

Reg. No.

Question Paper Code

11703

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20EIPC302 - SENSORS AND TRANSDUCERS

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level,CO</i> |
|---|------------------------------|
| 1. Classify Standards. | 2,K1,CO1 |
| 2. A series circuit is having three resistances given by $R_1 = 37 \Omega + 5\%$, $R_2 = 75 \Omega + 5\%$, $R_3 = 50 \Omega + 5\%$. Determine the total resistance and limiting error. | 2,K2,CO1 |
| 3. Obtain the steady state error for the first order system when subjected to unit impulse input. | 2,K2,CO2 |
| 4. Define time constant and dynamic error. | 2,K1,CO2 |
| 5. Explain the characteristics of RTD. | 2,K2,CO3 |
| 6. Write the principle of a hot wire anemometer. | 2,K2,CO3 |
| 7. Write few applications of LVDT. | 2,K2,CO4 |
| 8. Define the principle of Capacitor Microphone. | 2,K1,CO4 |
| 9. Compare and contrast digital and analog transducers. | 2,K2,CO5 |
| 10. Mention the few advantages of Magneto elastic sensors. | 2,K2,CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) (i) Explain the different classification of errors in the measurement System. 8,K2,CO1
(ii) Describe the various factors affecting the selection of transducers. 5,K2,CO1

OR

- b) In a test, temperature is measured 100 times with variations in apparatus and procedures. After supplying corrections, the results are 13,K3,CO1

Temp in degree C	397	398	399	400	401	402	403	404	405
Frequency	1	3	12	23	37	16	4	2	2

Find the (i) Mean (ii) Average deviation (iii) Standard deviation (iv) probable error of one reading (v) the probable error of mean (vi) Range (vii) variance (viii) standard deviation of standard deviation.

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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12. a) Derive the Step response of the Second order system for under damped critically damped and undamped conditions. 13,K2,CO2

OR

- b) Describe the static characteristics of transducer with appropriate sketches. 13,K2,CO2

13. a) (i) Explain the construction, working principle of Thermistor. 6,K2,CO3
(ii) Derive the Gauge factor of strain gauge. 7,K2,CO3

OR

- b) Explain the function of RTD with two, three and four lead configurations. 13,K2,CO3

14. a) Describe the principle of operation, construction details, and characteristics of LVDT. 13,K2,CO4

OR

- b) (i) A capacitive transducer has two plates of area 20cm^2 each, separated by an air gap of 4 mm thickness. Find the displacement sensitivity due to gap change. 7,K2,CO4

- (ii) The output of an LVDT is 15 V for a displacement of 14.5mm. Determine the output voltage for a core displacement of 10mm. 6,K2,CO4

15. a) Describe MEMS technology. Explain different manufacturing processes for MEMS. 13,K2,CO5

OR

- b) (i) Explain two different types of Digital transducers in detail. 7,K2,CO5
(ii) Explain the working principle of Nano Sensor. 6,K2,CO5

PART - C (1 × 15 = 15 Marks)

16. a) Describe the principle of operation, construction details, and characteristics of Piezoelectric transducer and derive an expression for voltage sensitivity. 15,K2,CO5

OR

- b) (i) Explain the construction and working of Fiber optic sensors. 8,K2,CO5
(ii) Explain the working of air pollution environmental sensor. 7,K2,CO5