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Question Paper Code : 51074

B.E/B.Tech DEGREE EXAMINATIONS, APRIL/MAY 2023.

Seventh Semester

Electronic And Communication Engineering

OIC 751 — TRANSDUCERS ENGINEERING

(Common to: Biomedical Engineering/Medical Electronics)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for calibration of measuring instruments?
2. Compare limiting error and probable error.
3. What causes loading effect on transducer?
4. Define resolution and sensitivity of a transducer.
5. Compare the characteristics of RTD and Thermistor.
6. What is the operating principle of piezoresistive sensor?
7. What is EI pickup?
8. Mention the applications of capacitive transducer.
9. List the important features of smart sensor.
10. What is a nanosensor?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the different types of error that can occur in the measuring instrument. (8)
- (ii) List the important factors to be considered for selection of transducers. (5)

Or

- (b) (i) Describe the different statistical methods of error analysis. (8)
- (ii) A series circuit is having three resistances whose values are given by $R_1=50\Omega \pm 3\%$, $R_2=65\Omega \pm 3\%$, $R_3=44\Omega \pm 3\%$ Determine the total resistance and the limiting value. (5)

12. (a) Explain with suitable examples the different static characteristic of transducer.

Or

- (b) Obtain the response of a first-order transducer when applied with test inputs such as step, ramp and impulse signal.
13. (a) What is Gauge factor? Derive the expression for gauge factor in strain gauge.

Or

- (b) (i) Illustrate with a neat diagram the operation of hot-wire anemometer. (8)
- (ii) Discuss the working of humidity sensor. (5)
14. (a) (i) Describe the construction and operation of condenser microphone. (8)
- (ii) Explain briefly the operation of variable reluctance sensor. (5)

Or

- (b) Describe with a neat diagram the construction, operation, characteristics and application of LVDT.
15. (a) (i) Explain the operation of piezoelectric transducer and give its applications. (8)
- (ii) Discuss the working of shaft encoder. (5)

Or

- (b) Illustrate with a neat diagram the operation of Hall effect transducer and also explain how it can be used for flux density measurement?

PART C — (1× 15 = 15 marks)

16. (a) A batch of colour coded resistors of value $8.6\text{ k}\Omega$ was measured and was found to have the following values: 8.75, 8.60, 8.65, 8.50, 8.70, 8.55, 8.80 and $8.55\text{ k}\Omega$. Determine the mean, standard deviation and probable error. Can any resistor be discarded on the basis of $\pm 2\sigma$ limits?

Or

- (b) A thickness measuring transducer system has a parallel plate capacitive sensor having a pair of plate of area $10\text{ cm}\times 20\text{ cm}$, which are separated by a distance of 0.02 cm , a mica sheet of thickness $0.01\pm 0.001\text{ cm}$ is being passed between the plates. Calculate the variation of capacitance when the dielectric constant of mica is 8 and the permittivity of air is $8.85\times 10^{-12}\text{ F/m}$.