Reg. No. : | | | | | | | | | | | | |

T 3266

B.E./B. Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fourth Semester

(Regulation 2004)

Electronics and Instrumentation Engineering

EI 1252 — TRANSDUCER ENGINEERING

(Common to Instrumentation and Control Engineering)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What are Active and Passive transducers?

2. Distinguish between Static and Dynamic characteristics.

3. Define the terms "Resolution" and "Precision".

4. List and sketch the different standard inputs for analyzing dynamic characteristics of a system.

5. Mention any two advantages of semiconductor resistance thermometer.

6. Give any two materials used in the humidity sensors.

7. State the principle of Induction potentiometer.

8. Discuss the advantages of capacitive transducers (any four).

9. What is Villari effect? Write any one of the materials showing this effect.

10. What are smart sensors? Give an example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss in detail the various classifications of transducers with examples. (8)

(ii) Tow resistors R_1 and R_2 are connected in series and then in parallel. The values of resistances are $R_1 = 100.0 \pm 0.1\,\Omega$, $R_2 = 50.0 \pm 0.03\,\Omega$. Calculate the uncertainty in the combined resistance for both series and parallel. (8)

Or

(b) (i) Explain in detail the various classification of errors with examples and also discuss the methods of minimizing them. (10)

(ii) Two resistors $460\,\Omega \pm 10\%$ and $330\,\Omega \pm 5\%$ are connected in parallel. Calculate the effective resistance neglecting errors and effective resistance taking errors into consideration. (6)

12. (a) (i) Explain the terms "Static Sensitivity" and "Linearity". (8)

(ii) A mercury thermometer has a capillary tube of 0.3 mm diameter. If the bulb is made of zero expansion material, what volume must it have if a sensitivity of 3mm /°C is desired? Assume operating temperature be 20° C and co–efficient of volumetric expansion of mercury is 0.181×10^{-3} /°C. (8)

Or

(b) (i) Obtain and expression for the Impulse response and Ramp response of second order transducers. (8)

(ii) Discuss the identification of second order transducers using transducer model from step response and sinusoidal response. (8)

13. (a) (i) Describe the construction and the working of Resistance Potentiometers. (6)

(ii) Derive and expression for the error occurring in a resistance potentiometer when connected across a load of finite resistance. Also obtain the condition for maximum error. (10)

Or

(b) (i) Derive an expression for "Gauge Factor" of a Strain Gauge. (6)

(ii) Describe the construction and working of Constant Current Type and Constant Temperature Type Anemometers. (10)

14. (a) (i) Discuss the construction working of variable reluctance acclerometer. (8)

(ii) With neat diagrams explain the construction and working of LVDT Transducers. (8)

Or

(b) (i) Obtain an expression for the sensitivity of capacitance transducers for change in overlapping area of the plates and change in distance between the two plates. (8)

(ii) Describe the construction and working of capacitor microphone. (8)

15. (a) (i) With neat sketch discuss the different modes of operation of Piezoelectric crystals. (6)

(ii) Derive an expression for the Voltage sensitivity and Charge sensitivity of Piezoelectric transducers. (10)

Or

(b) (i) Describe in detail the fibre optic displacement transducer with its characteristic curves. (8)

(ii) What are digital transducers? Describe the construction and working of a digital transducer. (8)