Code No: NR221002 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
TRANSDUCERS IN INSTRUMENTATION
(Common to Electronics & Instrumentation Engineering and Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the following static characteristics with necessary examples and graphs:
   i. Accuracy
   ii. sensitivity
   iii. static error
   iv. Dead space
   v. Drift
   (b) A voltage has a true value of 1.50 volts. An Analog indicating instrument with a scale range of 0-2.50 volts shows a voltage of 1.46 volts. What are the values of absolute error and correction. Express the error as a traction of the true value and the full-scale deflection.

2. (a) Derive the differential equation describing the dynamics of mechanical translational system subjected to a step input force. Draw up a table showing analogy between mechanical and electrical quantities based upon force-voltage analogy .
   (b) An RC circuit consists of 1 μ F in series with a resistor of 5KΩ . A D.C voltage of 50 volts is suddenly applied across the circuit. Calculate the value of voltage after
   i. 5 m sec.
   ii. 25 m sec.

3. (a) Derive an expression for gauge factor of a strain gauge. Also find an expression for a four arm active Wheatstone bridge output used to measure strain.
   (b) Explain the classification of strain gauges with their salient features.

4. A parallel plate capacitive transducer uses plates of area 500 mm^2 which are separated by a distance of 0.2mm. Calculate the value of capacitance when the dielectric is air having a permittivity of 8.85 x10^{-12} f/m.
   (a) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm. Also calculate the ration of per unit change of capacitance to per unit change of displacement.
   (b) Suppose a mica sheet 0.01mm thick is inserted in the gap. Calculate the value of original capacitance and change in capacitance for the same displacement. Also calculate the ratio of per unit change in capacitance to per unit charge in displacement. The dielectric constant of mica is 8.

5. (a) Mention the features of piezo electric accelerometers.
   (b) How will you measure vibration using piezo electric pickup.
6. (a) What is meant by 'The Force-balance principle'.
   (b) List out the advantages and the disadvantages of Force-balance transducers and briefly explain their working with relevant diagram.
7. (a) Why is cold junction compensation necessary in temperature measuring schemes using thermocouples?
   (b) What is the recent trend in making such compensation.
8. (a) List the detectors used in radiation and optical pyrometers.
   (b) Explain the factors affecting the static accuracy of filled in thermometers.

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