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| **Course Code** | **14EE2024/19EE2032** | **Duration** | **3hrs** |
| **Course Name** | **Basics of Electric and Hybrid Vehicle** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Computation of Air to Fuel Ratio is performed by obtaining the signal from which sensor? | | CO1 | U | 1 |
| 2. | When torque on the driven gear increases, the rotational speed on the driven gear\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | CO2 | R | 1 |
| 3. | The quantity of fuel sent to the intake manifold of the engine is determined by sensing the mass or volume of air flowing in to the intake manifold using which sensor | | CO2 | An | 1 |
| 4. | Output parameter of the Vehicle speed sensor \_\_\_\_\_\_\_\_\_\_\_ with increase in vehicle Speed | | CO3 | R | 1 |
| 5. | In \_\_\_\_\_\_\_\_\_\_\_\_ type of vehicle the battery capacity is in the range of 2kW. | | CO4 | R | 1 |
| 6. | Maximum Grading considered for Mid-Size vehicle is limited to\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | CO2 | U | 1 |
| 7. | In Negative Earthing, which portion of the spark plug gets corroded? | | CO1 | R | 1 |
| 8. | In an electronic fuel injection, the maintenance cost is \_\_\_\_\_\_\_\_\_\_\_ | | CO2 | U | 1 |
| 9. | The capacity of a battery is expressed in terms of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | CO6 | R | 1 |
| 10. | When two batteries are connected in parallel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the two batteries should be same | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Discuss the need for Lambda sensor. | | CO1 | U | 3 |
| 12. | Draw a neat sketch of a series hybrid EV. | | CO3 | U | 3 |
| 13. | Define TCS. | | CO3 | R | 3 |
| 14. | Compare the DC motor and SRM based propulsion drive system. | | CO4 | An | 3 |
| 15. | In short write about the advantage of ADAS. | | CO3 | R | 3 |
| 16. | Differentiate a stepper motor and a servo motor. | | CO2 | R | 3 |
| **PART – C (8 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | With a block diagram explain the basic sensor arrangement in an automotive system. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Discuss in brief about All Wheel Drive, Front Wheel Drive, Rear Wheel Drive, 4 Wheel Drive. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | With a neat block diagram explain the operation and advantage of Electronics Steering system. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Elaborate the role of power electronic converters that are used for digitizing the ignition system. Justify the merits of the same. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss about the various strategies followed to avoid glare during night driving. | CO3 | R | 12 |
|  |  |  |  |  |  |
| 22. | a. | Show how the power flows in a parallel hybrid architecture in different modes and discuss on the same. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Discuss the various steps that are involved in developing a wireless TPMS. Discuss about the impact of TPMS created over the vehicle performance. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Develop an Energy management strategy for a series hybrid vehicle and discuss about the various modes of operation | CO6 | A | 12 |

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

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|  | **COURSE OUTCOMES** |
| CO1 | Explain the functioning of the propulsion system in vehicles |
| CO2 | Apply the knowledge for selecting suitable combinations of EHV propulsion system |
| CO3 | Analyze the effect on the characteristic behaviors of EHV |
| CO4 | Evaluate the performance of the propulsion system for a given scenario |
| CO5 | Design an Electric Hybrid Propulsion system for a specific application |
| CO6 | Develop an Energy Management system for Electric Vehicles. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 28 |  |  |  |  | 29 |
| CO2 | 4 | 14 |  | 1 |  |  | 19 |
| CO3 | 19 | 27 |  |  |  |  | 46 |
| CO4 | 1 |  |  | 3 |  |  | 4 |
| CO5 |  | 12 |  |  |  |  | 12 |
| CO6 | 1 | 1 | 12 |  |  |  | 14 |
|  | | | | | | | **124** |



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| **Course Code** | **18EE2001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRICAL CIRCUIT ANALYSIS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | | **CO / BL** | | **Marks** | | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | Write the dual element for inductor. | | | CO1 / U | | 1 | | |
| 2. | Identify the following source. | | | CO1 / U | | 1 | | |
| 3. | State one application of maximum power transfer theorem. | | | CO2 / R | | 1 | | |
| 4. | State one application of compensation theorem. | | | CO2 / R | | 1 | | |
| 5. | State final value theorem. | | | CO3 / R | | 1 | | |
| 6. | Write the expression for time constant of RL circuit. | | | CO3 / R | | 1 | | |
| 7. | Draw the phasor of the sinusoidal voltage . | | | CO4 / U | | 1 | | |
| 8. | Write the expression for mutual inductance between two coils which are magnetically coupled. | | | CO4 / R | | 1 | | |
| 9. | How will you represent the inductor with initial current in frequency domain? | | | CO5 / A | | 1 | | |
| 10. | Write in your own words about the frequency response of a circuit. | | | CO5 / U | | 1 | | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | | State KCL and KVL. | | | CO1 / R | | 3 | |
| 12. | | Write reciprocity theorem. | | | CO2 / R | | 3 | |
| 13. | | Current through a circuit is given by . Find the initial rate of change of current. | | | CO3 / A | | 3 | |
| 14. | | List the characteristics of an ideal transformer. | | | CO4 /U | | 3 | |
| 15. | | Find the poles and zeros of the transfer function . | | | CO5 / U | | 3 | |
| 16. | | Draw the generalized representation of two-port network. Define the network parameters. | | | 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. | Suppose your circuit laboratory has the following standard commercially available resistors in large quantities: 1.8 Ω 20 Ω 300 Ω 24 kΩ 56 kΩ.  Using series and parallel combinations and a minimum number of available resistors, how would you obtain the following resistances for an electronic circuit design? (i) 5 Ω (ii) 311.8 Ω. | | CO1/An | | 5 | |
| b. | Find the current through 10 Ω resistor using mesh analysis. | | CO1/An | | 7 | |
|  | |  |  | |  | |  | |
| 18. | |  | What should be the value of R such that maximum power transfer can take place from the rest of the network to R in the figure? Obtain the amount of this power. | | CO2/An | | 12 | |
|  | |  |  | |  | |  | |
| 19. | |  | A series RC branch with R=5Ω and C=100µF, is applied with 25 V DC by closing a switch. From the basic principles, find the expressions for current through and voltage across the capacitor. | | CO3/A | | 12 | |
|  | |  |  | |  | |  | |
| 20. | | a. | A series RLC circuit with R=10Ω, L=0.3H and C=50µF is connected to. Find impedance, admittance and the expression for the current. | | CO4 /A | | 6 | |
| b. | Draw the waveforms and phasors of three phase voltages. | | CO4 /U | | 6 | |
|  | |  |  | |  | |  | |
| 21. | | a. | Represent the following circuit in s-domain. | | CO5/ A | | 6 | |
| b. | Derive the expression for resonant frequency of series resonance. | | CO5 /A | | 6 | |
|  | |  |  | |  | |  | |
| 22. | |  | Find v1 and v2 by node analysis. | | CO1/An | | 12 | |
|  | |  |  | |  | |  | |
| 23. | |  | Find current ‘i’ using superposition theorem. | | CO2/ An | | 12 | |
|  | |  | **Compulsory:** | | | | | |
| 24. | | a. | How will you combine the networks when they are connected in cascade? | | CO6 / U | | | 4 |
| b. | For the given two-port network, find the Z-parameters. | | CO6 / An | | | 8 |

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|  | **COURSE OUTCOMES** |
| CO1 | Name the various circuit elements, explain the behavior of circuit elements and circuits and analyze the circuits using KVL, KCL, Mesh analysis and Nodal analysis techniques. |
| CO2 | State various network theorems explain it and use it for solving the problems of electric circuits and networks |
| CO3 | Relate first order and second order differential equations to electric circuits and networks, explain it, solve it for obtaining the transient responses of RL, RC and RLC networks and categorize RLC  Networks. |
| CO4 | Describe fundamental concepts used in single phase and three phase AC circuits and coupled circuits, explain these concepts, and solve problems pertaining to these circuits |
| CO5 | Explain the Laplace transform technique, transformed networks and resonance in electric circuits,use the Laplace transform technique for transforming a network to S domain and analyzing it, and examine the behavior of resonant circuits and assess the performance of tuned coupled circuits. |
| CO6 | Calculate the network parameters, explain the network parameters and identify thenetwork parameters for a two-port network and construct interconnected networks |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 3 | 2 | - | 24 | - | - | 29 |
| CO2 | 5 | - | - | 24 | - | - | 29 |
| CO3 | 2 | - | 15 | - | - | - | 17 |
| CO4 | 1 | 10 | 6 | - | - | - | 17 |
| CO5 | - | 2 | 15 | - | - | - | 17 |
| CO6 | - | 7 | - | 8 | - | - | 15 |
|  | | | | | | | **124** |



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| **Course Code** | **18EE2002** | **Duration** | **3hrs** |
| **Course Name** | **NETWORK THEORY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Apply source transformation to calculate the voltage in the given circuit.  electric-circuits-questions-answers-source-transformations-q4 | | CO1 | A | 1 |
| 2. | Apply current division rule and calculate the value of current *i* in the given circuit. | | CO1 | A | 1 |
| 3. | Identify the duality of Thevenin’s theorem. | | CO2 | U | 1 |
| 4. | Recall the condition for maximum power transfer from a source to the load. | | CO2 | R | 1 |
| 5. | State the relation between line current and phase current in a delta connected system. | | CO3 | R | 1 |
| 6. | A balanced mesh load of 20∠40⁰ is connected across a 400V, 3 – Ø balanced supply. Calculate the power factor. | | CO3 | A | 1 |
| 7. | Write the Laplace transform of . | | CO4 | R | 1 |
| 8. | Identify the Transform impedance of the capacitor | | CO5 | R | 1 |
| 9. | Name the condition for the network functions to be stable. | | CO6 | R | 1 |
| 10. | Select a filter which passes without attenuation all frequencies up to the cut-off frequency fc and attenuates all other frequencies greater than fc. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Analyze the given circuit to calculate the voltage e0. | | CO1 | An | 3 |
| 12. | Determine the Norton resistance for the given circuit if 5 Ω is the load resistance.  basic-electrical-engineering-questions-answers-nortons-theorem-q7 | | CO2 | A | 3 |
| 13. | A three phase balanced star-connected load having an impedance (15+j20)Ω per phase is connected to a 3-phase 440 V , 50 Hz supply. Determine the line currents. | | CO3 | A | 3 |
| 14. | Recall the three properties of Laplace transform. | | CO4 | R | 3 |
| 15. | Identify the poles and zeros for the network function | | CO5 | U | 3 |
| 16. | The lower and higher cut-off frequencies of a band-pass filter are 2.5kHz and 10kHz. Determine its bandwidth. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Analyze the given circuit to find the current through each resistor. | CO1 | An | 8 |
|  | b. | Compute the equivalent resistance between the two points A and B shown in figure. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 18. | a. | Analyze the given circuit using nodal analysis to compute the voltage across each current source. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Calculate the phase voltage, line voltage, power drawn by the load and power factor for the following:  A three-phase balanced star connected load of (5+j4) Ω is connected across a 400V, 3Ø balanced supply. Assume the phase sequence to be RYB. | CO3 | An | 10 |
|  | b. | |  | | --- | | Construct the dual network of the following circuit | | CO3 | E | 2 |
|  |  |  |  |  |  |
| 20. | a. | Apply Thevenin’s theorem to determine the current through 2Ω resistor in the circuit shown | CO2 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | Apply mesh analysis technique to determine the current flowing through the branch CD. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | Express the steady state response of series RL and series RC circuit using Laplace transform | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Estimate the resonant frequency, Q factor, lower cut off frequency, upper cut off frequency and bandwidth of the following circuit specification. A series RLC circuit consists of 50 Ω resistor 0.2 H inductance and 10 μF capacitor with an applied voltage of 20V. | CO5 | An | 10 |
|  | b. | Express the value of impedance at resonance in the given circuit. | CO5 | U | 2 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Determine the open circuit impedance parameters of the network given below.  C:\Users\ALFRED KIRUBARAJ\Desktop\ECA_CBCS\p_2\3_4.png | CO6 | A | 12 |

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

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|  | **COURSE OUTCOMES** |
| CO1 | Understand basics electrical circuits with nodal and mesh analysis |
| CO2 | Apply the various electrical network theorems to analyze the circuits and  networks. |
| CO3 | Analyze three phase circuits |
| CO4 | Apply Laplace Transform for steady state and transient analysis |
| CO5 | Analyze the frequency domain techniques |
| CO6 | Determine different network functions and Design filter circuits to satisfy design specifications |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | 18 | 23 | - | - | 41 |
| CO2 | 1 | 1 | 15 | - | - | - | 17 |
| CO3 | 1 | - | 4 | 10 | 2 | - | 17 |
| CO4 | 4 | 12 | - | - | - | - | 16 |
| CO5 | 1 | 5 | - | 10 | - | - | 16 |
| CO6 | 1 | 1 | 15 | - | - | - | 17 |
|  | | | | | | | **124** |



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| **Course Code** | **18EE3021** | **Duration** | **3hrs** |
| **Course Name** | **SMART POWER GRID RENEWABLE ENERGY SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the need of smart grid and differentiate with traditional grid. | CO1 | U | 10 |
|  | b. | Define Self-healing and resilient grid. | CO1 | R | 5 |
|  | c | Write down international policies associated with smart grid. | CO1 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate about various functions, opportunities, challenges and benefits of smart grid. | CO1 | U | 10 |
|  | b. | Justify: To transform the traditional grid into smart grid, new technologies have to be implemented. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define Distributed Management System (DMS). Draw and describe the Structure and main components of DMS. | CO2 | R | 10 |
|  | b. | Draw the configuration of Energy Management Systems (EMS) and list its various functions. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Review on the following (i) Smart substations (ii) Substation Automation (iii) Feeder Automation (iv) HVDC and FACTS. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 5. | a. | Draw the architecture of WAMS and illustrate its functional blocks. | CO3 | U | 10 |
|  | b. | Write short notes on Local Area Network (LAN) - House Area Network (HAN) - Wide Area Network (WAN). | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Apply the concept of cyber security and Cloud computing in Smart meter construction. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain the operation of Phasor Measurement Module (PMU) and Intelligent Electronic Devices(IED) application for monitoring and protection of smart grid. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define AMI and Illustrate about its protocols, standards initiatives and benefits in smart grid environment. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the demand response issues-Electric Vehicles (EV) and Plug-in Hybrids-Electric Vehicle (PHEV) Technology. | CO6 | U | 10 |
|  | b. | List out the penetration issues associated with renewable energy technology. | CO6 | R | 10 |

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

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|  | **COURSE OUTCOMES** |
| CO1 | Differentiate the information exchange in traditional grid and smart grid |
| CO2 | Assess the importance of the information security for smart grid |
| CO3 | Demonstrate different Smart Grid communication technologies |
| CO4 | Design the prototype model of the smart grid |
| CO5 | Evaluate the role of power electronic devices in the network |
| CO6 | Analyze the grid integration issues of renewable energy sources |

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



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| **Course Code** | **19EE2003** | **Duration** | **3hrs** |
| **Course Name** | **RENEWABLE ENERGY SOURCES FOR HEALTH CARE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Name the equipment used to measure solar radiation flux. | | CO1 | R | | 1 |
| 2. | Indicate the rate of photons striking a square centimeter of the Earth's surface every second. | | CO1 | U | | 1 |
| 3. | Identify the semiconductor material that is mostly used for solar cells. | | CO2 | U | | 1 |
| 4. | Define the fill factor (FF) of a solar cell. | | CO2 | R | | 1 |
| 5. | Illustrate the DC equivalent of an AC transformer. | | CO3 | U | | 1 |
| 6. | Give an example of an anaerobic process. | | CO3 | U | | 1 |
| 7. | According to WHO, quote the percent of hospital waste is considered to be infectious? | | CO4 | R | | 1 |
| 8. | Mention the IEEE code representing current harmonics. | | CO4 | R | | 1 |
| 9. | Identify the pressure chamber used to carry out processes at high temperature and pressure. | | CO5 | U | | 1 |
| 10. | Indicate the main composition of biogas. | | CO6 | U | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | List different types of Solar Cells. | | CO1 | | R | 3 |
| 12. | Compare and contrast Solar cooling and Solar Ponds. | | CO2 | | U | 3 |
| 13. | Summarize the effect of building heating. | | CO3 | | U | 3 |
| 14. | Identify the purpose of electrical code NFPA 99. | | CO4 | | U | 3 |
| 15. | Explain the procedure used for the transportation of biomedical waste. | | CO5 | | U | 3 |
| 16. | Define sterilization. | | 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. | With the help of neat diagrams, explain the V-I characteristics of a PV cell. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 18. | a. | Sketch neatly the flowchart of the maximum power point tracking (MPPT) algorithm and explain it in detail. | CO2 | | A | 12 |
|  |  |  |  | |  |  |
| 19. | a. | Construct a model used for Physio-Chemical treatment. | CO3 | | A | 6 |
|  | b. | Explain the terms secured landfills and Incinerators | CO3 | | U | 6 |
|  |  |  |  | |  |  |
| 20. | a. | List the IEEE 519 guidelines for power quality in critical facilities. | CO4 | | R | 4 |
|  | b. | Show the functionalities of national electrical codes NFPA 110, and NFPA 780. | CO4 | | U | 4 |
|  | c. | Summarize the terms Disposal and Disinfection. | CO4 | | U | 4 |
|  |  |  |  | |  |  |
| 21. | a. | Design a solar-powered Health clinic by considering the following critical loads.   |  |  |  |  | | --- | --- | --- | --- | | **S. No** | **EQUIPMENT** | **POWER RATING (Watts)** | **No of hours used** | | 1 | Computer | 200 | 6 | | 2 | Lights | 70 | 10 | | 3 | Fans | 75 | 12 | | 4 | Microscope | 15 | 6 | | 5 | Centrifuge nebulizer | 150 | 2 | | 6 | Vaporizer | 40 | 3 | | 7 | Oxygen concentrator | 300 | 3 | | CO5 | | C | 12 |
|  |  |  |  | |  |  |
| 22. | a. | Identify the power electronic converters used for Solar Systems. Explain each one with suitable diagrams. | CO1 | | U | 12 |
|  |  |  |  | |  |  |
| 23. | a. | Illustrate the working of the solar air conditioning system. | CO5 | | U | 12 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Develop the required power system for the mobile hospital. List the different requirements. Explain the various blocks involved in the development with suitable diagrams. | CO6 | | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic physics of solar power generation. |
| CO2 | Summarize the solar thermal power generation technologies |
| CO3 | Explain the bio and clinical waste to energy generation. |
| CO4 | Describe the various electrical codes for Power station in a hospital. |
| CO5 | Explain the various applications of Solar Power for a hospital. |
| CO6 | Plan for the Emergency Power units for a hospital using Renewable Energy Sources |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 4 | 25 | - | - | - | - | 29 |
| CO2 | 1 | 4 | 12 |  |  |  | 17 |
| CO3 | - | 11 | 6 | - | - | - | 17 |
| CO4 | 2 | 15 | - | - | - | - | 17 |
| CO5 | - | 16 | - | - | - | 12 | 28 |
| CO6 | 3 | 1 | 12 | - | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **19EE2027** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL SAFETY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | If a person is affected with 0.5 to 3mA of current, how he will be affected? | | CO1 | U | 1 |
| 2. | Abbreviation for OSHA. | | CO1 | R | 1 |
| 3. | The device that disconnects the supply automatically if current exceeds the normal value is known as\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 4. | The sound energy from blasts and pressure waves can reach to the maximum of \_\_\_\_\_\_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 5. | Define Insulators and give few examples for insulators. | | CO3 | R | 1 |
| 6. | Voltage between the feet of a Pearson standing near and energized grounded object is known as. | | CO3 | U | 1 |
| 7. | What purpose does the energy control program serve? | | CO4 | R | 1 |
| 8. | What are the advantages of adhering to OSHA regulations? | | CO4 | R | 1 |
| 9. | Expand the term NESC. | | CO5 | R | 1 |
| 10. | Earth Fault Loop Impedance is denoted as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Classify step and touch potential. | | CO1 | U | 3 |
| 12. | Contrast the consequences occurred due to arc blasts. | | CO2 | An | 3 |
| 13. | Assume you witnessed someone getting an electric shock; how you will react? | | CO3 | An | 3 |
| 14. | Extend the intent of energy control programs. | | CO4 | U | 3 |
| 15. | List down the major Properties of Electrical Conductor. | | CO5 | R | 3 |
| 16. | What are the key benefits of electrical equipment maintenance? | | 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. | With a neat diagram, explain different types of earthing. | CO1 | C | 6 |
|  | b. | Classify the different classes of electrical equipment. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Before starting an electrical machinery work, what all are the key parameters which needed to be checked? | CO1 | An | 6 |
|  | b. | Examine the difference between conductors and insulators. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Assume that you are working with low voltage electrical equipment. List the fundamental safety precautions that you must observe. | CO2 | An | 6 |
|  | b. | Differentiate between a circuit breaker and a relay. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Create a flowchart to help you decide whether a circuit needs to be worked on when it is energized. | CO3 | C | 12 |
|  |  |  |  |  |  |
| 21. | a. | What are the highlighted responsibilities and Rights of Employers according to OSHA? | CO4 | R | 7 |
|  | b. | Write down the key functions of NFPA and IEEE in electrical safety. | CO4 | U | 5 |
|  |  |  |  |  |  |
| 22. | a. | Create a self-evaluating checklist for electrical power distribution. | CO5 | E | 7 |
|  | b. | List why barriers are needed in electrical safety. | CO5 | R | 5 |
|  |  |  |  |  |  |
| 23. | a. | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Calculate the wire size in AWG for a single-phase power supply operating at 110 V with a 2% acceptable voltage drop. The single copper conductor runs for 75m with a maximum peak current of 25A and an operating temperature of 50°C. Copper has a resistivity of at 20°C. Refer below table for to AWG conversion.   |  |  |  |  | | --- | --- | --- | --- | | American Wire Gauge (AWG) | Diameter (inches) | Diameter (mm) | Cross Sectional Area (mm2) | | 0000 | 0.46 | 11.68 | 107.16 | | 000 | 0.4096 | 10.40 | 84.97 | | 00 | 0.3648 | 9.27 | 67.40 | | 0 | 0.3249 | 8.25 | 53.46 | | 1 | 0.2893 | 7.35 | 42.39 | | 2 | 0.2576 | 6.54 | 33.61 | | 3 | 0.2294 | 5.83 | 26.65 | | 4 | 0.2043 | 5.19 | 21.14 | | 5 | 0.1819 | 4.62 | 16.76 | | 6 | 0.162 | 4.11 | 13.29 | | 7 | 0.1443 | 3.67 | 10.55 | | 8 | 0.1285 | 3.26 | 8.36 | | 9 | 0.1144 | 2.91 | 6.63 | | 10 | 0.1019 | 2.59 | 5.26 | | 11 | 0.0907 | 2.30 | 4.17 | | 12 | 0.0808 | 2.05 | 3.31 | | 13 | 0.072 | 1.83 | 2.63 | | 14 | 0.0641 | 1.63 | 2.08 | | 15 | 0.0571 | 1.45 | 1.65 | | 16 | 0.0508 | 1.29 | 1.31 | | 17 | 0.0453 | 1.15 | 1.04 | | 18 | 0.0403 | 1.02 | 0.82 | | 19 | 0.0359 | 0.91 | 0.65 | | 20 | 0.032 | 0.81 | 0.52 | | 21 | 0.0285 | 0.72 | 0.41 | | 22 | 0.0254 | 0.65 | 0.33 | | 23 | 0.0226 | 0.57 | 0.26 | | 24 | 0.0201 | 0.51 | 0.20 | | 25 | 0.0179 | 0.45 | 0.16 | | 26 | 0.0159 | 0.40 | 0.13 | | | CO5 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Draw the schematic diagram for Earth Loop Path due to Earth Fault in TNS system. | CO6 | U | 6 |
|  | b. | Explain the step-by-step process for measuring Continuity in an Electrical Device. | CO6 | U | 6 |

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

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Describe the effects of electrical hazards on human body. |
| CO2 | Discover the potential of electrical hazard in the workplace. |
| CO3 | Identify the right safety procedure/method for the electrical accident that happened. |
| CO4 | Comprehend on the function of electrical safety equipment’s. |
| CO5 | Apply the appropriate electrical safety code prescribed by the regulatory bodies. |
| CO6 | Test the electrical safety systems and apply them in real-time applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 10 | - | 12 | - | 6 | 29 |
| CO2 | 2 | 6 | - | 9 | - | - | 17 |
| CO3 | 1 | 1 | - | 3 | - | 12 | 17 |
| CO4 | 9 | 8 | - | - | - | - | 17 |
| CO5 | 9 | - | - | - | 19 | - | 28 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **19EE2040** | **Duration** | **3hrs** |
| **Course Name** | **AI FOR ELECTRIC AND HYBRID VEHICLES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | State the reason why problem formulation should follow goal formulation. | | CO1 | R | 1 |
| 2. | Represent the advantage of heuristic search. | | CO2 | U | 1 |
| 3. | Indicate how depth-first search explore the search space. | | CO2 | U | 1 |
| 4. | State the reason why conditional probability table is needed in a Bayesian Network. | | CO3 | R | 1 |
| 5. | Represent P(A|B). | | CO3 | U | 1 |
| 6. | Identify the iteration technique used in dynamic programming algorithm to find the optimal policy for an MDP. | | CO4 | U | 1 |
| 7. | Indicate the purpose of direct utility estimation in in reinforcement learning | | CO5 | U | 1 |
| 8. | Interpret the function of a current sensor in a battery management system. | | CO6 | U | 1 |
| 9. | Interpret the uniqueness of parallel configuration in an EV. | | CO6 | U | 1 |
| 10. | List any two hybrid power sources. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Identify various elements of an agent and the characteristics of an intelligent agent. | | CO1 | U | 3 |
| 12. | Recall the Characteristics of a rational agent | | CO1 | R | 3 |
| 13. | Summarize the advantages of the breadth-first search algorithm. | | CO2 | U | 3 |
| 14. | Interpret the probability of rolling an even number on a fair six-sided die. | | CO3 | U | 3 |
| 15. | Differentiate between value iteration and policy iteration | | CO4 | U | 3 |
| 16. | Represent the difference in the operation of hybrid EV and EV | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. |  | Explicate the game search algorithm with an example. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | Interpret the Best-First search algorithm with an example. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Discuss construction and inference of Bayesian Networks with an example. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Deduce the purpose of policy iteration and partially observable MDPs in providing decision-making under uncertainty. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain model-free and model based reinforcement learning. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Show that utility functions are an essential concept in decision theory and reinforcement learning. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Illustrate and explain the components in Hidden Markov model formulation. | CO3 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | With a block diagram, explain the battery management modeling. | CO6 | U | 12 |

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

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic structure of AI |
| CO2 | Formulate search algorithms for AI |
| CO3 | Build Bayesian network for typical processes. |
| CO4 | Formulate Markov decision process. |
| CO5 | Know the concept of reinforcement learning. |
| CO6 | Apply reinforcement learning for vehicle power management |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 15 | - | - | - | - | 19 |
| CO2 | - | 17 | - | - | - | - | 17 |
| CO3 | 1 | 28 | - | - | - | - | 29 |
| CO4 | - | 16 | - | 12 | - | - | 28 |
| CO5 | - | 13 | - | - | - | - | 13 |
| CO6 | 1 | 17 | - | - | - | - | 18 |
|  | | | | | | | **124** |



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| **Course Code** | **20EE1001** | **Duration** | **3hrs** |
| **Course Name** | **BASIC ELECTRICAL AND COMPUTER ENGINEERING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | \_\_\_\_\_\_\_\_\_\_ is used to carry the water from valve house to power house in hydro power plant. | | CO1 | U | 1 |
| 2. | If the frequency of an AC system is 50Hz, find the time-period (T). | | CO1 | R | 1 |
| 3. | Mention any two motors used in Robotics. | | CO2 | R | 1 |
| 4. | For high torque applications, DC \_\_\_\_\_ motors are preferable. | | CO2 | R | 1 |
| 5. | Name the Universal Logic Gates. | | CO3 | R | 1 |
| 6. | In semiconductor devices, UJT stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | CO3 | U | 1 |
| 7. | Give an example of Embedded memory microcontroller. | | CO4 | U | 1 |
| 8. | Normal blood pressure level is \_\_\_\_mmHg / \_\_\_\_mmHg. | | CO4 | R | 1 |
| 9. | MAC Address is the example of \_\_\_\_\_\_ layer. | | CO5 | U | 1 |
| 10. | \_\_\_\_\_ is a technique which enables machines to mimic human behavior. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Define earthing. | | CO1 | U | 3 |
| 12. | List the components of electric vehicles. | | CO2 | U | 3 |
| 13. | Compare the Arduino Uno and Raspberry pi. | | CO3 | An | 3 |
| 14. | Mention the advantages of Industry 4.0 | | CO4 | U | 3 |
| 15. | Compare WLAN and Bluetooth | | CO5 | An | 3 |
| 16. | Name the 5G spectrum Bands and service providers in India. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | An alternating sinusoidal current equation is given by i = 200 sin 314𝑡. Obtain Iavg, Irms, form factor, peak factor, frequency and time period. | CO1 | U | 6 |
|  | b. | Draw the wiring diagram of a fluorescent lamp and explain the working principle. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the working principle of 3-phase Induction motor with the help of a neat diagram. | CO2 | U | 8 |
|  | b. | Compare BLDC Motor with Brushed DC motor. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. | a. | Discuss the operation of the AND, OR, NOT, NOR, NAND and EXNOR logic gates using the truth table. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | With a neat block diagram, explain automatic irrigation system. | CO4 | U | 6 |
|  | b. | Sketch the diagram of water level indicator using microcontroller. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 21. | a. | Examine the components, features and types of operating system. | CO5 | An | 8 |
|  | b. | Compare RAM and ROM. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. | a. | Distinguish between BJT and MOSFET. | CO3 | U | 6 |
|  | b. | Sketch the diagram of soil moisture measurement circuit. | CO4 | R | 6 |
|  |  |  |  |  |  |
| 23. | a. | Describe the six design principles of Industry 4.0 | CO3 | R | 6 |
|  | b. | A household uses the following electric appliance  a. Refrigerator of rating 200w for 10hrs.  b. Two BLDC fans of rating 40w each for 12hrs each day.  c. 6 LED bulbs of rating 10w each for 8hrs each day.  Calculate the electric bill of the house for the month of June if the cost of per unit electrical energy is ₹3.0 | CO1 | An | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the role of AI in Food Industries. | CO6 | U | 6 |
|  | b. | Elucidate the basic components and working of IoT. | CO6 | U | 6 |

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

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the basics and usage of electric grids, power supply, wiring and safety in domestic and commercial electrical areas. |
| CO2 | Apply the working of electrical machines in daily life and other applications. |
| CO3 | Recognize the need of electronic circuits in digital circuits and devices. |
| CO4 | Identify the characteristics and applications of sensors and transducers. |
| CO5 | Classify the role of computers in daily and commercial applications. |
| CO6 | Understand the latest concepts in the computer and electrical trends. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 10 | - | 6 | - | - | 22 |
| CO2 | 2 | 15 | - | - | - | - | 17 |
| CO3 | 7 | 7 | 12 | 3 | - | - | 29 |
| CO4 | 13 | 10 | - | - | - | - | 23 |
| CO5 | 1 | 5 | - | 11 | - | - | 17 |
| CO6 | 4 | 12 | - | - | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20EE1003** | **Duration** | **3hrs** |
| **Course Name** | **SENSORS AND MEASUREMENT TECHNIQUES IN BIOTECHNOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | **House wiring is a parallel circuit. Justify.** | | CO1 | U | 1 |
| 2. | Write the expression for capacitance in terms of physical parameters. | | CO1 | R | 1 |
| 3. | Controlling torque has to oppose the deflecting torque in indicating instruments. Justify. | | CO2 | R | 1 |
| 4. | What is the role of signal conditioner in Electronic Power Meter? | | CO2 | R | 1 |
| 5. | Write any one application of CRO. | | CO3 | R | 1 |
| 6. | State any one advantage of capacitive touch screen. | | CO3 | R | 1 |
| 7. | Name any one optical property that can be sensed by optical sensor. | | CO4 | U | 1 |
| 8. | Define threshold of a sensor. | | CO4 | U | 1 |
| 9. | Give an example for displacement transducer. | | CO5 | R | 1 |
| 10. | Mention any one smart sensor used in Smart Cattle Monitoring. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write Ohm’s Law. Write the equation form of Ohm’s law. | | CO1 | U | 3 |
| 12. | Compare induction type energy meter with electronic energy meter. | | CO2 | U | 3 |
| 13. | Correlate the number of pixels with picture resolution in digital image. | | CO3 | U | 3 |
| 14. | List the applications of LDR. | | CO4 | U | 3 |
| 15. | State the working principle and applications of inductive transducers. | | CO5 | U | 3 |
| 16. | Define smart sensor in the context of IoT. | | 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 charge, current, voltage and power in electrical system. Mention their units. | CO1 | U | 6 |
|  | b. | Four resistors of 10 Ω, 4.2 Ω, 5.3 Ω and 6.5 Ω are connected in series across 52 V supply. Find the equivalent resistance, current and voltage across each resistor. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. |  | With neat diagram, outline the construction and working principle of Permanent Magnet Moving Coil Instrument. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the working of digital voltmeter (DVM). | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a | Illustrate how a capacitive touch screen locates the point of touch on the screen. | CO3 | U | 6 |
|  | b | Outline the recording process of an inkjet recorder. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Interpret the terms sensitivity and hysteresis in sensor systems. | CO4 | U | 6 |
|  | b. | Elaborate the solar irradiance measurement process using pyronometer. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 22. | a. | Summarize the applications of biosensors. | CO4 | R | 6 |
|  | b. | Explore the importance of E-Tongue in biotechnology. Present the layout of E-Tongue. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 23. |  | With simple diagram, explain the working of strain gauge. State few industrial applications of strain gauge. | CO5 | U | 12 |
| COMPULSORY QUESTION | | | | | |
| 24. |  | Smart biosensors can be applied for smart agriculture. Justify with a functional diagram. | CO6 | A | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic circuit components. |
| CO2 | Describe working of the electronic measuring instruments. |
| CO3 | Know the different display and recording devices. |
| CO4 | Identify sensors and instruments needed for measurement and control. |
| CO5 | Know the working principle and the characteristics of different transducers. |
| CO6 | Choose suitable smart sensors for various biotechnology applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 10 | 6 |  |  |  | 17 |
| CO2 | 2 | 27 |  |  |  |  | 29 |
| CO3 | 5 | 11 |  |  |  |  | 17 |
| CO4 |  | 33 | 8 |  |  |  | 29 |
| CO5 | 1 | 15 |  |  |  |  | 16 |
| CO6 | 1 | 16 |  |  |  |  | 16 |
|  | | | | | | | **124** |



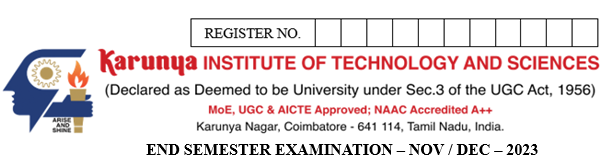
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| **Course Code** | **20EE2001** | **Duration** | **3hrs** |
| **Course Name** | **ELECTRIC VEHICLE DESIGN** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Regenerative braking is not possible in a \_\_\_\_ motor. | | CO1 | U | 1 |
| 2. | Carbon Dioxide (CO2) is a chief greenhouse gas – **True or False** | | CO1 | R | 1 |
| 3. | \_\_\_\_\_\_ device is preferred for DC chopper operation due to its high switching frequency. | | CO2 | R | 1 |
| 4. | The hall sensor in BLDC motor is placed after every \_\_\_ degree. | | CO2 | U | 1 |
| 5. | It is well known that the more aerodynamic a vehicle is, the \_\_\_ is its energy consumption. | | CO3 | U | 1 |
| 6. | A fully charged battery has SoD = 0 – **True or False**. | | CO3 | An | 1 |
| 7. | The main factors controlling co-efficient of rolling resistance (μrr) are the type of \_\_\_\_\_ and the tyre \_\_\_\_\_\_. | | CO4 | U | 1 |
| 8. | The expression for the effect of aerodynamic drag force (Fad) on a vehicle is given by \_\_\_\_\_\_\_\_\_\_\_. | | CO4 | U | 1 |
| 9. | Define a sensor. | | CO5 | U | 1 |
| 10. | \_\_\_\_\_ is a subset of AI technique which used statistical methods to enable machines to improve with experience. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Distinguish Electric and IC Engine vehicles with any 3 points. | | CO1 | An | 3 |
| 12. | Find the energy released in a flywheel, if I(moment of inertia) = 4, and ω(angular velocity) = 4 radians per second. | | CO2 | E | 3 |
| 13. | Draw the electric drive train diagram. | | CO3 | U | 3 |
| 14. | Sketch the dual out-wheel motor front-wheel drive on an electric powertrain configuration. | | CO4 | U | 3 |
| 15. | Mention any three optimization methods used in AI. | | CO5 | U | 3 |
| 16. | Compare the EV’s AudiE-tron and BMW iX | | 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. | Brief about the historical development of electric vehicle. | CO1 | U | 8 |
| 17. | b. | Distinguish lithium ion and lithium polymer batteries. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 18. | a. | Explain the four-quadrant operation of chopper-based DC motor with necessary diagrams and waveforms. | CO2 | U | 8 |
| b. | Outline the basic SRM drive system. | CO2 | A | 4 |
|  |  |  |  |  |  |
| 19. | a. | Determine the aero dynamic and rolling resistance design consideration of vehicle with necessary equations and diagrams. | CO3 | U | 8 |
| b. | If the μrr is 0.015,m=1000Kg, g=9.81m/s2 and v=200km/h, calculate the rolling drag Frr and power needed to overcome rolling Prr. | CO3 | E | 4 |
|  |  |  |  |  |  |
| 20. | a. | Discuss the DC motor modelling with necessary diagrams and equations. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | Discuss the history, system model and various level of the self-driving cars. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the total tractive effort in the analysis of an electric vehicle performance modelling with necessary diagrams. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Discuss the parallel hybrid and series-parallel hybrid configuration of hybrid vehicle with necessary diagrams | CO1 | U | 8 |
|  | Brief out ultra-capacitors | CO1 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the case study on Nissan Leaf. | CO6 | U | 12 |

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

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|  | **COURSE OUTCOMES** |
| CO1 | Realize the need of Electric vehicles |
| CO2 | State different types of Electric & Hybrid Vehicles |
| CO3 | Use the energy on-board optimally |
| CO4 | Understand the design and mathematical modelling of EV and drives |
| CO5 | Analyze the latest control techniques for vehicle control |
| CO6 | Simulate and observe the behaviour of the EV |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 17 | - | 7 | - | - | 29 |
| CO2 | 1 | 9 | 4 | - | 3 | - | 17 |
| CO3 | - | 12 | - | 1 | 4 | - | 17 |
| CO4 | - | 29 | - | - | - | - | 29 |
| CO5 | - | 17 | - | - | - | - | 17 |
| CO6 | - | 12 | - | 3 | - | - | 15 |
|  | | | | | | | **124** |



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| **Course Code** | **20EE3001** | **Duration** | **3hrs** |
| **Course Name** | **IOT FOR FOOD INDUSTRIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Differentiate the physical and logical design of IoT. | CO1 | U | 10 |
| b. | Explain with a block diagram the simple communication model. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the Service-oriented Architecture of IoT in detail. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | Draw the hardware architecture of an embedded system. | CO3 | U | 10 |
| b. | Compare Arduino and Raspberry Pi Microcontrollers. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Compare TCP and UDP. | CO4 | U | 10 |
| b. | Analyze the network level challenges of IoT. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the Smart prepackaged food lifecycle management service with a neat diagram. | CO5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the features, advantages, applications and seven guiding principles of Service-oriented Architecture. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | Analyze smart farming using remote sensing techniques. | CO6 | An | 10 |
| b. | Discuss the role of the 5G network on smart farming. | CO6 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Examine the need of Quality Assurance (QA) in the process of delivery of a truly end-to-end production level IoT system. | CO5 | An | 10 |
| b. | Compare cloud, edge cloud and edge computing. | CO3 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss the role of Nanosensors in agriculture and food industry with necessary block diagrams and schematics. | CO6 | An | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concepts of Internet of Things. |
| CO2 | Understand the design architecture of IoT and its concepts. |
| CO3 | Select appropriate components for developing IoT hardware. |
| CO4 | Choose suitable protocols and deployment in solutions. |
| CO5 | Learn the concepts of food supply chain |
| CO6 | Understand the IoT based Monitoring system |

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



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| **Course Code** | **23EE1002** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF ELECTRICAL AND COMPUTER ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Indicate the electromechanical device which is used to protect an electrical circuit from an overcurrent. | | CO1 | U | 1 |
| 2. | Give two examples of star-rated equipment. | | CO1 | U | 1 |
| 3. | List the applications of stepper motor. | | CO2 | R | 1 |
| 4. | Indicate the motor used in the Mixer. | | CO2 | U | 1 |
| 5. | Give examples of semiconductor material. | | CO3 | U | 1 |
| 6. | Represent the universal logic gates. | | CO3 | U | 1 |
| 7. | List the types of transducers. | | CO4 | R | 1 |
| 8. | Name the sensors used in altitude and pressure measurement in aircraft. | | CO4 | R | 1 |
| 9. | Represent the use of WLAN. | | CO5 | U | 1 |
| 10. | Show the significance of cloud computing. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Compute the resistance of the current flowing through a 40 W filament lamp powered up by 240 V operating at normal operating temperature. | | CO1 | A | 3 |
| 12. | State Faraday's law of electromagnetic induction. | | CO2 | R | 3 |
| 13. | Sketch the output of the full wave rectifier circuit. | | CO3 | A | 3 |
| 14. | Write short notes on Industry 4.0. | | CO4 | A | 3 |
| 15. | Differentiate MAC address and IP address. | | CO5 | U | 3 |
| 16. | List the characteristics of big data. | | 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. |  | Give examples of conventional energy sources. With a proper diagram, explain the working of the thermal power plant. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | With a neat diagram, explain the working principle and construction of the DC motor. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe the construction and working of the NPN transistor with a neat sketch. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Sketch the block diagram of the automatic irrigation system. Explain the role of each block. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Define computer network. With relevant diagrams, explain the features of LAN, WAN and MAN. | CO5 | R | 12 |
|  |  |  |  |  |  |
| 22. |  | Discuss the operation of the AND, OR, NOT, NOR, EXOR and EXNOR gates using the truth table. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Calculate the energy consumed per month by the following electrical appliances.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | S.N | Name of the load | Quantity | Wattage | Operating hours | | 1 | Fluorescent lamp | 5 | 40W | 5 | | 2 | Ceiling Fan | 2 | 60W | 10 | | 3 | Refrigerator(165L) | 1 | 100W | 24 | | 4 | Air Conditioner | 1 | 1500W | 6 | | 5 | Mixer | 1 | 450W | 1 | | 6 | LED Television | 1 | 100W | 8 | | CO1 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Sketch neatly and explain the basic functioning of an artificial neural network. | CO6 | A | 12 |

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

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the basics and usage of electric grids, power supply, wiring and safety in domestic  and commercial electrical areas. |
| CO2 | Apply the working of electrical machines in daily life and other applications. |
| CO3 | Recognize the need of electronic circuits in digital circuits and devices. |
| CO4 | Categorize the characteristics and applications of sensors and transducers. |
| CO5 | Classify the role of computers in daily and commercial applications. |
| CO6 | Comprehend the latest concepts in the computer and electrical trends. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 15 | 15 | - | - | - | 30 |
| CO2 | 3 | 13 | - | - | - | - | 16 |
| CO3 | - | 26 | 3 | - | - | - | 29 |
| CO4 | 2 | - | 15 | - | - | - | 17 |
| CO5 | 12 | 4 | - | - | - | - | 16 |
| CO6 | 3 | 1 | 12 | - | - | - | 16 |
|  | | | | | | | **124** |