |
| 7. | Infer the applications of MESFET. | | CO5 | U | 1 |
| 8. | Define photoelectric effect. | | CO5 | R | 1 |
| 9. | Recall the materials used for LED construction. | | CO6 | R | 1 |
| 10. | Show the circuit symbol of DIAC | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Distinguish drift current from diffusion current. | | CO1 | An | 3 |
| 12. | Assume in an N-type semiconductor, the concentration of electron is 2 × 1022 m–3 and its electrical conductivity is 112 ohm–1 m–1. Calculate the mobility of electrons. | | CO1 | An | 3 |
| 13. | Show the Eber Moll model of a transistor. | | CO3 | U | 3 |
| 14. | List the applications of UJT and sketch its equivalent circuit. | | CO5 | R | 3 |
| 15. | Zener diode is preferred as a voltage regulator. Justify. | | CO5 | A | 3 |
| 16. | Explain the concept of solar cells and its applications. | | 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 junction formation and operation of PN diode with necessary diagrams. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Summarize the carrier generation and recombination methods in a semiconductor. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the operation of NPN transistor and the dc characteristics of common emitter configuration. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize the construction and working principle of Junction Field effect Transistor. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the construction, operation, dc characteristics of Enhancement and Depletion MOSFET. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Examine the working principle of LASER diode and Schottky barrier diode with necessary diagrams. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the HALL effect experimental setup to identify the type of semiconductor and its charge density. | CO1 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Appraise the characteristics of Silicon Controlled Rectifier with necessary diagrams | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 13 | 12 | 6 | - | - | 32 |
| CO2 | 1 | 12 | - | - | - | - | 13 |
| CO3 | 2 | 3 | - | 12 | - | - | 17 |
| CO4 | - | 24 | - | - | - | - | 24 |
| CO5 | 4 | 1 | 15 | 1 | - | - | 21 |
| CO6 | 1 | 1 | 3 | 12 | - | - | 17 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2003** | **Duration** | **3hrs** |
| **Course Name** | **SIGNALS AND SYSTEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define Time Scaling of a signal. | | CO1 | R | 1 |
| 2. | Sketch the signal | | CO1 | A | 1 |
| 3. | Predict the number of samples at the output of a DT-LTI system if the input has 3 samples and the impulse response of the system has 5 samples. | | CO2 | U | 1 |
| 4. | Define Shift Invariance of a BIBO system | | CO2 | R | 1 |
| 5. | State the Time Reversal property of Continuous-Time Fourier Transform (CTFT). | | CO3 | R | 1 |
| 6. | List the two types of representation of CTFS. | | CO3 | R | 1 |
| 7. | Identify the Nyquist interval for the signal x(t)=sin 500πt | | CO4 | U | 1 |
| 8. | Define ROC of Laplace Transform. | | CO4 | R | 1 |
| 9. | Recall the Synthesis equation of DTFT. | | CO5 | U | 1 |
| 10. | Indicate the relation between the Z-transform and the Fourier Transform | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Sketch given | | CO1 | A | 3 |
| 12. | Test whether the given system is Time-Variant or not. | | CO2 | An | 3 |
| 13. | Discuss the conditions for convergence of Continuous-Time Fourier Series | | CO3 | U | 3 |
| 14. | Compute the Final value, if | | CO4 | A | 3 |
| 15. | Calculate the DTFT of u(n-5). | | CO5 | A | 3 |
| 16. | Estimate the Z transform of u(-n). | | 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. | Compute the Even and odd parts of | CO1 | A | 6 |
|  | b. | Test whether the given signal is periodic or not. If it is periodic, compute the fundamental period. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. |  | Sketch the graphical representation of the following signals.  (i)  (ii)  (iii)  given | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Test the following properties of the system  a) Static or Dynamic  b) Linear or Non-linear  c) Time invariant or variant  d) Causal or Non- causal | CO2 | An | 6 |
|  | b. | Determine the response of the Discrete-Time Linear Time Invariant system with an input and impulse response  using  Graphical method | CO2 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Determine the exponential Fourier series coefficients for the continuous time periodic signal    with fundamental period T=4 sec. | CO3 | A | 6 |
|  | b. | Evaluate the CTFT of x(t) =t. | CO3 | E | 6 |
|  |  |  |  |  |  |
| 21. | a. | Calculate the Laplace Transform and the ROC of | CO4 | An | 6 |
|  | b. | Evaluate the Complete response of the system using Laplace Transform  ; with initial conditions  ; and | CO4 | E | 6 |
|  |  |  |  |  |  |
| 22. | a. | State Sampling Theorem and explain aliasing with a neat diagram. | CO4 | U | 6 |
|  | b. | Determine the Fourier Series Coefficients of the signal  . Plot the magnitude and phase spectrum, | CO5 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Determine the Fourier Transform of ,|a|<1 | 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 |
|  | | | | | |
| 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 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Analyze different types of signals for mathematical modelling. |
| 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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | - | 22 | 6 | - | - | 29 |
| CO2 | 1 | 1 | 6 | 9 | - | - | 17 |
| CO3 | 2 | 3 | 6 | - | 6 | - | 17 |
| CO4 | 1 | 7 | 3 | 6 | 6 | - | 23 |
| CO5 | - | 1 | 15 | - | 6 | - | 22 |
| CO6 | - | 4 | 6 | 6 | - | - | 16 |
|  | | | | | | | **124** |

**­­­**



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2004** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER ARCHITECTURE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define Computer Architecture. | | CO1 | U | 1 |
| 2. | What are the components of a computer system? | | CO1 | R | 1 |
| 3. | State the advantages of multiprocessor system. | | CO2 | An | 1 |
| 4. | List the various elements of instruction. | | CO2 | A | 1 |
| 5. | What are the instructions set available in MIPS architecture? | | CO3 | R | 1 |
| 6. | What is meant by address mapping? | | CO3 | An | 1 |
| 7. | Distinguish pipelining from parallelism. | | CO4 | U | 1 |
| 8. | Define memory interleaving. | | CO4 | A | 1 |
| 9. | What are the two I/O interfacing techniques? | | CO2 | A | 1 |
| 10. | What is a multicore microprocessor? | | CO3 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain various instruction formats and illustrate the same with an example. | | CO1 | R | 3 |
| 12. | Explain the different types of addressing modes with suitable examples. | | CO1 | U | 3 |
| 13. | Explain how the instruction pipeline works. | | CO2 | R | 3 |
| 14. | Explain in detail about the memory technologies. | | CO2 | An | 3 |
| 15. | Explain in detail about any two standard input and output interfaces required to connect the I/O device to the bus. | | CO3 | A | 3 |
| 16. | Explain in detail the operation of the data path and its control. | | CO3 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain in detail about Arithmetic Micro-operations. | CO1 | U | 6 |
|  | b. | Describe the Bus and Memory Transfers. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the Direct and Indirect addressing of basic computer. | CO2 | A | 6 |
|  | b. | Explain the Instruction cycle. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Justify how parallel processing improves the performance of multiprocessing environment. | CO3 | U | 6 |
|  | b. | Implement a simple pipeline unit for floating addition and subtraction. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the internal hardware architecture of 8086 microprocessor with neat diagram. | CO4 | R | 6 |
|  | b. | Explain the various addressing modes of 8086 microprocessor with examples. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 21. | a. | Draw the block diagram of 8279 and explain the function of each. | CO3 | A | 6 |
|  | b. | Draw and explain the interfacing of cascaded 8259 with 8086. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | What is DMA? Explain the DMA based data transfer using DMA controller. | CO4 | An | 6 |
|  | b. | Describe the functions of the following signals in 8051. RST, EA, PSEN and ALE. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 23. | a. | With neat sketch explain the function of Keyboard and display controller. | CO2 | U | 6 |
|  | b. | Explain the various status flags in 8086. | CO2 | U | 6 |
|  | | | | | |
| 24. | a. | Draw and explain the block diagram of minimum mode of operation. | CO4 | A | 6 |
|  | b. | Define the bus cycle and minimum mode read and write bus cycles with proper timing diagram. | CO4 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Illustrate the basics of computer organization. |
| CO2 | Outline the architecture of 8086 microprocessor. |
| CO3 | Implement micro operations and micro programming concepts. |
| CO4 | Formulate Memory hierarchy. |
| CO5 | Demonstrate the concepts of I/O devices. |
| CO6 | Outline the importance of pipelining. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 16 |  |  |  |  | 20 |
| CO2 | 3 | 12 | 14 | 4 |  |  | 33 |
| CO3 | 1 | 13 | 15 | 4 |  |  | 33 |
| CO4 | 12 | 1 | 1 | 24 |  |  | 38 |
| CO5 | - | - | - | - | - | - | - |
| CO6 | - | - | - | - | - | - | - |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2005** | **Duration** | **3hrs** |
| **Course Name** | **IOT FOR COMMUNICATION ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define CoAP. | | CO1 | R | 1 |
| 2. | State the Electrical Output Characteristics in terms of selecting a  Transducer. | | CO2 | R | 1 |
| 3. | Identify the given communication pattern. | | CO1 | R | 1 |
| 4. | Define Ad-Hoc networks. | | CO3 | R | 1 |
| 5. | Interpret the functions of UMB core in an IoT system. | | CO3 | U | 1 |
| 6. | State your perception about Match board profiler. | | CO4 | R | 1 |
| 7. | List the architecure of Fog Computing. | | CO5 | R | 1 |
| 8. | Define IAAS. | | CO5 | R | 1 |
| 9. | Describe Flash Crowd IoT attack. | | CO4 | R | 1 |
| 10. | List the IOT network components. | | CO1 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain any two Core IoT technologies. | | CO1 | U | 3 |
| 12. | Distinguish between M2M and IoT. | | CO1 | U | 3 |
| 13. | Explain Fragmentation and Reassembly. | | CO2 | U | 3 |
| 14. | Define Filtering in the case of Signal Conditioning. | | CO2 | R | 3 |
| 15. | Differentiate between Selfish and Malicious nodal behaviors. | | CO3 | U | 3 |
| 16. | Differentiate between Data Lost and Data Leakage IoT attack. | | 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 IPv4 classes & ranges and also differentiate between IPv4 and IPv6. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the following in detail:  1. ZigBee  2. Bluetooth  3. LoRaWAN  4. 6LOWPAN | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the interoperability in terms of device identification,  syntactic, semantic solutions and UMB with necessary diagrams. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain the attacks that takes place in every phase of an IoT system in  detail with necessary diagrams. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the attacks as per architecture in an IOT system and illustrate with a block diagram. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain Fog Computing and differentiate between Fog and Edge computing. | CO5 | U | 6 |
|  | b. | Explain IDS in detail and illustrate the types with a neat block diagram. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the following in detail:  1. NAAS.  2. PAAS.  3. IAAS.  4. SAAS.  5. Public Cloud.  6. Private Cloud. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain in detail the Home Automation and illustrate the working of it with the help of a block diagram. | CO6 | A | 6 |
|  | b. | Explain in detail the Smart Parking and illustrate the working with the help of a block diagram. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamental concepts of IoT, architecture and communication pattern. |
| CO2 | Analyse the various sensors/actuators and the various IoT protocols. |
| CO3 | Analyse WSN architecture, node behaviour and interoperability issues. |
| CO4 | Analyse the various network security issues and its prevention. |
| CO5 | Apply their understanding and to apply the IoT principles in real time applications. |
| CO6 | Examine various real time applications and case studies. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 3 | 18 | - | - | - | - | 21 |
| CO2 | 4 | 15 | - | - | - | - | 19 |
| CO3 | 1 | 16 | 6 | - | - | - | 23 |
| CO4 | 2 | 3 | - | 24 | - | - | 29 |
| CO5 | 2 | 18 | - | - | - | - | 20 |
| CO6 | - | - | 12 | - | - | - | 12 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2008** | **Duration** | **3hrs** |
| **Course Name** | **5G COMMUNICATIONS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the regulatory body that provided the requirements for a 5G mobile communications air interface. | | CO1 | R | 1 |
| 2. | Identify the 5G use case in which ‘latency’ requirement is below 1ms. | | CO1 | U | 1 |
| 3. | Report the technique used for channel estimation in TDD massive MIMO. | | CO2 | U | 1 |
| 4. | Represent the key performances achieved by using Phantom cell concept. | | CO2 | U | 1 |
| 5. | Identify the OSI layer that is primarily responsible for regulating access to the shared medium. | | CO3 | U | 1 |
| 6. | Report the multi-carrier technique in which a certain number of subcarriers can be grouped into sub-bands. | | CO3 | U | 1 |
| 7. | Indicate the frequency spectrum that is most suitable for mMTC applications. | | CO4 | U | 1 |
| 8. | Name the technology which offers scalable OFDM numerology. | | CO4 | R | 1 |
| 9. | Report a technique used to reduce interference caused toward adjacent cells in communication. | | CO5 | U | 1 |
| 10. | List the mMTC requirements for 5G. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the 5G key performance indicators. | | CO1 | R | 3 |
| 12. | Identify the different types of blockages in mm-Wave communication. | | CO2 | U | 3 |
| 13. | Compare mono-carrier and multi-carrier concepts in communication. | | CO3 | U | 3 |
| 14. | Recognize the subcarrier spacing for the Numerology-3. | | CO4 | R | 3 |
| 15. | Classify Coordinated Multi-Point (CoMP) techniques as 3GPP. | | CO5 | U | 3 |
| 16. | Describe a set of challenging characteristics in 5G modeling. | | 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. |  | Justify the statement “5G usage expands to include both human-centric and machine-centric communications” with five examples. | CO1 | E | 12 |
|  |  |  |  |  |  |
| 18. |  | Assess whether 5G is a complete replacement of LTE. Explain interms of dual connectivity and mobility. | CO2 | E | 12 |
|  |  |  |  |  |  |
| 19. | a. | Devise a multiple access technique that operates in the same band, at the same time but is distinguished by the power level. | CO3 | An | 6 |
|  | b. | With the necessary diagrams, explain the working principle of orthogonal frequency division multiplexing. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Deduce the higher-level procedures to generate radio channel realizations using a map-based model. Explain each step in detail. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Discuss on key enablers are required for Joint Transmission Coordinated Multi-Point (JT CoMP). | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Determine the following for the numerology n=1, channel bandwidth 100MHz, and guard bandwidth 845KHz.   1. Subcarrier spacing 2. Bandwidth of one resource block 3. Number of resource blocks. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Distinguish and explain the multi-carrier modulation techniques filter bank multicarrier (FBMC) and universal filtered multi-carrier (UFMC) with proper diagrams. | CO3 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the performance indicators to be used in the evaluation of the 5G system. | CO6 | U | 6 |
|  | b. | Describe the design principles, and technology components of massive machine-type communication. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Describe the key part of the evolution to 5G, requirements of 5G, building blocks of 5G and  5G spectrum. |
| CO2 | Explain the Millimeter Wave Communications and massive MIMO. |
| CO3 | Discuss the 5G Radio Access Technologies and Modulation Techniques. |
| CO4 | Outline the significance New Radio Air Interface and wireless propagation channel models |
| CO5 | Analyze the multi-point transmission and network coding in 5G. |
| CO6 | Acquire basic knowledge on 5G applications like Machine-type communications. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 1 | - | - | 12 | - | 17 |
| CO2 | - | 5 | - | - | 12 | - | 17 |
| CO3 | - | 11 | - | 18 | - | - | 29 |
| CO4 | 4 | 1 | 12 | 12 | - | - | 29 |
| CO5 | - | 16 | - | - | - | - | 16 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2009** | **Duration** | **3hrs** |
| **Course Name** | **ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | List the three parts of a biological neuron. | | CO1 | R | 1 |
| 2. | Draw a typical McCulloh-Pitts neuron model. | | CO1 | R | 1 |
| 3. | Why is learning essential in an artificial neural network? | | CO2 | U | 1 |
| 4. | Identify the number of weights which needs to be learned for an artificial neural network with 6 input layer neurons and 4 output layer neurons. | | CO2 | U | 1 |
| 5. | Infer what happens when the learning rate of perceptron is ‘0’. | | CO3 | U | 1 |
| 6. | Record the weight update equation of a back propagation algorithm. | | CO3 | R | 1 |
| 7. | Define loss function in training a feed forward neural network. | | CO4 | R | 1 |
| 8. | Indicate the significance of momentum based Gradient Descent over the conventional Gradient Descent. | | CO4 | U | 1 |
| 9. | After trianing a deep neural network, you observe a large gap between the training accuracy (100%) and the test accuracy (47%). Which common method can be adapted to reduce this gap? | | CO5 | U | 1 |
| 10. | Name any one use of autoencoders. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Paraphrase the applications of artificial neural network. | | CO1 | U | 3 |
| 12. | “Error cannot be estimated in unsupervised learning” – Justify this statement. | | CO2 | U | 3 |
| 13. | Appraise the limitations of perceptron. | | CO3 | An | 3 |
| 14. | Illustrate the temporal instability problem in a Back Propagation Network. | | CO3 | An | 3 |
| 15. | List the hyperparameters of a Deep Feed Forward Neural Network. | | CO5 | R | 3 |
| 16. | Calculate the convoluted feature indicated by “?” for the given input and 3x3 filter with a stride 1.  https://cdn.analyticsvidhya.com/wp-content/uploads/2017/06/19171440/Image33.jpg | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Describe how action potential is initiated and propagated in a biological neuron for coordinating reflex actions. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Sketch any four activation functions along with their mathematical representation used in single and multi-layer networks to calculate the output. | CO2 | R | 12 |
|  |  |  |  |  |  |
| 19. |  | Compute the output of the neuron Y for the perceptron shown in the figure using activation function as binary sigmoidal and bipolar sigmoidal. Use a suitable threshold for approximation. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss the Back Propagation algorithm for a Feed Forward Neural Network consisting of one input layer, one hidden layer and an output layer. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Summarize on Gradient Descent learning method used in Deep Feed Forward Neural Network. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Compare the salient features of an artificial neural network and a biological neural network | CO1 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain the Hopfield neural network in detail with neat architecture and training algorithm. | CO2 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Construct a Convolutional Neural Network to solve a 10-class classification problem and explain its operation. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 15 |  | 12 |  |  | 29 |
| CO2 | 12 | 17 |  |  |  |  | 29 |
| CO3 | 1 | 13 |  | 6 |  |  | 20 |
| CO4 | 1 | 1 | 12 |  |  |  | 14 |
| CO5 | 3 | 13 |  |  |  |  | 16 |
| CO6 | 1 |  | 15 |  |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2014** | **Duration** | **3hrs** |
| **Course Name** | **BASIC ELECTRONICS FOR AEROSPACE ENGINEERS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify the color codes for 270Ω. | | CO1 | A | 1 |
| 2. | List any two Non - Conventional energy sources. | | CO1 | R | 1 |
| 3. | Outline the need of star rating in electrical appliances. | | CO2 | U | 1 |
| 4. | Name the motor that is self-starting. | | CO2 | R | 1 |
| 5. | Sketch the energy band diagram of a semiconductor. | | CO3 | R | 1 |
| 6. | Which diode is used in the reverse breakdown voltage? | | CO3 | R | 1 |
| 7. | Illustrate the symbol and truth table of Ex-OR gate. | | CO4 | U | 1 |
| 8. | Infer the gate which produces high output only when both the inputs are high. | | CO4 | U | 1 |
| 9. | Interpret the role of sensors. | | CO5 | U | 1 |
| 10. | Recall the concept of Handoff. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate the function of a transformer. | | CO1 | U | 3 |
| 12. | Analyze the DC series motor’s characteristics. | | CO2 | An | 3 |
| 13. | Discuss the construction of a PN junction diode. | | CO3 | C | 3 |
| 14. | Compare combinational and sequential circuits. | | CO4 | E | 3 |
| 15. | What are the devices used for pressure measurement in aircraft? | | CO5 | R | 3 |
| 16. | Outline the general block diagram of communication 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. | a. | Classify the various types of resistors with its color-coding Schemes. | CO1 | An | 8 |
|  | b. | Discuss Unmanned Arial Vehicles. | CO1 | C | 4 |
| 18. | a. | Elaborate on electric cars and the factors involved in manufacturing them. | CO2 | C | 6 |
|  | b. | Explain the working principle of a stepper motor and discuss its applications. | CO2 | U | 6 |
| 19. | a. | What is the principle of a Zener diode? Discuss its construction and its operation. | CO3 | C | 8 |
|  | b. | Explain the function generator and its applications. | CO3 | E | 4 |
| 20. |  | Interpret the operation of various logic gates with its symbol and truth table. | CO4 | U | 12 |
| 21. | a. | Examine the construction and working of an air speed indicator. | CO5 | An | 6 |
|  | b. | Appraise on the applications of sensors in aircraft. | CO5 | E | 6 |
| 22. |  | Discuss the working principle of PN junction diode rectifier | CO3 | C | 12 |
| 23. | a. | Draw the block diagram of a microcontroller and discuss its working. | CO4 | C | 8 |
|  | b. | Determine the salient features of an Arduino microcontroller. | CO4 | E | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Elaborate the concept of cellular mobile communication and the evolution of 1G, 2G, 3G, 4G and 5G. | CO6 | C | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 3 | 1 | 8 | - | 4 | 17 |
| CO2 | 1 | 7 | - | 3 | - | 6 | 17 |
| CO3 | 2 | - | - | - | 4 | 23 | 29 |
| CO4 | - | 14 | - | - | 7 | 8 | 29 |
| CO5 | 3 | 1 | - | 6 | 6 | - | 16 |
| CO6 | 1 | 3 | - | - | - | 12 | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC2018** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF PRINTED CIRCUIT AND ARDUINO BOARD DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write the significance of penstock. | | CO1 | R | 1 |
| 2. | Identify the type of turbine used in thermal power plant. | | CO1 | R | 1 |
| 3. | Classify passive electronic components. | | CO2 | U | 1 |
| 4. | State few applications of photo diode. | | CO2 | R | 1 |
| 5. | Sketch the symbol of NAND gate. | | CO3 | A | 1 |
| 6. | Sketch the block diagram of sequential circuit. | | CO3 | A | 1 |
| 7. | Which conducting foil is used to make the conducting layers of a PCB? | | CO4 | R | 1 |
| 8. | List the general rules of PCB design. | | CO4 | R | 1 |
| 9. | Define embedded systems. | | CO5 | R | 1 |
| 10. | List few characteristics of Internet of Things (IoT). | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Analyze the energy consumption and cost per month of a 60W lamp which operates continuously for 5 hours per day. Assume per unit cost is 5 rupees. | | CO1 | An | 3 |
| 12. | Describe the formation of N type semiconductor. | | CO2 | U | 3 |
| 13. | Compare digital and analog sensor. | | CO3 | U | 3 |
| 14. | State the importance of PCB development tools. | | CO4 | A | 3 |
| 15. | Interpret the function of address bus in a microcontroller. | | CO5 | A | 3 |
| 16. | Analyze the importance of touch sensor used in robotic arm. | | 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. | Explain the operation of hydroelectric power plant with a neat sketch. | CO1 | U | 8 |
|  | b. | Sketch the circuit connection of a 12V lamp with a relay. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate the structure of PN junction diode and explain its V-I characteristics. | CO2 | U | 8 |
|  | b. | Examine the characteristics of LED with relevant circuit diagram and characteristics. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 19. | a. | Sketch the block diagram of microcontroller and label its blocks. | CO3 | A | 6 |
|  | b. | Describe the function of Half adder with its logic diagram and truth table. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Discover the significance of multi Layered PCB and discuss its advantages. | CO4 | U | 6 |
|  | b. | Classify different types of IC packages and explain. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the architecture of Arduino board with a neat block diagram. | CO5 | U | 8 |
|  | b. | Summarize IDE and explain its software development process. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Explain the principle of a smart energy meter which calculates the monthly electricity bill. | CO1 | A | 8 |
|  | b. | Compare sensor and actuator. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 23. | a. | Interpret the function of various digital logic gates with its symbol and truth table. | CO3 | A | 8 |
|  | b. | Describe the evolution of microprocessors. | CO4 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Design a line follower vehicle using any microcontroller and illustrate its algorithm and block diagram. | CO6 | C | 8 |
|  | b. | List few applications of robotic arm in automobile industries. | CO6 | R | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 8 | 12 | 3 | - | - | 25 |
| CO2 | 1 | 16 | 4 | - | - | - | 21 |
| CO3 | - | 8 | 16 | - | - | - | 25 |
| CO4 | 2 | 16 | 3 | - | - | - | 21 |
| CO5 | 2 | 12 | 3 | - | - | - | 17 |
| CO6 | 4 | - | - | 3 | - | 8 | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC3002** | **Duration** | **3hrs** |
| **Course Name** | **LOW POWER VLSI DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain in detail the need for low power VLSIchips. | CO1 | U | 8 |
|  | b. | Describe the different sources of power dissipation. | CO1 | R | 8 |
|  |  |  |  |  |  |
| 2. | a. | Explain the power extraction methods in gate level simulation with necessary equations. | CO2 | U | 8 |
|  | b. | Explain the data correlation analysis in DSP system with necessary equations. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 3. | a. | Predict how the precomputation can be done in synchronous digital circuit. | CO3 | U | 8 |
|  | b. | Discuss in detail about the power reduction techniques used in clock network. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Justify the following statement with necessary equations, tables and explanation. The gray code counters are better than the binary code counters. | CO3 | E | 8 |
|  | b. | Describe the operation of a bus invert encoding system with necessary diagram. | CO3 | R | 8 |
|  |  |  |  |  |  |
| 5. | a. | Discuss in detail about the performance management scheme used in asynchronous processing unit. | CO4 | U | 8 |
|  | b. | Paraphrase the issues in designing the deep submicrometer device. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Justify how the multiple threshold voltages are useful in managing the power and performance of a VLSI chip. | CO4 | E | 8 |
|  | b. | Write a detailed note on power saving approaches of pipelining and parallel processing architectures. | CO5 | C | 8 |
|  |  |  |  |  |  |
| 7. | a. | Describe about the delay balancing approach in array multipliers. | CO5 | R | 8 |
|  | b. | Explain the operation of 4T and 6T SRAM cell with a necessary circuit diagram | CO5 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Explain in detail about the energy recovery circuit design. | CO6 | A | 20 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Compute the basic principles and need for low power VLSI chips. |
| CO2 | Summarize the various low power reduction techniques at circuit and logic level. |
| CO3 | Demonstrate the application of probabilistic power analysis in VLSI chip design. |
| CO4 | Design low power SRAM Architecture |
| CO5 | Compute the energy recovery concepts to design low power circuits |
| CO6 | Develop low power Latches and flip-flops. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 8 |  |  | 8 |  | 24 |
| CO2 | 8 | 8 |  |  |  |  | 16 |
| CO3 | 8 | 16 |  |  | 8 |  | 32 |
| CO4 |  | 16 |  |  | 8 |  | 24 |
| CO5 | 8 | 8 |  |  |  | 8 | 24 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **132** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20EC3003** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG VLSI DESIGN** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Illustrate BJT small signal equivalent model. | CO1 | An | 8 |
|  | b. | Distinguish Sah’s and Shichman-Hodges model with neat description and obtain the equivalent circuits for MOSFET in Ohmic and Saturation region. | CO1 | An | 8 |
|  |  |  |  |  |  |
| 2. | a. | Determine the size of M2 with minimum area so that V0=4.0V.Assume M1 is minimum size. Use process parameters of Table 1.Neglect λ effects and NMOS Process (with a feature size λ=1.5µ, so that Wmin= 3 µ and Lmin= 3µ).    **Table 1**  **Typical Process Parameter for 3µ NMOS and CMOS processes**   |  |  |  |  | | --- | --- | --- | --- | | **Parameter** | **n-channel** | **p-channel** | **units** | | K’ | 24 | 8 | µA/V2 | | VTOE | 0.75 | -0.75 | V | | VTOD | -3 | 3 | V | | Ƴ(CMOS) | 0.8 | 0.4 | V1/2 | | Ƴ(NMOS) | 0.4 | - | V1/2 | | Ф | 0.6 | 0.6 | V | | λ | 0.01 | 0.02 | V-1 | | CO1 | A | 8 |
|  | b. | Discuss in detail about dc BJT model and also elaborate the forward and reverse active regions of operation. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Determine the DNL (codes 011,100,101,110,111) for the 3-bit non-ideal DAC whose transfer function is shown below. | CO2 | A | 4 |
|  | b. | Examine the resistor emulation in parallel switched capacitor circuits. | CO3 | R | 12 |
|  |  |  |  |  |  |
| 4. | a. | Estimate the total charging and discharging time in dual slope ADC with neat diagrams and relevant expressions. | CO2 | E | 12 |
|  | b. | If the clock frequency of a Parallel switched capacitor circuit is 200kHz, show the value of the capacitor C that will emulate a 1.1MΩ resistor. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 5. | a. | Develop in detail about the Unity-Gain Sampler/Buffer in different operating modes. | CO3 | A | 8 |
|  | b. | Explain the basic concepts of non- inverting amplifier and find the overall output voltage. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Estimate the basic conditions of oscillator with neat diagrams and explain in detail about the ring oscillator with two pole feedback system, with signal inversion and three stage ring oscillator. | CO5 | E | 8 |
|  | b. | Analyze the basic concepts of current amplifier and examine the single ended output and differential input current amplifier. | CO4 | An | 8 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate in detail about the Class B power amplifier and derive the maximum collector efficiency with necessary expressions and circuit diagram. | CO4 | A | 8 |
|  | b. | Develop the four types of high-gain amplifiers with gain analysis and necessary diagrams. | CO4 | A | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Summarize in detail about the design and the tuning range of Voltage Controlled Oscillator. | CO5 | E | 10 |
|  | b. | Design the two stage open –loop comparator with all the design parameters. | CO6 | C | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 8 | 8 | 16 | - | - | 32 |
| CO2 | - | - | 4 | - | 12 | - | 16 |
| CO3 | 12 | 4 | 8 | - | - | - | 24 |
| CO4 | - | 8 | 16 | 8 | - | - | 32 |
| CO5 | - | - | - | - | 18 | - | 18 |
| CO6 | - | - | - | - | - | 10 | 10 |
|  | | | | | | | **132** |



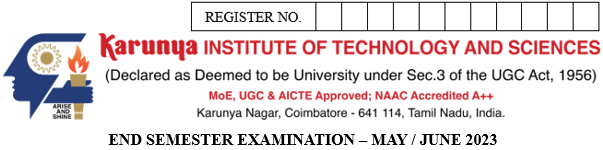
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC1001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONICS FOR EVERYDAY LIFE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Electronics. | | CO1 | R | 1 |
| 2. | Give two examples for communication sector in electronics industry. | | CO1 | U | 1 |
| 3. | Infer the different types of amplifiers. | | CO2 | U | 1 |
| 4. | Illustrate modulation. | | CO2 | R | 1 |
| 5. | Express the aspect ratio in televisions. | | CO3 | U | 1 |
| 6. | Indicate the reason for slanted video recording/playback head in a VCR. | | CO3 | U | 1 |
| 7. | Define handoff. | | CO4 | R | 1 |
| 8. | Recall the access technology used in 3G mobile communication. | | CO4 | R | 1 |
| 9. | List the types of washing machines. | | CO5 | R | 1 |
| 10. | Give examples for diagnostic equipment. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the working of electronics industry with block diagram. | | CO1 | U | 3 |
| 12. | Compare AM and FM modulations. | | CO2 | U | 3 |
| 13. | Differentiate between LCD and LED screens. | | CO3 | U | 3 |
| 14. | Indicate the elements of a Digital PBX. | | CO4 | U | 3 |
| 15. | Summarize the working of flatbed scanner. | | CO5 | U | 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. |  | Categorize the five major sectors of the electronics industry with examples. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain the construction and operation of capacitor microphones. | CO2 | U | 6 |
|  | b. | Distinguish between AM and FM radio systems. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. |  | Illustrate the working of a television transmitter with a neat block diagram. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss the cellular concept and access methods in mobile communication. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Describe the operation of microwave oven with its advantages and cookware specifications. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Examine the working of a barcode scanner and a flatbed scanner. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Discuss about ECG in detail. | CO6 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Report the two methods by which blood pressure can be measured. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

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



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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Infer your perception on algorithmic thinking. | | CO5 | U | 1 |
| 2. | List the correct sequence in problem solving. | | CO3 | R | 1 |
| 3. | Construct a C program to display the elements in an array. | | CO3 | A | 1 |
| 4. | Identify the **cause and effect** for the following based on the 'Cause - Effect relationship'.  “IF battery charge drops to 10%, THEN initiate a pop up warning message”. | | CO5 | A | 1 |
| 5. | Analyze the bugs and correct them.  #include<string.h>  int main()  {  int a, b;  a=10.5;  print(“A is” a);  } | | CO6 | An | 1 |
| 6. | Identify the category **(Sequencing/Selection/Iteration)**:  IF (timer <= 0) OR (numberOfLives == 0):  PRINT "Game Over". | | CO1 | U | 1 |
| 7. | Extend your perception on ‘single linked list’. | | CO2 | U | 1 |
| 8. | Relate FIFO with an example. | | CO2 | U | 1 |
| 9. | Infer on algorithm analysis. | | CO4 | U | 1 |
| 10. | Define a minimum spanning tree. | | CO4 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write the means - ends relationship with an example. | | CO1 | U | 3 |
| 12. | Compare Inductive reasoning and Deductive reasoning. | | CO1 | U | 3 |
| 13. | Write an algorithm to determine whether a Student has Passed the Exam or Not. | | CO2 | U | 3 |
| 14. | Examine the constituents of the algorithm. | | CO4 | A | 3 |
| 15. | Outline the significance of the state activity table. | | CO4 | U | 3 |
| 16. | Define 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. |  | Extend the concept of problem solving and explain the below strategies in detail:   * Problem Definition * Logical Reasoning * Decomposition | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Construct an algorithm for building the below flowchart of a non functioning lamp and write a C program for the same. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 19. | a. | Explain the concept of abstraction with a simple case diagram. | CO1 | U | 6 |
|  | b. | Infer on the ‘problem tree’ and ‘objective tree’ with suitable examples. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Construct a C code to create a linked list and to add a node to the list.node. Also, explain the types of linked list in detail. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Apply Kruskal’s algorithm to find the minimum spanning tree for the following graph. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain any sorting algorithm with an example. | CO1 | U | 6 |
|  | b. | Explain Linear Search algorithm with a C program. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Construct a C programme to retrieve the personal data, such as the name, registration number, marks from the user on five subjects for ten students, along with the overall percentage.Adopt the concept of functions. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe the idea of modularity and then use it to create a C programme to carry out arithmetic operations. | CO3 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 25 | 12 |  |  |  | 37 |
| CO2 |  | 14 |  |  |  |  | 14 |
| CO3 | 1 | 12 | 13 |  |  |  | 26 |
| CO4 |  | 5 | 15 |  |  |  | 20 |
| CO5 |  | 1 | 13 |  |  |  | 14 |
| CO6 |  |  | 12 | 1 |  |  | 13 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC1004** | **Duration** | **3hrs** |
| **Course Name** | **PYTHON PROGRAMMING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Indicate which one translates the program one statement at a time? | | CO1 | U | 1 |
| 2. | Recall the output of print() statement. | | CO1 | R | 1 |
| 3. | Write a program to display the type of the data, c = 1+3j. | | CO2 | A | 1 |
| 4. | Write a program to print *End Sem Exam* in multiline. | | CO2 | A | 1 |
| 5. | Cite an example for *short hand if* statement. | | CO2 | U | 1 |
| 6. | Identify what library is math in Python. | | CO3 | U | 1 |
| 7. | Recall the keyword used to create anonymous functions. | | CO4 | R | 1 |
| 8. | Mention the use of *docstring.* | | CO4 | R | 1 |
| 9. | Write a statement to rename a Python module. | | CO5 | A | 1 |
| 10. | Show the syntax to create an object. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Recall any three features of Python. | | CO1 | R | 3 |
| 12. | Write suitable program for the following: creating a set, adding & removing an element in a set. | | CO2 | A | 3 |
| 13. | Show the output of the following: print(math.pi), print(-math.inf), print(math.nan). | | CO3 | U | 3 |
| 14. | Write a recursive function to find factorial of a number. | | CO4 | A | 3 |
| 15. | Criticize the blocks for exception error handling. | | CO5 | An | 3 |
| 16. | Indicate the advantage of OOP over procedural programming in Python. | | 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 iteration strategy for developing algorithms. | CO1 | U | 4 |
|  | b. | Chart the algorithm to find the smallest number in the list by means of comparing elements. | CO1 | A | 8 |
| 18. | a. | Write a program in Python to find an element in an array using linear search. | CO2 | A | 4 |
|  | b. | Describe the following forms of control in Python: sequence, iteration and selection. | CO1 | U | 8 |
| 19. | a. | Discuss the output of following functions: math.ceil(x), math.trunc(x), math.cbrt(x) and math.exp2(x). | CO3 | U | 4 |
|  | b. | Write a program in Python to show the use of following string manipulation functions: count( ), find( ), index( ), join( ). | CO2 | A | 8 |
| 20. | a. | Write a program in Python to illustrate the following properties of higher order functions: functions as object, function can return another function. | CO4 | A | 8 |
|  | b. | Determine the output of the functions get( ) and pop( ) on the dictionary d = {1: '001', 2: '010', 3: '011'}: | CO4 | A | 4 |
| 21. | a. | Select suitable Python built-in module to write a code to print the following: factorial of 4, cos 0º, random integer between 0 and 10, choosing a random element in List = [1,4,True, 800, "Python", 27, "hello"] and current year, month and day. | CO5 | U | 8 |
|  | b. | Write a Python code to show the use of string module class, template. | CO5 | A | 4 |
| 22. | a. | Identify the output of the following: x%=3, x|=3, x\*\*3, x//3 and x!=3, where x = 5. | CO2 | U | 5 |
|  | b. | Write the Python program to perform the following on the string s = “Radar Level” : reverse the string, print 4th character, avoid space, location of Level and split string. | CO2 | A | 7 |
| 23. | a. | Justify that class is an example of encapsulation. | CO6 | E | 4 |
|  | b. | Write a Python program to show various ways to read and write data in a file. | CO6 | A | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Illustrate the following operators with suitable Python program: logical, membership and identity. | CO2 | A | 9 |
|  | b. | Criticize the output and precedence of operators in the statement  x = 7+3\*\*2+4\*2. | CO1 | An | 3 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 13 | 8 | 3 | - | - | 28 |
| CO2 | - | 6 | 33 | - | - | - | 39 |
| CO3 | - | 8 | - | - | - | - | 8 |
| CO4 | 2 | - | 15 | - | - | - | 17 |
| CO5 | - | 8 | 5 | 3 | - | - | 16 |
| CO6 | - | 4 | 8 | - | 4 | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC1006** | **Duration** | **3hrs** |
| **Course Name** | **INTRODUCTION TO COMPUTER ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Recall the architecture in which the data and the program code share the same memory space. | | CO1 | R | 1 |
| 2. | Name the flag which indicates the borrow status in arithmetic operation. | | CO1 | R | 1 |
| 3. | Identify the unit in CPU which provides signals for the execution of series of micro-operations in sequence. | | CO2 | R | 1 |
| 4. | State the significance of opcode in the machine instruction. | | CO2 | R | 1 |
| 5. | Show number of bytes occupied by the instruction LDA 2500H. | | CO3 | U | 1 |
| 6. | Recall the register which holds the result of arithmetic or logical operation. | | CO3 | R | 1 |
| 7. | Recall the technique by which the DMA controller steals the access cycles of the processor to do IO transfer. | | CO4 | R | 1 |
| 8. | Name the IO devices connected to CPU. | | CO4 | R | 1 |
| 9. | State the method where execution of several activities happen at the same time. | | CO5 | R | 1 |
| 10. | Identify the memory device which is volatile. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Summarize on system bus and it types used in transfer of information. | | CO1 | U | 3 |
| 12. | List down the disadvantages of hardwired control unit. | | CO2 | R | 3 |
| 13. | Show the places where operands will be available in a machine instruction. | | CO3 | U | 3 |
| 14. | Indicate how pipelining improve performance of instruction execution. | | CO4 | U | 3 |
| 15. | Distinguish between Multi-Core system and Multi-CPU system | | CO5 | An | 3 |
| 16. | Restate the importance of cache memory. | | 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 and infer the status and control flag registers used in computer architecture. | CO1 | A | 12 |
| 18. |  | Summarize on fetch phase and examine the registers and the micro-operations involved in the fetch phase of instruction cycle. | CO3 | U | 12 |
| 19. | a. | Infer machine instruction and sketch the instruction format. | CO1 | U | 3 |
|  | b. | Describe the basic addressing modes and give one suitable example instruction to each category. | CO1 | U | 9 |
| 20. | a. | List the reason why one does not connect peripherals directly to the system bus. | CO4 | R | 4 |
|  | b. | Illustrate the structure of the I/O module and explain the sequence of steps for peripheral data exchange. | CO4 | U | 8 |
| 21. |  | Explain with diagrammatic illustration Flynn’s classification. | CO4 | An | 12 |
| 22. |  | Describe the operations of an interrupt driven IO and different techniques to solve the design issues in implementing. | CO4 | U | 12 |
| 23. |  | Represent the structure and functions of an IO module with a block diagram. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the memory technologies used in memory hierarchies and give your inferences. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 15 | 12 |  |  |  | 29 |
| CO2 | 5 |  |  |  |  |  | 5 |
| CO3 | 1 | 16 |  |  |  |  | 17 |
| CO4 | 6 | 23 |  | 12 |  |  | 41 |
| CO5 | 1 | 12 |  | 3 |  |  | 16 |
| CO6 |  | 16 |  |  |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC1007** | **Duration** | **3hrs** |
| **Course Name** | **SOFTWARE ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write the IEEE definition of software engineering. | | CO1 | R | 1 |
| 2. | List out the goals of software engineering | | CO1 | R | 1 |
| 3. | Summarize the human factors considered for an agile software development. | | CO2 | U | 1 |
| 4. | Is it possible to realize Win-Win spiral model for software? | | CO2 | An | 1 |
| 5. | Name any two requirements of elicitation techniques. | | CO3 | R | 1 |
| 6. | Distinguish between the term inception and elicitation. | | CO3 | U | 1 |
| 7. | What are the characteristics of good tester? | | CO6 | U | 1 |
| 8. | What is integration testing? | | CO6 | U | 1 |
| 9. | How black box testing is differing from white box testing? | | CO6 | U | 1 |
| 10. | Define debugging and What are the common approaches in debugging. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write short notes on aspect oriented software development. | | CO1 | U | 3 |
| 12. | Compare the life cycle models based on their distinguishing factors. | | CO2 | An | 3 |
| 13. | With suitable example explain the functional and non-functional requirements. | | CO3 | U | 3 |
| 14. | What are the different types of architectural styles exist for software? | | CO4 | R | 3 |
| 15. | State the importance of Software requirements documentation. | | CO5 | R | 3 |
| 16. | Explain Integration & debugging activities? | | 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. | Generalize about system engineering hierarchy with suitable diagram and give an overview of the Business process ngineering with a diagram. | CO1 | U | 10 |
|  | b. | Explain all COCOMO models. | CO2 | U | 2 |
|  |  |  |  |  |  |
| 18. | a. | Elaborate on the series of tasks of a software configuration management process. | CO5 | U | 8 |
|  | b. | What are the principles of agile methods? | CO2 | R | 4 |
| 19. | a. | Explain the following: (i) RAD model (ii) Prototyping model. | CO3 | U | 6 |
|  | b. | Write note on business process engineering and product engineering? | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Describe in detail about Extreme programming. | CO2 | An | 4 |
|  | b. | Explain the execution of seven distinct functions accomplished in requirement engineering process with an example. | CO3 | An | 8 |
|  |  |  |  |  |  |
| 21. | a. | Analyze your understanding on the following design models (i) Data design elements and Architectural design elements. (ii) Interface design elements and Component-level design elements. | CO2 | An | 8 |
|  | b. | Classify the metrics for specifying non-functional requirements. | CO3 | A | 4 |
|  |  |  |  |  |  |
| 22. | a. | Summarize mapping. In case of user interface analysis, assess the steps that are taken for understanding the problems. | CO3 | E | 4 |
|  | b. | (i) Classify the different types of checks carried out on the requirements in the requirements document during the validation process.  (ii) Demonstrate on the requirement validation techniques. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 23. | a. | Explain software implementation techniques and explain control flow testing. | CO6 | E | 5 |
|  | b. | (i) An application has the following: 10 low external inputs, 8 high external outputs, 13 low internal logical files, 17 high external interface files, 11 average external inquires and complexity adjustment factor of 1.10.Formulate the unadjusted and adjusted function point counts?  (ii) Discuss Putnam resources allocation model. Develop the time and effort equations. | CO3 | C | 7 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | i) What is feasibility study? How it helps in requirement engineering process. ii) How will you classify the requirement types of a project, give example? | CO4 | C | 8 |
|  | b. | Assess on software requirement specification for banking system. | CO4 | E | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 13 |  |  |  |  | 15 |
| CO2 | 4 | 3 |  | 16 |  |  | 23 |
| CO3 | 1 | 16 | 12 | 8 | 4 | 7 | 48 |
| CO4 | 3 |  |  |  | 4 | 8 | 15 |
| CO5 | 3 | 8 |  |  | 5 |  | 16 |
| CO6 | 3 | 4 |  |  |  |  | 7 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2001** | **Duration** | **3hrs** |
| **Course Name** | **OBJECT ORIENTED PROGRAMMING IN C++** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List the characteristics of Object Oriented Programming. | | CO2 | R | 1 |
| 2. | Define Data abstraction. | | CO2 | R | 1 |
| 3. | Estimate the output in the below source code:  #include <iostream>  using namespace std;  int main()  {  struct {  int a;  char b;  }str;  str.a = 999;  str.b = 65;  cout<<str.a+ str.b<<endl;  return 0;  } | | CO1 | U | 1 |
| 4. | Predict the error in the below source code:  #include <iostream>  using namespace std;  enum week {sun,mon,tues};  int main()  {  cout<<a+5;  return 0;  } | | CO1 | U | 1 |
| 5. | Recall the syntax of creating a class in C++. | | CO2 | R | 1 |
| 6. | Identify the procedure to read multiple lines in C++. | | CO1 | R | 1 |
| 7. | Examine the below code and find its output:  #include <iostream>  using namespace std;  int main()  {  int a[5] = {1,2,3,4};  cout<<a[4];  return 0;  } | | CO1 | R | 1 |
| 8. | Recall the significance of reusability concept in inheritance. | | CO4 | R | 1 |
| 9. | List the dynamic memory management operators in C++. | | CO5 | R | 1 |
| 10. | Identify the base class in stream hierarchy. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Construct a C++ program to print the below pattern using ‘for’ loop.  \*  \* \*  \* \* \*  \* \* \* \* | | CO1 | A | 3 |
| 12. | Infer the error in the following program:  #include <iostream>  using namespace std;  int main()  {  int i = 0;  i = i + 1;  cout , i << " ";  cout << i;  return 0;  } | | CO1 | An | 3 |
| 13. | Summarize the characteristics of constructors. | | CO2 | U | 3 |
| 14. | Describe the procedure to access a base class function through a derived class when the base class variable is protected. | | CO4 | U | 3 |
| 15. | Explain the concept of friend function with an example. | | CO5 | A | 3 |
| 16. | Interpret on the usage of file pointers. | | 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. | Develop C++ example programs for the below operators in C++:  Arithmetic Operators,  Logical operators  Relational Operators | CO1 | A | 9 |
|  | b. | Explain the features of Object Oriented Programming concepts. | CO2 | An | 3 |
|  |  |  |  |  |  |
| 18. |  | Construct an arithmetic calculator using switch-case statement. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Apply the concept of structures within structures in a C++ example program. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Construct a C++ code to print the below pattern using overloaded functions with different number of arguments. Also, explain about inline functions.  ++++++++++++++  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  ==============  ++++++++++++++ | CO3 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the concept of constructors. Relate it with a C++ program to add two numbers. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain unary operator overloading with an example program. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain about the memory management operators using a C++ program. | CO5 | An | 6 |
|  | b. | Relate the concept of virtual member function assessed with pointers with an example program. | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Construct a C++ program for maintaining employee database using the concept of function overriding in inheritance. | CO4 | A | 8 |
|  | b. | Examine this pointer with an example program. | CO6 | R | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 | 2 | 24 | 15 | - | - | 43 |
| CO2 | 3 | 15 | - | 3 | - | - | 21 |
| CO3 | - | - | 24 | - | - | - | 24 |
| CO4 | 1 | 3 | 8 | - | - | - | 12 |
| CO5 | 1 | 6 | 3 | 6 | - | - | 16 |
| CO6 | 5 |  | 3 | - | - | - | 8 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2003** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRONIC DEVICES AND CIRCUITS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name the charge carriers in a semiconductor. | | CO1 | R | 1 |
| 2 | Define fermi energy. | | CO1 | R | 1 |
| 3. | Name the transistor configuration that provides unity voltage gain. | | CO2 | R | 1 |
| 4. | State the importance of Zener diode. | | CO3 | R | 1 |
| 5. | Show the symbol of TRIAC. | | CO3 | U | 1 |
| 6. | Identify the other name for tunnel diode. | | CO3 | R | 1 |
| 7. | Define operating point. | | CO4 | R | 1 |
| 8. | Express the relation between collector current and base current | | CO5 | U | 1 |
| 9. | Classify the power amplifiers based on the operating cycle. | | CO5 | U | 1 |
| 10. | Differentiate positive and negative feedback amplifier. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Sketch the energy band diagram of conductor, semiconductor and insulator. | | CO1 | A | 3 |
| 12. | Illustrate the working of positive series clipper with necessary waveforms. | | CO2 | U | 3 |
| 13. | Relate the applied reverse voltage and capacitance of varactor diode. | | CO3 | U | 3 |
| 14. | Calculate IB and IC for a silicon BJT operating under fixed bias configuration, RB = 240kΩ, RC = 2.2 kΩ, VCC = 12V, β = 50. | | CO4 | A | 3 |
| 15. | Recall the purpose of using bypass capacitor in an amplifier circuit. | | CO5 | R | 3 |
| 16. | State Barkhausen criterion for oscillation. | | 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 continuity equation for holes in an elemental semiconductor as a function of time and distance by analyzing the conservation of charge in a semiconductor. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain the operation of PN junction diode and analyse its characteristics with neat diagram. | CO2 | An | 8 |
|  | b. | Compare the transistor configurations of CB, CC and CE. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. |  | Summarize the construction and operation of Silicon Controlled Rectifier with its transistor equivalent circuit. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the operation of center tapped full wave rectifier with neat  circuit diagram and derive its efficiency and ripple factor. | CO4 | U | 8 |
|  | b. | Describe the working of shunt voltage regulator with a neat circuit. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 21. |  | Explain the working principle of Class B amplifier and derive the collector efficiency. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain in detail about methods of generation and recombination of charge carriers in semiconductors. | CO1 | A | 8 |
|  | b. | Discuss in detail about Schottky barrier diode and its applications. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 23. |  | Discuss the operation and frequency response of RC coupled amplifier with neat circuit diagram. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Construct the voltage series feedback amplifier and derive its gain with feedback, input impedance and output impedance. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 2 |  | 23 |  |  |  | 25 |
| CO2 | 1 | 7 |  | 8 |  |  | 16 |
| CO3 | 2 | 20 |  |  |  |  | 22 |
| CO4 | 1 | 12 | 3 |  |  |  | 16 |
| CO5 | 3 | 14 |  | 12 |  |  | 29 |
| CO6 | 3 | 1 | 12 |  |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2005** | **Duration** | **3hrs** |
| **Course Name** | **OPERATING SYSTEMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Interpret the privileged instructions in operating system. | | CO1 | U | 1 |
| 2. | List any two advantages of multi-processor system. | | CO1 | R | 1 |
| 3. | Define the term context switching. | | CO2 | R | 1 |
| 4. | Justify why the system has to maintain the balance between I/O bound and CPU bound processes. | | CO2 | An | 1 |
| 5. | Summarize the functions of dispatcher module in operating system. | | CO3 | U | 1 |
| 6. | Define turn-around time in process scheduling algorithms. | | CO3 | R | 1 |
| 7. | Recall any two types of semaphores used in process synchronization. | | CO4 | U | 1 |
| 8. | Define starvation. | | CO4 | R | 1 |
| 9. | Define dynamic linking. | | CO5 | R | 1 |
| 10. | Compare seek time and latency time in hard disk drive. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Compare interrupt and trap in the processor. | | CO1 | An | 3 |
| 12. | List any three major activities of an operating system in process management. | | CO2 | R | 3 |
| 13. | Differentiate preemptive and non-preemptive scheduling. | | CO3 | An | 3 |
| 14. | List down the conditions to avoid deadlock in system. | | CO4 | R | 3 |
| 15. | Explain swapping in memory management. | | CO5 | An | 3 |
| 16. | Determine the most common schemes for defining the logical structure of a directory. | | 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 operating system services that provide functions helpful to the user and ensures efficient operation of the system. | CO1 | U | 12 |
| 18. |  | Explain the two types of inter process communications with all possible examples. | 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: Priority (a larger priority number implies a higher priority), and Round Robin (quantum = 4). Determine the turnaround 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. |  | Discuss the rate monotonic and earliest deadline first scheduling algorithm with relevant process table and Gantt chart. | CO3 | U | 12 |
| 21. |  | Explain the use of Banker’s Algorithm for deadlock avoidance with an example. | CO4 | An | 12 |
| 22. |  | Illustrate the significance of resource allocation graph with an example. | CO4 | A | 12 |
| 23. |  | Paging is a memory management scheme. Sketch the Paging hardware diagram. Report the working procedure of paging hardware in detail. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain about file system mounting in detail. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

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



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2006** | **Duration** | **3hrs** |
| **Course Name** | **MATHEMATICS FOR SIGNAL ANALYSIS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **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. | Predict the number of samples at the output of a DTLTI system if the input has 3 samples and the impulse response of the system has 4 samples. | | CO2 | U | 1 |
| 4. | Define Linearity of a DTLTI system. | | CO2 | R | 1 |
| 5. | Recall the Time-Reversal property of Continuous-Time Fourier Series (CTFS). | | CO3 | R | 1 |
| 6. | Define the Fourier transform of if the Fourier Transform of x(t) is X(jω). | | CO3 | R | 1 |
| 7. | Identify the Nyquist rate for the signal x(t)=sin 500πt. | | CO4 | U | 1 |
| 8. | State any two properties of ROC of Laplace Transform. | | CO4 | R | 1 |
| 9. | Identify the DTFT of Unit Sample. | | CO5 | U | 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 if the given system is Linear or not. | | CO2 | An | 3 |
| 13. | Discuss the Dirichlet conditions for Fourier Series | | CO3 | U | 3 |
| 14. | Compute the Initial value . | | CO4 | A | 3 |
| 15. | Calculate the DTFT of . | | CO5 | A | 3 |
| 16. | Estimate the Z transform of | | 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. | Sketch the graphical representation of.  (i)  (ii)  (iii)  given | CO1 | A | 8 |
|  | b | Test if the given signal is periodic or not. If it is periodic, compute the Fundamental period. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 18. | a. | Test the properties of the system  a) Static or Dynamic  b) Linear or Non-linear  c) Time invariant or variant  d) 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 the Time scaling and Linearity Properties 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 system using Laplace Transform  ; with initial conditions  ; | CO4 | E | 6 |
|  |  |  |  |  |  |
| 23. | a. | Calculate the inverse Laplace Transform of  given ROC: | 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 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Analyze different types of matrices, signals for mathematical modelling. |
| 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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2007** | **Duration** | **3hrs** |
| **Course Name** | **DATA STRUCTURES AND ALGORITHMS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Specify the time complexity of the following algorithm in Big-Theta notation:  Algorithm fun(int m):  for (i = 1; i<=m; i++):  print(“Hello World”) | | CO1 | An | 1 |
| 2. | Arrange the given Big O notations in ascending order in terms of rate of growth.  O (log n),O (n),O (n log n),O (n\*n) | | CO1 | U | 1 |
| 3. | Consider a stack with four elements 25, 30, 45 and 70. Find the top element after performing two pop operations. | | CO3 | U | 1 |
| 4. | Convert the following infix expression ((R + D) ∗ Z) - d to its equivalent reverse polish notation. | | CO3 | R | 1 |
| 5. | Calculate the Bubble sort algorithm's average-case complexity. | | CO2 | R | 1 |
| 6. | Define binary search. | | CO2 | R | 1 |
| 7. | Articulate the terms Sibling, Degree with respect to trees. | | CO3 | R | 1 |
| 8. | Define weighted graph and explain about it with an example. | | CO3 | R | 1 |
| 9. | Consider a container having a capacity of 15 tons. There are seven items available to be transported. The weight of each item and the profit from transporting each is as given in the following table.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Objects | A | B | C | D | E | F | G | | Profit (P) | 5 | 10 | 15 | 7 | 8 | 9 | 4 | | Weight (w) - tons | 1 | 3 | 5 | 4 | 1 | 3 | 2 |   Any amount of each item can be loaded into the container to its fullest capacity. Suggest the objects to be transported to earn maximum profit. | | CO6 | E | 1 |
| 10. | Enumerate greedy method strategy | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Define Algorithm, Time Complexity and Space Complexity. | | CO1 | R | 3 |
| 12. | State differences between stack and queue | | CO3 | R | 3 |
| 13. | Explain merge sort with an example. | | CO2 | U | 3 |
| 14. | List the keys in the following binary tree in post-order traversal. | | CO3 | R | 3 |
| 15. | Using Prim’s Algorithm, find the cost of minimum spanning tree (MST) of the given graph.  Prim's Algorithm | | CO3 | A | 3 |
| 16. | Consider a set of given jobs as shown in the following table. Find the sequence of jobs, which will be completed within their deadlines and will give maximum profit. Each job is associated with a deadline and profit. | | 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. |  | Explain the time and space complexity of matrix multiplication algorithm with steps. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Demonstrate the insertion sort algorithm by sorting the following numbers in ascending order: 12, 11, 13, 5, 6. | CO2 | An | 6 |
|  | b. | Explain the merge sort algorithm by sorting the following numbers in ascending order: 23, 90, 45, 67, 35, 89, 54, 74. Write the algorithm for merge sort. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Describe the depth first search algorithm of the graph with an example. | CO3 | R | 6 |
|  | b. | Build a binary tree for the following sequence of numbers 50, 20, 60, 10, 8, 15, 32, 46, 11, 48, 100, 190, 2 ,21,79, 200 | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. |  | Consider the following linked list and create the pseudocode to do the following operations:     1. Insert a new node with the data =25 after the node with data = 82 of the linked list 2. Delete the node with data 55. 3. Insert a new node with data=85 at the end of the linked list 4. Insert a new node with data = 10 at the beginning of the linked list   Visualize the linked list after each operation. | CO4 | C | 12 |
|  |  |  |  |  |  |
| 21. | a. | Using Dijkstra’s Algorithm, find the shortest distance from source vertex ‘0’ to remaining vertices in the following graph.  Lightbox | CO6 | A | 6 |
|  | b. | Consider the undirected graph given. Construct a minimum spanning tree by applying Kruskal’s algorithm.  Start with a weighted graph | CO3 | C | 6 |
|  |  |  |  |  |  |
| 22. |  | List the operations of stack and explain it with example and pseudocode. | CO5 | R | 12 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the linked list representation of stack and queue with operations and pseudocode. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Consider a set of given 6 files with sizes. Solve the problem using all the solutions of 2 -way merge pattern and find the optimal solution.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **1** | **2** | **3** | **4** | **5** | **6** | | 5 | 10 | 20 | 6 | 10 | 14 | | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 3 | 13 | - | 1 | - | - | 17 |
| CO2 | 2 | 9 | - | 6 | - | - | 17 |
| CO3 | 15 | 13 | 9 | - | - | 6 | 43 |
| CO4 | - | - | - | - | - | 12 | 12 |
| CO5 | 12 | - | - | - | - | - | 12 |
| CO6 | 1 | 1 | 5 | - | 16 | - | 23 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2009** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF JAVA PROGRAMMING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Identify the looping structure if you have to work hard until you score above 90 marks. | | CO1 | R | 1 |
| 2. | Predict the output of the following sample code.  int i=3;  switch(i) {  case 1:  cout("Hello\n");  case 2:  cout("Hi\n");  case 3:  break;  default:  printf("Bye\n");  } | | CO1 | U | 1 |
| 3. | State the acronym of JDK and JRE. | | CO1 | R | 1 |
| 4. | Quote the keyword to access the base class members. | | CO2 | R | 1 |
| 5. | List any two functions used to compare whether the two strings are identical. | | CO3 | R | 1 |
| 6. | Name any two checked exceptions in Java. | | CO3 | R | 1 |
| 7. | Construct an interface to represent days of the week as data members. | | CO3 | A | 1 |
| 8. | Summarize the use of collections in Java. | | CO5 | U | 1 |
| 9. | Infer the listener triggered during a text entered in a text box. | | CO6 | U | 1 |
| 10. | Define layouts in Jswing. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write a program to print the sum of a single-dimension array using Java. | | CO1 | A | 3 |
| 12. | Demonstrate the use of break and continue statements. | | CO1 | A | 3 |
| 13. | List down the use of the final keyword. | | CO2 | R | 3 |
| 14. | Give examples of dynamic method dispatching in the hierarchical inheritance. | | CO3 | U | 3 |
| 15. | Illustrate the approaches used to synchronize the threads. | | CO4 | A | 3 |
| 16. | Construct a design to show the login page of a website. | | 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. | List down the features of Java with the necessary definition. | CO1 | R | 6 |
|  | b. | Construct three programs to demonstrate the looping structures supported by Java. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Develop a basic calculator using Java switch statement. | CO1 | A | 6 |
|  | b. | Illustrate the purpose of the relational and logical operator in Java. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Compare the need for method overloading and overriding with suitable examples. | CO2 | U | 6 |
|  | b. | Create a " Customer " class with name, age, and address as data members. Develop the member functions such as add\_customer, edit\_customer, and display\_customer. Demonstrate the above-mentioned class with five arrays of objects. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Demonstrate the five keywords of exception handling in Java. | CO3 | A | 6 |
|  | b. | Differentiate abstract classes and interfaces with necessary snippets. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain the two ways to create threads with sample Java code. | CO4 | A | 6 |
|  | b. | Describe the following concepts in terms of Java,   * Static members * This keyword * Finalize method | CO3 | R | 6 |
|  |  |  |  |  |  |
| 22. | a. | Enumerate any five stationary items with their price using the enum class. | CO4 | R | 4 |
|  | b. | Write a program to demonstrate the file handling operations as per the following.   * Write your subject registered for the semester details (Subject code, name, faculty chosen) in a file "Subject\_reg.txt." * Read and display the Subject details from that file into the console. | CO5 | A | 8 |
|  |  |  |  |  |  |
| 23. | a. | Develop a Java application to perform the following functionalities in ArrayList.   * Create an ArrayList to hold the product names of the data type String. * Add five different product names. * Print the first two product names. * Print the size of the ArrayList. * Remove a particular product from ArrayList. * Replace the existing element with a new element in the ArrayList. | CO5 | A | 6 |
|  | b. | Describe the significance of Generic Class with a suitable example program. | CO4 | R | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Construct a Java GUI to get the details of the Student, such as Name, Register\_no, Mail Id, Mobile Number, and Mentor Name using Swing components. Also, display the received content through a dialogue box. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of Object-Oriented design. |
| CO2 | Identify classes, abstract classes, objects, and members needed for the specific application. |
| CO3 | Create JAVA application programs using sound OOP practices. |
| CO4 | Develop programs using multitasking applications. |
| CO5 | Analyse real-time applications. |
| CO6 | Apply the skills for designing GUI-based applications. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom's Level** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 7 | 18 | - | - | - | 33 |
| CO2 | 4 | 6 | 6 | - | - | - | 16 |
| CO3 | 8 | 9 | 7 | - | - | - | 24 |
| CO4 | 10 | - | 9 | - | - | - | 19 |
| CO5 | 1 | - | 14 | - | - | - | 15 |
| CO6 | 1 | 1 | 15 | - | - | - | 17 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2010** | **Duration** | **3hrs** |
| **Course Name** | **LINEAR INTEGRATED CIRCUITS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Report a technique used in op-amp to compensate input bias currents. | | CO1 | A | 1 |
| 2. | Define thermal drift. | | CO1 | R | 1 |
| 3. | Illustrate an amplifier with a gain of ‘-5’ using one op-amp. | | CO2 | A | 1 |
| 4. | Indicate the device connected in the feedback path of the fundamental log-amplifier circuit. | | CO2 | U | 1 |
| 5. | Identify a multivibrator circuit that does not require any trigger pulse to change its state. | | CO3 | U | 1 |
| 6. | Recite the op-amp-based circuits used to generate a triangular wave. | | CO3 | R | 1 |
| 7. | Show one significant difference between active and passive filters. | | CO4 | U | 1 |
| 8. | State the characteristics of the notch filter. | | CO4 | R | 1 |
| 9. | Report the significance of the voltage-controlled oscillator in PLL. | | CO5 | U | 1 |
| 10. | List various types of direct-type analog-to-digital converters. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Calculate the maximum frequency for sine wave output voltage 10V peak to peak with an op-amp whose slew rate is 1V/μs. | | CO1 | A | 3 |
| 12. | In a Schmitt trigger circuit, the threshold voltages are given as VUT = 28mV and VLT = -28mV. Calculate the hysteresis width and plot the Schmitt trigger transfer characteristics. | | CO2 | A | 3 |
| 13. | Classify different types of oscillators according to the range of frequencies. | | CO3 | U | 3 |
| 14. | Sketch the frequency plot of high-pass and narrow band-pass filters. | | CO4 | A | 3 |
| 15. | Draw the block schematic of the phase-locked loop. | | CO5 | U | 3 |
| 16. | The basic voltage of a 3-bit DAC is 10.3V. If ‘000’ represents 0V, determine the output produced if the input is ‘101’. | | 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. |  | Sketch the block diagram of op-amp and explain the functions of each block. Also, illustrate the labeled pin diagram of IC 741 and provide its ideal characteristics. | CO1 | A | 12 |
| 18. | a. | Examine and explain the operation of the circuit shown below. Determine difference-mode (Ad) and common-mode (Ac) gains for the circuit given below. | CO2 | A | 6 |
|  | b. | Explain the application of op-amp as an integrator. | CO2 | A | 6 |
| 19. |  | Sketch neatly a mono-stable multivibrator circuit using op-amp. Explain the working of the circuit with necessary diagrams and show the time duration in which the multivibrator remains in a quasi-stable state. | CO3 | A | 12 |
| 20. |  | Design and analyze the frequency response of a first-order low-pass filter. Also, provide its overall transfer function. | CO4 | C | 12 |
| 21. | a. | Describe the pin diagram and functional block diagram of the 555 timer with neat diagrams. | CO5 | U | 8 |
|  | b. | Define i) capture range ii) lock in range in PLL | CO5 | U | 4 |
| 22. |  | With a neat circuit diagram, explain the working and draw the input, output waveforms of the non-inverting and inverting comparator. | CO2 | U | 12 |
| 23. |  | Report the limitations of three terminal IC voltage regulators. Discuss how the limitations are overcome using IC 723 and explain its functional block diagram. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain in detail the operational features of a 4-bit weighted resistor type DAC. Show how the disadvantage of weighted resistor type DAC is overcome in R-2R ladder DAC. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | - | 16 | - | - | - | 17 |
| CO2 | - | 13 | 16 | - | - | - | 29 |
| CO3 | 1 | 16 | 12 | - | - | - | 29 |
| CO4 | 1 | 1 | 3 | - | - | 12 | 17 |
| CO5 | - | 16 | - | - | - | - | 16 |
| CO6 | 1 | 12 | 3 | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2011** | **Duration** | **3hrs** |
| **Course Name** | **ANALOG ELECTRONICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the Isolation techniques used for IC fabrication. | | CO1 | R | 1 |
| 2. | Identify the basic chemical reaction used for thermal oxidation. | | CO1 | R | 1 |
| 3. | Predict the region of MOSFET acts as an amplifier. | | CO3 | U | 1 |
| 4. | Show the modified circuit symbols of NMOSFET. | | CO1 | R | 1 |
| 5. | Sketch the voltage transfer characteristics of EMOSFET. | | CO2 | A | 1 |
| 6. | Recall the operating regions of MOSFET. | | CO2 | R | 1 |
| 7. | Mention the stages involved in cascode amplifier. | | CO2 | R | 1 |
| 8. | Name the layer that isolates terminal gate from semiconductor. | | CO3 | R | 1 |
| 9. | Define Current Mirror. | | CO5 | R | 1 |
| 10. | List out the important characteristics of CMOS devices. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | List the steps that are involved in the fabrication of ICs. | | CO1 | R | 3 |
| 12. | Sketch the small signal model of MOSFET with necessary equations. | | CO2 | A | 3 |
| 13. | State the advantages of source-degeneration resistance in CS amplifier. | | CO3 | R | 3 |
| 14. | List out the applications of MOSFET amplifier. | | CO4 | R | 3 |
| 15. | Visualize Widlar current source circuit. | | CO5 | R | 3 |
| 16. | Compare between CMOS and Bipolar technologies. | | 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. |  | Illustrate the basic processes involved in fabricating monolithic Integrated circuits. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Discuss in detail about CMOS p-well process with neat diagram. | CO1 | U | 10 |
|  | b. | Identify the circuit symbol and truth table of CMOS Invertor. | CO1 | R | 2 |
|  |  |  |  |  |  |
| 19. |  | Explain device structure and physical operation and characteristics for an enhancement type NMOS transistor with diagram | CO2 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Describe the following MOS device models with necessary equations.  a)Large signal model b)Small signal model | CO2 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Determine the characteristic parameters and overall voltage gain of Common Gate amplifier with necessary equivalent circuit. | CO3 | A | 8 |
|  | b. | Summarize small signal voltage gain of transistor amplifier. | CO3 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Sketch the improved performance of cascode MOS current mirror circuit with neat diagram. | CO4 | A | 6 |
|  | b. | Describe the Wilson current mirror circuit and find the expression of output resistance. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the operation of MOS differential pair with common mode and differential mode input voltage. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss the following CMOS amplifier topology.  a) Common-source with resistive load  b) Common source with diode connected load. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of MOSFETs. |
| CO2 | Analyze the Transistor amplifier. |
| CO3 | Understand the configurations of MOSFET. |
| CO4 | Adopt different techniques in Cascode amplifiers. |
| CO5 | Demonstrate the current mirrors and Differential amplifiers. |
| CO6 | Apply the entire concepts to design CMOS amplifiers. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 10 | 12 | - | - | - | 30 |
| CO2 | 2 | 12 | 4 | 12 | - | - | 30 |
| CO3 | 4 | 5 | 8 | - | - | - | 17 |
| CO4 | 3 | - | 6 | - | - | - | 09 |
| CO5 | 4 | 6 | - | 12 | - | - | 22 |
| CO6 | 1 | 12 | - | 3 | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2015** | **Duration** | **3hrs** |
| **Course Name** | **WEB TECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Name the smallest header in HTML by default. | | CO1 | R | 1 |
| 2. | Define the use of<br> tag in HTML web page. | | CO1 | R | 1 |
| 3. | State the CSS Selector that selects the HTML element by **.** symbol. | | CO2 | R | 1 |
| 4. | Write the property in CSS which helps to add padding to the top of the element. | | CO2 | A | 1 |
| 5. | Illustrate the need of session tracking. | | CO3 | U | 1 |
| 6. | List out the information contained in cookies. | | CO3 | R | 1 |
| 7. | Recall the technology which helps to separate programming and presentation. | | CO4 | R | 1 |
| 8. | Describe the purpose of JavaBeans in JSP. | | CO4 | U | 1 |
| 9. | Define XPath. | | CO4 | R | 1 |
| 10. | Recall WSDL. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Describe the HTML code to display the following content in a web  page.  I. Ice cream  o Vanilla  II. Milkshake  o Chocolate | | CO1 | U | 3 |
| 12. | Write html code for the following design   |  |  | | --- | --- | | **Emp name** | **Emp ID** | | XXX | 01 | | YYY | 02 | | | CO1 | A | 3 |
| 13. | Implement JavaScript function with example. | | CO2 | U | 3 |
| 14. | List any three methods of servlet interface with its syntax. | | CO3 | R | 3 |
| 15. | Differentiate Client-side programming and server-side programming. | | CO3 | U | 3 |
| 16. | Describe how to use the callback function in AJAX. | | 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. |  | Demonstrate a HTML registration form as given below with all fields that are mandatory and include necessary attributes. Explain all the form elements with its syntax. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain the CSS Box model properties with suitable example programs. | CO2 | U | 6 |
|  | b. | Explain the purpose of on submit event with its example program. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Describe Session handling in depth and explain all the ways used for session handling? | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain JSP directives with its example in detail. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Explain the all XPATH nodes in detail. | CO4 | A | 7 |
|  | b. | Describe the XSLT transformation in detail. | CO4 | U | 5 |
|  |  |  |  |  |  |
| 22. | a. | Write the purpose of XML schema. | CO4 | A | 6 |
|  | b. | Explain JAX-RPC in detail. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Create a web page with JavaScript program to perform basic mathematic operations such as addition, subtraction, multiplication, and division for the two given numbers (input from user). | CO2 | C | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the working of web service and its types in detail. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design simple web pages using markup languages like HTML and XHTML. |
| CO2 | Create dynamic web pages using DHTML and java script that is easy to navigate and use. |
| CO3 | Program server side web pages that have to process request from client side web pages. |
| CO4 | Represent web data using XML and develop web pages using JSP. |
| CO5 | Understand various web services. |
| CO6 | Comprehend how these web services interact. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 3 | 15 | - | - | - | 20 |
| CO2 | 1 | 9 | 7 | - | - | 12 | 29 |
| CO3 | 4 | 16 | - | - | - | - | 20 |
| CO4 | 2 | 6 | 25 | - | - | - | 33 |
| CO5 | 1 | - | - | - | - | - | 1 |
| CO6 | - | 3 | 6 | 12 | - | - | 21 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2025** | **Duration** | **3hrs** |
| **Course Name** | **NEURAL NETWORKS AND DEEP LEARNING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the function of dendrites in biological neuron. | | CO1 | R | 1 |
| 2. | Name anyone architecture used in artificial neural networks and deep learning. | | CO1 | R | 1 |
| 3. | Summarize on weights in a neural network | | CO2 | U | 1 |
| 4. | Infer your understanding on the speed of learning in Boltzmann Machines. | | CO3 | U | 1 |
| 5. | Recall what occurs when the gradient become very small and moves towards zero. | | CO4 | R | 1 |
| 6. | Recall and mention the layers of Restricted Boltzmann Machine. | | CO2 | R | 1 |
| 7. | Trace what is synchronous updated in hopfield model. | | CO4 | U | 1 |
| 8. | Define average pooling. | | CO5 | R | 1 |
| 9. | What is early stopping? | | CO5 | R | 1 |
| 10. | Identify the learning framework in which an agent learns to make decisions by interacting with an environment. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Infer how Gradient Descent can optimize the performance of neural network model. | | CO1 | U | 3 |
| 12. | Record few applications of autoencoder. | | CO2 | R | 3 |
| 13. | Summarize on Boltzmann Machine. | | CO3 | U | 3 |
| 14. | “Recurrent Neural Networks are best suited for Text Processing” – Justify the statement. | | CO4 | An | 3 |
| 15. | List the hyperparameters of a basic convolutional neural network. | | CO5 | R | 3 |
| 16. | Generalize bootstrapping in Reinforcement Learning. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Explain in detail the backpropagation in training a neural network with one hidden layer. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss supervised learning and unsupervised learning with suitable examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Appraise on the layers of a Restricted Boltzmann Machine and give its advantages and disadvantages. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Categorize the elements of the LSTM architecture and brief on its operation. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Paraphrase on Recurrent Neural network and write short notes on the following.   1. Echo State Network. 2. Gated Recurrent Network. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Dramatize how signals are transferred through biological neuron for spiking reflex action. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Construct a Convolutional Neural Network for 2 class classification problem and discuss its layers and training method. | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Illustrate a reinforcement learning environment and explain its elements and principles of working. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of neural networks. |
| CO2 | Comprehend RBF network and its training. |
| CO3 | Understand the concepts of Restricted Boltzmann Machines. |
| CO4 | Apply recurrent neural networks. |
| CO5 | Understand the details of Convolution Neural network. |
| CO6 | Analysis the significance of Reinforcement learning. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 15 | 12 | 12 |  |  | 41 |
| CO2 | 3 | 1 |  |  |  |  | 5 |
| CO3 | 1 | 4 |  | 12 |  |  | 16 |
| CO4 | 1 | 13 |  | 15 |  |  | 29 |
| CO5 | 5 |  | 12 |  |  |  | 17 |
| CO6 | 1 | 3 | 12 |  |  |  | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2027** | **Duration** | **3hrs** |
| **Course Name** | **LINUX PROGRAMMING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Mention which software system convert instructions written in high level language to machine language to execute specific task. | | CO1 | U | 1 |
| 2. | Brief note on Linux File Systems. | | CO1 | R | 1 |
| 3. | State any two features of Command Line interface. | | CO2 | R | 1 |
| 4. | Construct a command for creating multiple directories. | | CO2 | A | 1 |
| 5. | Recall the command used to toggle from Command to Insert mode. | | CO3 | R | 1 |
| 6. | Predict the output for the following command : **“Head -n5<linux.txt>”.** | | CO4 | A | 1 |
| 7. | Quote any three commands that are used in filters. | | CO4 | R | 1 |
| 8. | List the types of shell based on interaction. | | CO5 | R | 1 |
| 9. | Recite the syntax for While command in script. | | CO5 | U | 1 |
| 10. | Define Pipe in Linux Programming. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Differentiate Bourne Shell with Bash. | | CO1 | U | 3 |
| 12. | Identify the type of permission given for different types of user -rwx – r\_ \_-rw\_ and write short notes for the same. | | CO2 | U | 3 |
| 13. | State the Commands that are used to move around the file in insert mode. | | CO3 | U | 3 |
| 14. | Apply the Command to perform the following:   1. Numerical sorting 2. Reverse sorting 3. ASCII sorting | | CO4 | A | 3 |
| 15. | Recall different types of logical Operators used in Scripting. | | CO5 | R | 3 |
| 16. | Discuss open and Close system calls in Linux programming. | | 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 Linux system Features. | CO1 | U | 6 |
|  | b. | Illustrate Hieracial arrangement of Linux File System. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. |  | Brief note for the following:   1. Three file Permission 2. Three types of users 3. Change permissions using Chmod Command | CO2 | R | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the different types of process and mention the steps kill the steps with signals | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Illustrate the commands used in vi editor to perform the following operations:  (i) To save and quit a file  (ii) To Quit without saving  (ii) To save a file. | CO3 | U | 6 |
|  | b. | Determine Linux commands for the given tasks :  File Content:  1 “unix is great os. unix is open source. unix is a free operating system.unix is easy to learn.unix is a multiuser os.  2 Learn unix.  3 unix is a powerufl”  Tasks:   1. Change the case for unix in line 1 2. Overwrite unix with linux in line 2 3. Transpose Powerufl with Powerful in line 3 | CO3 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Explain the following Filter commands with syntax and example for each:   1. Cut 2. Paste 3. Sort 4. Cat | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Recall Pipes in Filter and perform following operation:   1. Print and merge two files without header and footer. 2. Print line between M and N lines with head and tail. 3. Display less number of lines in file | CO4 | R | 9 |
|  | b. | Write short notes on Grep Command with three attributes and example for each. | CO4 | A | 3 |
|  |  |  |  |  |  |
| 23. |  | Write a shell script to print a number in reverse order. It should meet the following requirements.   1. Use nested while loop. 2. Loop should iterate for fixed number of times. 3. Display the output in the given format.   0  1 0  2 1 0  3 2 1 0  4 3 2 1 0 | CO5 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the kill process with C program to demonstrate the signal handling operation. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Documentation will demonstrate good organization and readability. |
| CO2 | File processing projects will require data organization, problem solving and research. |
| CO3 | Scripts and programs will demonstrate simple effective user interfaces. |
| CO4 | Scripts and programs will demonstrate effective use of structured programming. |
| CO5 | Scripts and programs will be accompanied by printed output demonstrating completion of a test plan. |
| CO6 | Testing will demonstrate both black and glass box testing strategies. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 10 | 6 | - | - | - | 17 |
| CO2 | 13 | 15 | 1 | - | - | - | 29 |
| CO3 | 1 | 9 | 6 | - | - | - | 16 |
| CO4 | 10 | 12 | 7 | - | - | - | 29 |
| CO5 | 4 | 1 | 12 | - | - | - | 17 |
| CO6 | 1 | 3 | 12 | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2028** | **Duration** | **3hrs** |
| **Course Name** | **DATA ANALYTICS & VISUALIZATION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define representative sample. | | CO1 | R | 1 |
| 2. | Give an example of an unsupervised machine learning algorithm. | | CO1 | U | 1 |
| 3. | Write the output of the following code:  a={‘a’: ”ant”, ‘b’: “ball”, ‘c’: “car”}  print(type(a)) | | CO2 | A | 1 |
| 4. | Name a python library package to handle data frame. | | CO2 | R | 1 |
| 5. | Indicate the importance of data science in e-commerce. | | CO3 | U | 1 |
| 6. | Distinguish between numerical and categorical data. | | CO3 | U | 1 |
| 7. | Give an example of a void function. | | CO4 | U | 1 |
| 8. | Identify the length of the given tuple t = (1,2,(3,4,5)). | | CO4 | U | 1 |
| 9. | Define time series data. | | CO5 | R | 1 |
| 10. | Define data-ink ratio. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Compare data scientist and data analyst roles. | | CO1 | U | 3 |
| 12. | List the different operators in R programming. | | CO2 | R | 3 |
| 13. | Write any 3 applications of data science in a real-world scenario. | | CO3 | A | 3 |
| 14. | Write the default function argument with an example. | | CO4 | A | 3 |
| 15. | State the importance of data visualization. | | CO5 | U | 3 |
| 16. | List the key goals in visual design process. | | 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 data preparation phase of data science lifecycle with suitable examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Classify the different types of SQL commands and interpret the commands with suitable examples. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Summarize the descriptive statistics with necessary examples. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain any six free data science tools for handling and visualizing the data. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Consider five datapoints belong to positive class, five datapoints belong to negative class and an outlier (negative data point present in the positive class). Apply logistic regression algorithm to find the best plane which separates the data points with high accuracy. Also derive the objective function of logistic regression which is not affected by the outliers. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Write python code to perform the following operations.  i) Create a dictionary ‘dict’ with 4 elements.  ii) Access the second element of the dictionary ‘dict’.  iii) Modify the value of the third element of the dictionary ‘dict’.  iv) Delete the last element of the dictionary ‘dict’. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Summarize the visual encoding variables with necessary illustrations. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss the importance of effective dashboard display media in detail. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design and create data visualizations. |
| CO2 | Conduct exploratory data analysis using visualization. |
| CO3 | Use knowledge of perception and cognition to evaluate visualization design alternatives. |
| CO4 | Design and evaluate color palettes for visualization based on principles of perception. |
| CO5 | Identify opportunities for application of data visualization theory and principles. |
| CO6 | Critique existing visualizations based on design information dashboard. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 16 | 12 | - | - | - | 29 |
| CO2 | 4 | 24 | 1 | - | - | - | 29 |
| CO3 | - | 2 | 15 | - | - | - | 17 |
| CO4 | - | 2 | 15 | - | - | - | 17 |
| CO5 | 1 | 15 | - | - | - | - | 16 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2032** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER VISION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define a pixel. | | CO1 | R | 1 |
| 2. | List the components of an image processing system. | | CO1 | R | 1 |
| 3. | Recall the formula to compute the city block distance. | | CO2 | R | 1 |
| 4. | Define the skeleton process. | | CO2 | R | 1 |
| 5. | Calculate the length for the given boundary. | | CO3 | A | 1 |
| 6. | Define area of a region. | | CO3 | R | 1 |
| 7. | Recall the energy equation to compute the average squared perpendicular distance. | | CO4 | R | 1 |
| 8. | Indicate the disadvantages of Hough Transform. | | CO4 | U | 1 |
| 9. | Define “stereopsis”. | | CO5 | R | 1 |
| 10. | Identify the projection that show more than one side of an object. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write the importance of histogram equalization. | | CO1 | R | 3 |
| 12. | Give an account on the object labelling using raster scan process. | | CO2 | U | 3 |
| 13. | Predict the order and shape number for the given boundary. | | CO3 | U | 3 |
| 14. | Write the circle detection process using Hough Transform. | | CO4 | U | 3 |
| 15. | Paraphrase the 3D translation process. | | CO5 | U | 3 |
| 16. | Outline the pedestrian location process in In-vehicle vision 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. | a. | Explain the smoothing filters in detail with necessary equations and diagrams. | CO1 | U | 6 |
|  | b. | Employ dilation operation on the following input image.    And the structuring element is as follows. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the relationship between pixels. | CO2 | U | 4 |
|  | b. | An image set is shown below. Let V be the set of gray level values used to define the connectivity in the image. Compute D4, D8 and Dm distances between pixels P and Q for V = (1,2). | CO2 | A | 8 |
|  |  |  |  |  |  |
| 19. |  | Develop the chain code for the given boundary of an object clockwise from the lower left pixel. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Employ Hough Transform and examine whether the points (1,4), (3, −2) and C (4, −5) are collinear. Also find the equation of the line on which these points lie. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Describe the different projection schemes in 3D vision in detail. | CO5 | U | 8 |
|  | b. | Summarize the photometric stereo process. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Explain the fundamental steps in digital image processing in detail. | CO1 | U | 8 |
|  | b. | Summarize the feature extraction method for categorizing textures. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 23. |  | Explain the boundary, region and fourier descriptors in detail. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the foreground and background separation problem in surveillance application. | CO6 |  | 8 |
|  | b. | Summarize the location of road markings in “In-vehicle vision system”. | CO6 |  | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Implement fundamental image processing techniques required for computer vision. |
| CO2 | Perform shape analysis and to Implement boundary tracking techniques. |
| CO3 | Apply chain codes and other region descriptors. |
| CO4 | Apply Hough Transform for line, circle, and ellipse detections. |
| CO5 | Apply 3D vision techniques and Implement motion related techniques. |
| CO6 | Develop applications using computer vision techniques. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 18 | 6 | - | - | - | 29 |
| CO2 | 2 | 7 | 8 | - | - | - | 17 |
| CO3 | 1 | 15 | 13 | - | - | - | 29 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | 2 | 15 | - | - | - | - | 17 |
| CO6 | - | 15 | - | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21EC2032** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTER VISION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define histogram of an image. | | CO1 | R | 1 |
| 2. | List a few non-linear filters. | | CO1 | R | 1 |
| 3. | Recall the formula to compute the Euclidean distance. | | CO2 | R | 1 |
| 4. | Define the thinning process. | | CO2 | R | 1 |
| 5. | Compare boundary and region description. | | CO3 | U | 1 |
| 6. | Predict the order for the given boundary. | | CO3 | U | 1 |
| 7. | Differentiate image space and parameter space. | | CO4 | U | 1 |
| 8. | Recall the energy equation to find the average squared vertical distance. | | CO4 | R | 1 |
| 9. | Identify the projection where the projection plane intersects each coordinate axis in the model coordinate system at an equal distance. | | CO5 | R | 1 |
| 10. | Define stereo vision. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Compare the opening and closing morphological operations. | | CO1 | U | 3 |
| 12. | Summarize the boundary tracking procedures in shape analysis. | | CO2 | U | 3 |
| 13. | Illustrate major and minor axis of a boundary with an example. | | CO3 | U | 3 |
| 14. | Describe RANSAC operation for straight line detection with an example. | | CO4 | U | 3 |
| 15. | Compare orthographic and oblique projection schemes. | | CO5 | U | 3 |
| 16. | Summarize chamfer matching. | | 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 fundamental steps in digital image processing in detail. | CO1 | U | 6 |
|  | b. | Compute erosion operation on the following input image.    And the structuring element is as follows. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the adjacency and connectivity between pixels. | CO2 | U | 4 |
|  | b. | An image set is shown below. Let V be the set of gray level values used to define the connectivity in the image. Compute D4, D8 and Dm distances between pixels P and Q for V = (2,3). | CO2 | A | 8 |
|  |  |  |  |  |  |
| 19. | a. | Develop the chain code for the given boundary of an object clockwise from the upper left pixel. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Apply Hough Transform and show that the points (1,2), (2,3) and (3,4) are colinear. Also find the equation of the line. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Explain the photometric stereo process in detail. | CO5 | U | 5 |
|  | b. | Discuss the optical flow in 3D motion with necessary equations and illustrations. | CO5 | U | 7 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the working of canny edge detector. | CO1 | A | 4 |
|  | b. | Explain the sharpening filters in detail with necessary equations and diagrams. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 23. | a. | Explain the boundary, region and fourier descriptors in detail. | CO3. | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the face detection and recognition application in detail. | CO6 | U | 8 |
|  | b. | Summarize human iris location. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Implement fundamental image processing techniques required for computer vision. |
| CO2 | Perform shape analysis and to Implement boundary tracking techniques. |
| CO3 | Apply chain codes and other region descriptors. |
| CO4 | Apply Hough Transform for line, circle, and ellipse detections. |
| CO5 | Apply 3D vision techniques and Implement motion related techniques. |
| CO6 | Develop applications using computer vision techniques. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 17 | 10 | - | - | - | 29 |
| CO2 | 2 | 7 | 8 | - | - | - | 17 |
| CO3 | - | 17 | 12 | - | - | - | 29 |
| CO4 | 1 | 4 | 12 | - | - | - | 17 |
| CO5 | 2 | 15 | - | - | - | - | 17 |
| CO6 | - | 15 | - | - | - | - | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC1001** | **Duration** | **3hrs** |
| **Course Name** | **PHYSICAL ELECTRONICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | |  | | --- | | Predict the frequency range of Audible sound. | | | CO1 | U | 1 |
| 2. | |  | | --- | | List the transmission medium where sound wave can propagate. | | | CO1 | R | 1 |
| 3. | |  | | --- | | List the types of sound present in frequency spectrum between Hz and MHz. | | | CO2 | R | 1 |
| 4. | |  | | --- | | Write the expression for the intensity of sound wave. | | | CO2 | A | 1 |
| 5. | Reproduce the symbol of solar cell. | | CO3 | R | 1 |
| 6. | Illustrate the lift and drag forces in wind turbine. | | CO3 | An | 1 |
| 7. | List the materials used in solar cell. | | CO4 | R | 1 |
| 8. | Write the applications of Ultrasonic testing. | | CO4 | A | 1 |
| 9. | List the materials used for superconductor. | | CO5 | R | 1 |
| 10. | Recall the time interval between a consecutive low and high tide. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | |  | | --- | | Distinguish the difference between pitch and loudness. | |  | | | CO1 | An | 3 |
| 12. | |  | | --- | | Write the applications of Ultrasonics in medical field. | | | CO2 | A | 3 |
| 13. | Construct the device structure of solar cell. | | CO3 | C | 3 |
| 14. | List the applications of Laser. | | CO4 | R | 3 |
| 15. | Identify the role of membrane in fuel cell. | | CO5 | U | 3 |
| 16. | Define superconductivity. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | |  | | --- | | Describe the ordered and disordered sound in acoustics. | | CO1 | U | 6 |
|  | b. | |  | | --- | | Write the properties of ultrasonic waves. | | CO1 | A | 6 |
| 18. | a. | |  | | --- | | Visualize the cross section of a speaker and point out its working principle. | | CO2 | R | 6 |
|  | b. | |  | | --- | | Discuss in detail about the magnetostriction effect. | | CO2 | U | 6 |
| 19. | a. | Explain the working principle of piezoelectric generator with necessary circuit diagram. | CO3 | A | 6 |
|  | b. | Discuss in detail ultrasonic cleaner. | CO3 | U | 6 |
| 20. | a. | Paraphrase the working of wind-diesel hybrid system with neat sketch. | CO4 | U | 12 |
| 21. | a. | Interpret how electric energy is harvested using solar cells? | CO5 | An | 6 |
|  | b. | Explain the working of Tidal power plant with neat sketch. | CO5 | A | 6 |
| 22. | a. | Discuss in detail the mechanism of fuel cell with necessary diagram. | CO5 | U | 12 |
| 23. | a. | Write the properties and basic concepts of laser | CO6 | A | 5 |
|  | b. | Explain the arrangement and working of G.P Thomson experiment. | CO6 | An | 7 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Describe the basic components and working principle of scanning electron microscope. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of lasers and apply laser action in electronics. |
| 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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 7 | 6 | 3 |  |  | 16 |
| CO2 | 7 | 6 | 3 |  |  |  | 16 |
| CO3 | 1 | 6 | 6 | 3 |  | 2 | 19 |
| CO4 | 4 | 12 | 1 |  |  |  | 17 |
| CO5 | 1 | 15 | 6 | 6 |  |  | 28 |
| CO6 | 4 | 12 | 5 | 7 |  |  | 28 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC1004** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Name any two electrical safety devices. | | CO1 | R | 1 |
| 2. | Describe the purpose of Penstock in Hydro Electric Power Plant. | | CO1 | U | 1 |
| 3. | State the rule used to determine the working of a motor. | | CO2 | R | 1 |
| 4. | Summarize the significance of a generator. | | CO2 | U | 1 |
| 5. | Define doping. | | CO3 | R | 1 |
| 6. | Compare fixed and variable resistors. | | CO3 | U | 1 |
| 7. | Name the universal gates. | | CO4 | R | 1 |
| 8. | List few examples of combinational circuits. | | CO4 | R | 1 |
| 9. | Define sensors. | | CO5 | R | 1 |
| 10. | List the features of 4G technology. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Infer the Star Rating used in electrical appliances. | | CO1 | U | 3 |
| 12. | Interpret the merits and demerits of BLDC Motor with brushed DC motor. | | CO2 | A | 3 |
| 13. | Differentiate N type and P type semiconductor. | | CO3 | An | 3 |
| 14. | Classify the logic gates. | | CO4 | U | 3 |
| 15. | State the various applications of sensor. | | CO5 | R | 3 |
| 16. | Compare Uplink and Downlink in satellite communication. | | 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 working of Hydro Power Plant with neat diagram. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss the working principle of generator with neat diagram. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the operation, biasing, modes, and characteristics of Bipolar Junction Transistor with relevant diagrams. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Infer the significance of ALU, Processors and memories. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the operation of ultrasound scanner with its block diagram. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Appraise the working and characteristics of PN junction diode. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Infer the functions of online and offline UPS with necessary diagrams. | CO1 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Paraphrase the uplink, downlink and transponder block in satellite communication. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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 | 16 | 12 | - | - | - | 29 |
| CO2 | 1 | 13 | 3 | - | - | - | 17 |
| CO3 | 1 | 1 | 12 | 15 | - | - | 29 |
| CO4 | 2 | 3 | - | 12 | - | - | 17 |
| CO5 | 4 | 12 | - | - | - | - | 16 |
| CO6 | 1 | 15 | - | - | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2001** | **Duration** | **3hrs** |
| **Course Name** | **INTRODUCTION TO BIG DATA** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Give an example of Big Data. | | CO1 | R | 1 |
| 2. | List the major domains associated with Big Data. | | CO1 | R | 1 |
| 3. | Name any two applications of Natural Language Processing. | | CO2 | R | 1 |
| 4. | Name any two offline data processing platforms. | | CO2 | R | 1 |
| 5. | Distinguish between NoSQL and SQL. | | CO3 | An | 1 |
| 6. | List the different types of data models in Big Data. | | CO3 | U | 1 |
| 7. | List out the different types of resource management in Big Data. | | CO4 | R | 1 |
| 8. | Outline the technical concepts of MapReduce. | | CO4 | U | 1 |
| 9. | List any two security models available in Big Data. | | CO5 | R | 1 |
| 10. | Write the need for sentiment analysis in practical applications. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write about Visibility, Veracity and Value in Big Data. | | CO1 | U | 3 |
| 12. | List the characteristics of real time systems. | | CO2 | U | 3 |
| 13. | Give an account on ACID properties in relational data models. | | CO3 | U | 3 |
| 14. | Distinguish between ‘Hadoop’ and ‘Storm’ in big data. | | CO4 | An | 3 |
| 15. | Compare device-based sensing and device-free sensing in Big Data. | | CO5 | U | 3 |
| 16. | Write the role of Big Data in grid applications. | | 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 ideology of any 6Vs necessary for any data to be called as “Big Data”. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Summarize the different concepts and platforms necessary for real-time processing of Big Data. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the different methods used for Named Entity Recognition. | CO3 | U | 6 |
|  | b. | Compare the different types of Recommender Systems with examples. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. |  | Distinguish the different types of stores in NoSQL data models in Big Data. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Summarize the different properties and fairness policies of single resource management in the cloud. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the concepts of splitter and interleaver in Local Resource Shaper. | CO5 | U | 6 |
|  | b. | Illustrate the technical concepts of any two Big Data processing systems and platforms. | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Outline the technical concepts of the models in secured platforms over encrypted Big Data. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the role of Big Data in mining Thai public opinions. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of big data and its methods. |
| CO2 | Analyze the real-time big data for social media applications. |
| CO3 | Analyze data by its big data infrastructures and platforms. |
| CO4 | Perform analytics on local resource consumption shaping and system optimization. |
| CO5 | Understand the applications in big data security and privacy. |
| CO6 | Comprehend the real data models and its applications. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 15 | 0 | 0 | 0 | 0 | 17 |
| CO2 | 2 | 15 | 0 | 0 | 0 | 0 | 17 |
| CO3 | 0 | 16 | 0 | 13 | 0 | 0 | 29 |
| CO4 | 1 | 13 | 0 | 3 | 0 | 0 | 17 |
| CO5 | 1 | 27 | 0 | 0 | 0 | 0 | 28 |
| CO6 | 0 | 16 | 0 | 0 | 0 | 0 | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2005** | **Duration** | **3hrs** |
| **Course Name** | **PATTERN RECOGNITION TECHNIQUES** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Recall the data analysis method for pattern recognition. | | CO1 | R | 1 |
| 2. | Interpret the important aspects of pattern recognition and its applications. | | CO1 | U | 1 |
| 3. | Identify the different types of variables used in statistical pattern recognition. | | CO2 | A | 1 |
| 4. | List the process of measuring a variable requires a set of categories with an example. | | CO2 | An | 1 |
| 5. | Infer the three main approaches of using association rules for classification. | | CO3 | U | 1 |
| 6. | Define binary classification. | | CO4 | R | 1 |
| 7. | Outline the issues with unsupervised learning. | | CO4 | U | 1 |
| 8. | How syntactic analysis is done via parsing? | | CO5 | R | 1 |
| 9. | What are neural network? | | CO5 | R | 1 |
| 10. | List the applications of neural network models. | | CO6 | An | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain about the regression model and any two types with an example. | | CO2 | U | 3 |
| 12. | Infer the goal of a correlational study in statistical approach. | | CO2 | U | 3 |
| 13. | Which density estimation technique used for histogram technique? | | CO3 | R | 3 |
| 14. | What are the problems associated with clustering? | | CO4 | R | 3 |
| 15. | Interpret Kuhn – tucker condition for optimization in SVM. | | CO5 | E | 3 |
| 16. | List two main algorithms used to combine multiple classifiers to produce a better classifier. | | 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. | Construct the features such as eyes, ears, nose etc. are part of the face. Represent the feature vector from the given set. | CO1 | A | 4 |
|  | b. | Explain about different phases in pattern recognition systems. Brief about the activities for designing the pattern recognition system. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 18. | a. | Construct the graph for the given data below:  01f04A  Explain in brief about the correlational studies, experiment steps, and other types of studies with an example. | CO4 | A | 8 |
|  | b. | Explain about the notation and order of operations with an example. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. | a. | Explain how we would go about this in a simple coin toss experiment. **“Say we toss a coin 100 times and observe 56 heads and 44 tails. Instead of assuming that p is 0.5, we want to find the MLE for p. Then we want to ask whether or not this value differs significantly from 0.50”.**  How do we do this to find the value for p that makes the observed data most likely? | CO4 | U | 6 |
|  | b. | Evaluate ‘n-fold cross-validation and Leave-one-out cross-validation’ scheme and expression the performance measures – precision and recall measures. | CO4 | E | 6 |
|  |  |  |  |  |  |
| 20. | a. | How to avoid over-fitting problem in classification? | CO4 | R | 3 |
|  | b. | Create A1 through Ak be attributes with discrete values for the class is ‘C’ using Bayesian classification | CO3 | C | 3 |
|  | c. | Determine SVM linear classifiers that to find a hyper-plane to separate two classes of data such as positive and negative. How to deal with non-linear separation? | CO3 | E | 6 |
|  |  |  |  |  |  |
| 21. | a. | Explain in brief about unsupervised learning and data clustering with an example. | CO4 | U | 9 |
|  | b. | List the main advantages of model-based clustering. | CO4 | An | 3 |
|  |  |  |  |  |  |
| 22. | a. | Examine syntactic pattern recognition of realistic problems with an example. | CO5 | An | 6 |
|  | b. | Explain the following,   1. Syntactic recognition via parsing 2. Syntactic recognition via graphical approaches | CO5 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Classify the different types of neural networks and how significantly used for training process. | CO5 | An | 8 |
|  | b. | Infer the term long short term memory network. | CO6 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain support vector machine algorithm and compute the margin based on separable cases. | CO6 | U | 6 |
|  | b. | Estimate the optimization problem used in SVM algorithm. | CO6 | C | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic pattern recognition techniques. |
| CO2 | Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers. |
| CO3 | Realize the learning and clustering concepts |
| CO4 | Explain and compare a variety of pattern classification and structural pattern recognition |
| CO5 | Identify and solve engineering problems. |
| CO6 | Apply pattern recognition techniques to real-world problems such as document analysis and recognition |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 1 | 4 | - | - | - | 6 |
| CO2 | - | 18 | 1 | 1 | - | - | 20 |
| CO3 | 3 | 1 | - | - | 6 | 3 | 13 |
| CO4 | 7 | 16 | 8 | 3 | 6 | - | 40 |
| CO5 | 2 | 6 | - | 14 | 3 | - | 25 |
| CO6 | - | 10 | - | 4 | - | 6 | 20 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2007** | **Duration** | **3hrs** |
| **Course Name** | **NATURAL LANGUAGE PROCESSING** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define regular expressions with an example. | | CO1 | R | 1 |
| 2. | Infer on the closed class parts of speech. | | CO1 | U | 1 |
| 3. | Report about Rounding Harmony rule. | | CO2 | A | 1 |
| 4. | Recite on two formal mechanisms involved in optimality theory. | | CO2 | R | 1 |
| 5. | Name the back-end component used in TTS. | | CO3 | R | 1 |
| 6. | State the advantages of bottom-up chart parser. | | CO3 | R | 1 |
| 7. | Define semantic. | | CO4 | R | 1 |
| 8. | Discuss fallout to ignore spurious information in the text. | | CO4 | U | 1 |
| 9. | Identify lexeme pairing of an example “CAR & VEHICLE”. | | CO5 | R | 1 |
| 10. | Infer about stop list technique in evaluation process. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Recall on the term Stop word removal. | | 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. | Describe about inference & variable. | | CO4 | R | 3 |
| 15. | List the difference between Brown Corpus and British National Corpus. | | CO5 | R | 3 |
| 16. | Differentiate between a dialogue and the monologue. | | 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. | Construct the framework of finite state automata for discrete event system with an example. | CO1 | C | 08 |
|  | b. | Adapt a simple finite state Transducer for mapping English nouns. | CO1 | C | 04 |
|  |  |  |  |  |  |
| 18. | a. | Appraise the various concepts of automatic speech recognition model. | CO2 | E | 08 |
|  | b. | Assess the term “computational phonology” and conclude the purpose of International Phonetic Alphabet in NLP. | CO2 | E | 04 |
|  |  |  |  |  |  |
| 19. | a. | Describe about feature unification with suitable example. | CO3 | R | 08 |
|  | b. | Identify and describe the ambiguities in the following sentences.  i. The man kept the dog in the house.  ii. Book that flight. | CO3 | R | 04 |
|  |  |  |  |  |  |
| 20. | a. | Explain in detail about Computational & Lexical semantics with a parse tree example. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Recall Text Coherence and its significance in discourse segmentation. | CO5 | R | 12 |
|  |  |  |  |  |  |
| 22. | a. | Report the problems associated with N-gram model and explain how these problems are handled. | CO1 | A | 08 |
|  | b. | Illustrate parts of Speech Tagging. | CO1 | A | 04 |
|  |  |  |  |  |  |
| 23. | a. | Appraise syntactic analysis of the following sentence using any of the parsing method. “Book the flight through Houston.” | CO2 | An | 08 |
|  | b. | Differentiate between top-down and bottom-up parsing. | CO2 | An | 04 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the different ways of building belief models in a conversational agent. | CO6 | U | 08 |
|  | b. | Can statistical techniques be used to perform the task of machine translation? If so, explain in brief. | CO6 | U | 04 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 1 | 12 | - | - | 12 | 29 |
| CO2 | 1 | 3 | 1 | 12 | 12 | - | 29 |
| CO3 | 14 | 3 | - | - | - | - | 17 |
| CO4 | 4 | 13 | - | - | - | - | 17 |
| CO5 | 16 | - | - | - | - | - | 16 |
| CO6 | - | 13 | - | 3 | - | - | 16 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2007** | **Duration** | **3hrs** |
| **Course Name** | **NATURAL LANGUAGE PROCESSING.** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define Natural Language Processing with an example. | | CO1 | R | 1 |
| 2. | Infer on the closed class Parts of Speech with an example. | | CO1 | U | 1 |
| 3. | Identify the Back end component used in TTS. | | CO2 | R | 1 |
| 4. | Discuss Formant frequency with an example. | | CO2 | U | 1 |
| 5. | Recall the Stochastic Context Free Grammar with an example. | | CO3 | R | 1 |
| 6. | Describe Syntax in Natural language. | | CO3 | R | 1 |
| 7. | Discuss the Semantic analysis in meaning representation with an example. | | CO4 | U | 1 |
| 8. | Describe about the operator used in Pumping Lemma. | | CO4 | R | 1 |
| 9. | Describe the Canonical form representation of meaning with an example. | | CO5 | R | 1 |
| 10. | Infer about stop list technique in evaluation process. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the Parts of Speech Tagging with examples. | | CO1 | U | 3 |
| 12. | Describe Morphological segmentation with two real time examples. | | CO2 | R | 3 |
| 13. | Differentiate right and left linear grammar with an example each. | | CO3 | U | 3 |
| 14. | Explain about Inference & Variable with an example. | | CO4 | U | 3 |
| 15. | List the important challenges faced in Word Sense ambiguation with an example. | | CO5 | R | 3 |
| 16. | Relate the concepts of evaluation in performance of ranked system for Precision and Recall. | | 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 basic N-grams with spare data issues and evaluation process with necessary examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Discuss about various concepts of Automatic Speech Recognition with examples. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe about feature unification operator and its structure with examples. | CO3 | R | 12 |
|  |  |  |  |  |  |
| 20. |  | Discuss in detail about Computational 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 about hierarchy of grammar using Chomsky tool with suitable examples. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Describe the syntax tree for an example “book that flight” using Top down parsing &Bottom up parsing. | CO2 | R | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss about the architecture of ad hoc IR systems with real time applications in Question and Answering. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **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. |

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



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2023** | **Duration** | **3hrs** |
| **Course Name** | **IOT SECURITY AND TRUST** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | State the key length of DES algorithm. | | CO1 | R | 1 |
| 2. | Identify the logical operation done in Add round key stage of AES. | | CO1 | U | 1 |
| 3. | Define confidentiality in IoT security. | | CO2 | R | 1 |
| 4. | List the existing security tools in edge security. | | CO2 | R | 1 |
| 5. | Indicate the key elements of IoT security. | | CO3 | U | 1 |
| 6. | Recall and write what is threat modelling? | | CO3 | R | 1 |
| 7. | Indicate what is trust management in IoT? | | CO4 | U | 1 |
| 8. | Recite any one web of trust model in trust management, | | CO4 | R | 1 |
| 9. | Describe identity based access control system. | | CO5 | U | 1 |
| 10. | Recall and write why light weight cryptography is used in IoT. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Construct an additive inverse table for Z5. | | CO1 | A | 3 |
| 12. | List the aspects of security. | | CO2 | R | 3 |
| 13. | Discuss the security threats identified in intranet security. | | CO3 | U | 3 |
| 14. | Recite the mutual establishment phases in trust management. | | CO4 | R | 3 |
| 15. | Quote the limitations of capability based access control schemes. | | CO5 | R | 3 |
| 16. | List the classical solutions for digital identity management in cloud. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Describe the working of Advanced Encryption Standard. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the needs and methods of Edge security. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain different identity management models in detail. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain in detail the identity management framework in IoT security and trust. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the needs and methods involved in light weight cryptography in detail. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Interpret the encryption, decryption process and key setup procedure of RSA algorithm. Assume p=3, q=11, e=7. | CO1 | U | 6 |
|  | b. | Describe the boot process in IoT. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | Discuss the concepts involved in capability-based access control systems. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain in detail cyber forensics and incident response. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design and implement cryptography algorithms using C programs. |
| CO2 | Solve network security problems in various networks. |
| CO3 | Build security systems using elementary blocks. |
| CO4 | Build Trustable cloud based IoT systems. |
| CO5 | Solve IoT security problems using light weight cryptography. |
| CO6 | Appreciate the need for cyber security laws and methods. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 19 | 3 | - | - | - | 23 |
| CO2 | 5 | 18 | - | - | - | - | 23 |
| CO3 | 1 | 16 | - | - | - | - | 17 |
| CO4 | 4 | 13 | - | - | - | - | 17 |
| CO5 | 4 | 25 | - | - | - | - | 29 |
| CO6 | 3 | 12 | - | - | - | - | 15 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2023** | **Duration** | **3hrs** |
| **Course Name** | **IOT SECURITY AND TRUST** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Calculate the result of 27 mod 5. | | CO1 | R | 1 |
| 2. | Identify the key size for AES algorithm. | | CO1 | U | 1 |
| 3. | Define boot process in IIoT security framework | | CO2 | R | 1 |
| 4. | List the existing security fundamentals. | | CO2 | R | 1 |
| 5. | Indicate the advantages of local identity. | | CO3 | U | 1 |
| 6. | List the layers of OpenID. | | CO3 | R | 1 |
| 7. | Recall and write what is cryptosystem? | | CO4 | R | 1 |
| 8. | Recite any one mutual establishment phase in trust management. | | CO4 | R | 1 |
| 9. | List the capablity based access control schemes | | CO5 | R | 1 |
| 10. | Recall and write why light weight cryptography is used in IoT | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Construct a multiplicative inverse table for Z5 | | CO1 | A | 3 |
| 12. | List the components of Edge security. | | CO2 | R | 3 |
| 13. | Discuss about user centric identity management | | CO3 | U | 3 |
| 14. | Discuss the available web of trust models. | | CO4 | U | 3 |
| 15. | Recite the need for light weight cryptography | | CO5 | R | 3 |
| 16. | List the alternative solutions for digital identity management in cloud | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the working of Data Encryption Standard. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain network access security model with intranet and internet security in detail | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate threat modelling indicating types and threat identification. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Discuss the steps involved in cryptosystem establishment | CO4 | U | 6 |
|  | b. | Illustrate about web of trust models in detail | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Discuss in detail about identity based and identity driven access control schemes | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | 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. | CO1 | A | 6 |
|  | b. | Discuss the needs and methods of edge security. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Describe the vulnerabilities identified in IoT and the elementary blocks of IoT security in detail. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain in detail about cyber forensics and network forensics, | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Design and implement cryptography algorithms using C programs |
| CO2 | Solve network security problems in various networks |
| CO3 | Build security systems using elementary blocks |
| CO4 | Build Trustable cloud based IoT systems |
| CO5 | Solve IoT security problems using light weight cryptography |
| CO6 | Appreciate the need for cyber security laws and methods. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 13 | 9 | - | - | - | 23 |
| CO2 | 5 | 18 | - | - | - | - | 23 |
| CO3 | 1 | 28 | - | - | - | - | 29 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | 5 | 12 | - | - | - | - | 17 |
| CO6 | 3 | 12 | - | - | - | - | 15 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC2026** | **Duration** | **3hrs** |
| **Course Name** | **IoT DATA ANALYTICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | State data modeling. | | CO1 | R | 1 |
| 2. | Give an example for entity-relationship model. | | CO1 | U | 1 |
| 3. | List any two traversal functional groups in IoT functional model. | | CO2 | R | 1 |
| 4. | Illustrate the shape/symbol to represent type of entity and its attribute. | | CO2 | U | 1 |
| 5. | Give an example for an interaction between user and system. | | CO3 | U | 1 |
| 6. | Define exploratory data analysis. | | CO3 | R | 1 |
| 7. | State empathy mapping. | | CO4 | R | 1 |
| 8. | Define affinity diagram | | CO4 | R | 1 |
| 9. | Judge the statement. “Data mining technique is used to transform the raw data in to a useful and efficient format”. | | CO5 | U | 1 |
| 10. | Describe supervised learning. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Differentiate between data analytics and data science. | | CO1 | U | 3 |
| 12. | Write a python program to reverse the order of a 1-D array. | | CO2 | A | 3 |
| 13. | Classify the types of resources for IoT solution. | | CO3 | U | 3 |
| 14. | Develop a program to plot X-Y graph using python. | | CO4 | A | 3 |
| 15. | Distinguish between classification and regression in vertical algorithms. | | CO5 | U | 3 |
| 16. | Explain the features of predictive analytics. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Develop a use-case to implement the IoT level-5 deployment model in agriculture. | CO1 | A | 8 |
|  | b. | Discuss the significance of semantic data model in internet of things. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. |  | Discuss Tag Management in IoT devices for data analytics. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the main functionality groups of the IoT architecture environment and their relationships. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain water fall model for software development in detail. | CO4 | A | 6 |
|  | b. | Discuss the significance of V-shaped model over water fall model. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. |  | Discuss the difference between decision tree and random forest algorithm in predictive analytics. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain any four types of clustering methods available in machine learning with relevant example. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. | a. | With the help of cloud platform, explain how the data is analyzed and used across IoT solutions. | CO5 | An | 6 |
|  | b. | Classify the methods of data analytics in Internet of Things applications. | CO6 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss anomaly detection for predictive maintenance using a crafted dataset for industrial automation. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the various models applied for IoT solutions. |
| CO2 | Simulate the real world scenarios with the IoT models. |
| CO3 | Assess different business requirements of Internet of Things. |
| CO4 | Understand the principles of value engineering and analysis. |
| CO5 | Gain knowledge on the data analytics of IoT. |
| CO6 | Deploy data analytics solution to IoT based systems. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 8 | 8 | - | - | - | 17 |
| CO2 | 1 | 13 | 3 | 12 | - |  | 29 |
| CO3 | 1 | 4 | - | - | - | - | 5 |
| CO4 | 2 | 6 | 9 | - | - | - | 17 |
| CO5 | - | 16 | 12 | 6 | - | - | 34 |
| CO6 | 1 | 21 |  | - | - | - | 22 |
|  | | | | | | | **124** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **22EC3005** | **Duration** | **3hrs** |
| **Course Name** | **TESTING AND TESTABILITY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Justify that testing cost decides the yield of a chip. | CO1 | E | 4 |
|  | b. | Determine the minimal test vectors for the circuit shown in Fig 1 using fault table method.    **Fig 1** | CO2 | A | 12 |
|  |  |  |  |  |  |
| 2. | a. | List the different types of fault models and its types. | CO1 | R | 6 |
|  | b. | Estimate fault dominance collapsed ratio for the circuit shown in Fig 2, considering all possible stuck at faults.    **Fig 2** | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define Controllability and Observability. | CO4 | R | 4 |
|  | b. | Determine the test sequence for the state table of the sequential circuit shown in Table 1 using checking experiment.  **Table 1**   |  |  |  | | --- | --- | --- | | PS | X=0 | X=1 | | A | C/0 | A/0 | | B | B/1 | D/0 | | C | A/0 | B/0 | | D | B/1 | C/0 | | CO2 | A | 12 |
|  |  |  |  |  |  |
| 4. | a. | Justify the statement that “sequential circuit testing is difficult as compared to combinational circuit testing”. | CO2 | E | 4 |
|  | b. | Identify the faults detected by the input vector for the circuit given in Fig. 3, using deductive fault simulation.    **Fig 3** | CO3 | U | 12 |
|  |  |  |  |  |  |
| 5. | a. | Discuss various Ad Hoc design rules for improving testability with necessary block diagrams. | CO4 | U | 6 |
|  | b. | Construct a single latch LSSD using SRL L1/L2\* and explain its operation. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 6. | a. | Define D-algorithm. | CO2 | A | 4 |
|  | b. | Determine the test pattern for the given combinational circuit in Fig 4, to detect the presence of fault using D-algorithm.  H:\FIG\fig2.bmp  **Fig 4** | CO2 | A | 12 |
|  |  |  |  |  |  |
| 7. | a. | Describe the syndrome checking compression technique used in BIST. | CO5 | U | 6 |
|  | b. | Construct BILBO architecture and discuss the operation of its architecture. Also explain how to test a circuit using BILBO. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Indicate how a 0 to 1 transition fault occur in a memory cell with state diagram. | CO6 | U | 4 |
|  | b. | Compare the state transition diagrams of 2 cells in fault free and faulty state assuming the fault to be inversion coupling fault when the aggressor moves from 1 to 0. | CO6 | U | 16 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the testing concepts and compute the knowledge of modeling of faults. |
| CO2 | Utilize the test generation algorithms for generating test vectors. |
| CO3 | Perform modal analysis for fault simulation techniques. |
| CO4 | Design and develop various architectures for DFT. |
| CO5 | Develop various BIST architecture. |
| CO6 | Develop algorithms for memory testing. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 6 | 0 | 0 | 10 | 4 | 0 | 20 |
| CO2 | 0 | 0 | 40 | 0 | 4 | 0 | 44 |
| CO3 | 0 | 12 | 0 | 0 | 0 | 0 | 12 |
| CO4 | 4 | 6 | 10 | 0 | 0 | 0 | 20 |
| CO5 | 0 | 6 | 10 | 0 | 0 | 0 | 16 |
| CO6 | 0 | 20 | 0 | 0 | 0 | 0 | 20 |
|  | | | | | | | **132** |