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Question Paper Code: U9473

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Open Elective

Electronics and Communication Engineering

21UEC973- SENSORS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5Marks)

1. What is the main function of an ultrasonic sensor? CO1-U
(a) To detect the temperature of an object (b) To measure light intensity
(c) To measure distance by emitting sound waves (d) To measure pressure in a system
2. Which of the following transducers is used to measure light intensity? CO1-U
(a) Phototransistor (b) Strain gauge (c) Thermistor (d) Capacitive sensor
3. Which of the following is a commonly used material for electrodes in electro analytical sensors due to its high conductivity and stability? CO1-U
(a) Copper (b) Gold (c) Iron (d) Graphene
4. Which device is often integrated with digital transducers to process the digital signals? CO1-U
(a) Voltage regulator (b) Microcontroller (c) Transformer (d) Oscilloscope
5. Which of the following is a transducer commonly used in biosensors? CO1-U
(a) Thermistor (b) Photodiode (c) Strain gauge (d) Capacitor

PART – B (5 x 3= 15 Marks)

6. State the various techniques used for thin film deposition. CO1-U
7. Infer the effect of frequency on eddy current dissipation and eddy loss dissipation. CO1-U
8. Illustrate the important characteristics that need to be considered for the photo detectors. CO1-U

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| 9. | Draw the circuit of smart transmitter. | CO1-U |
| 10. | List out the classification of fluid velocity. | CO1-U |

PART – C (5 x 16= 80 Marks)

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| 11. | (a) Investigate the impact of material properties, waveform characteristics, and surrounding medium on the effectiveness of ultrasonic sensors in distance measurement and object detection. | CO3-App | (16) |
| | Or | | |
| | (b) How would you apply advanced semiconductor fabrication techniques to create a system-on-chip (SoC) for a mobile device, optimizing both performance and battery life | CO3-App | (16) |
| 12. | (a) Explain the working principle and operation of a Linear Variable Differential Transformer (LVDT). Describe its construction, advantages, and applications with suitable diagrams. | CO1-U | (16) |
| | Or | | |
| | (b) Describe how magnetic thermometers are applied in industrial processes, such as monitoring high temperatures in chemical reactors or furnaces. | CO1-U | (16) |
| 13. | (a) Illustrate the basic principle and working of Nuclear Radiation Sensors. Describe how Nuclear sensors are used in other industrial applications. | CO1-U | (16) |
| | Or | | |
| | (b) Describe the role of electrochemical cells in industrial applications such as electroplating, and explain the function of electrodes and electrolytes | CO1-U | (16) |
| 14. | (a) Design a water distribution system for a multi-story building that uses pressure control switches to maintain consistent water pressure across all floors. Apply your knowledge of pressure sensors and control systems to ensure water flow is optimized and pressure fluctuations are minimized. | CO3-App | (16) |
| | Or | | |
| | (b) Design an energy-efficient smart home system that controls lighting, heating, and appliances based on occupancy and energy consumption patterns. Apply principles of energy conservation and smart sensor integration to minimize electricity usage and reduce costs. | CO3-App | (16) |

15. (a) Classify the components of RTD and Hybrid IC temperature sensor and extend their performance in high-temperature environments like an automobile engine. CO4-Ana (16)

Or

- (b) Examine the V-I characteristics of an oxygen sensor with respect to the influence of oxygen concentration, resistance (ρ), and transition resistance (ρ_{on}). How do variations in oxygen levels and resistance values affect the sensor's voltage and current behavior? CO4-Ana (16)

