**20EI305**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **January, 2024** | **Electronics and Instrumentation Engineering** | | |
| **Third Semester** | **Transducers** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | Define resolution with an example | CO1 | L1 | 1M |
|  | b) | Distinguish between precision and accuracy | CO1 | L2 | 1M |
|  | c) | Give an example of first order instrument | CO1 | L1 | 1M |
|  | d) | What is meant by loading effect | CO1 | L1 | 1M |
|  | e) | Define limiting error | CO1 | L1 | 1M |
|  | f) | Give some examples of inverse transducer | CO2 | L1 | 1M |
|  | g) | Distinguish between variable area and variable gap capacitive transducers | CO3 | L2 | 1M |
|  | h) | Define residual voltage in LVDT | CO2 | L1 | 1M |
|  | i) | Define charge sensitivity in piezoelectric transducer | CO3 | L1 | 1M |
|  | j) | Distinguish between RTD and thermistor | CO2 | L2 | 1M |
|  | k) | List the advantages of smart sensors | CO4 | L1 | 1M |
|  | l) | Explain the principle of ultrasonic sensor | CO4 | L2 | 1M |
|  | m) | Mention the applications of micro sensor | CO4 | L1 | 1M |
|  | n) | Distinguish between sensor and transducer | CO2 | L2 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Define the following terms with examples.   1. Linearity, ii) Threshold, iii) Hysteresis, iv) Dead Zone, v) span,   vi) Loading effect | CO1 | L1 | 7M |
|  | b) | A set of independent ten measurements were made to determine the weight of a lead shot. The weights in grams were 1.57,1.597,1.591,1.562,1.577,1.58,1.564,1.586,1.55,1.575. Determine the i) Arithmetic mean ii)Average deviation iii) Standard deviation and iv)Variance | CO1 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Classify various types of errors present in instruments and explain them briefly. | CO1 | L4 | 7M |
|  | b) | Derive the expression for time response of second order underdamped system when subjected to a unit step input | CO1 | L4 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Define a transducer and write about the classification of transducers. | CO2 | L1 | 7M |
|  | b) | Illustrate the operation of hot wire anemometer for flow rate measurement | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Explain the principle of operation of Rotary Variable differential transformer (RVDT) | CO2 | L2 | 7M |
|  | b) | Explain the different principles of working of inductive transducers. | CO2 | L2 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Explain how by using a differential arrangement ,a capacitive transducer which works on the principle of variation of capacitance with displacement between plates, the response can be made linear. | CO3 | L2 | 7M |
|  | b) | A capacitive transducer uses two quartz diaphragms of area 750mm2 separated by a distance of 3.5 mm. A pressure of 900KN/m2 when applied to the top diaphragm produces a deflection of 0.6mm.The capacitance is 370 pF when no pressure is applied to the diaphragms. Find the values of capacitance after the application of a pressure of 900kN/m2. | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Explain the operation of piezoelectric transducer and draw its equivalent circuit. | CO3 | L2 | 7M |
|  | b) | A quartz piezo electric crystal having a thickness of 2mm and voltage sensitivity of 0.055V-m/N is subjected to a pressure of 1.5MN/m2.Calculate the voltage output. If the permittivity of quartz is 40.6x10-12F/m, calculate its charge sensitivity. | CO3 | L3 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | With a neat block diagram, explain the operation of smart sensor. | CO4 | L2 | 7M |
|  | b) | Illustrate the operation of fiber optic sensors for temperature measurement. | CO4 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Demonstrate the operation of chemical sensors with a neat diagram | CO4 | L3 | 7M |
|  | b) | Describe the principle and operation of biosensors. | CO4 | L2 | 7M |

