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B. E. (Fourth Semester) Examination,  
Nov.-Dec., 2007

(ET & T Engg. Branch)

INDUSTRIAL TRANSDUCERS & SENSORS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt any two questions from each unit. All questions carry equal marks as is given.

Unit-I

- I. (a) Give characteristics and choice of Transducers. 3
- (b) A strain gauge with gauge factor of 2 is fastened to a metallic member subjected to a stress of  $1,000 \text{ kg/cm}^2$ . The modulus of elasticity of the metal is  $2 \times 10^6 \text{ kg/cm}^2$ . Calculate the percentage change in resistance

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of the strain gauge. What is value of Poisson's ratio? 5

- 2. (a) Give the measurement of Low pressure with Pirani Vacuum Gauge. 4
- (b) An LVDT is used for measuring deflection of a bellows. The sensitivity of LVDT is 40 V per mm. The bellows is deflected by 0.125 mm by a pressure of  $0.8 \times 10^6 \text{ N/m}^2$ . Determine the sensitivity of LVDT in V per  $\text{N/m}^2$  and the pressure when output voltage of LVDT is 3.5 V. 4

- 3. (a) Give the method of measurement of temperature by optical pyrometer. 4
- (b) A platinum resistance thermometer has a resistance of 120  $\Omega$  at 25°C. Determine its resistance at 75°C. The temperature coefficients of resistance of platinum at 25°C is 0.00392  $\Omega/\Omega/^\circ\text{C}$ .  
In case the resistance of thermometer is found to be 180  $\Omega$ , determine the temperature. 4

Unit-II

- 4. (a) What are the different methods of measurement of thickness. 3
- (b) A linear resistance potentiometer is 50 mm long and is uniformly wound with a wire having a resistance of 10,000  $\Omega$ . Under normal conditions, the slider is at the centre of potentiometer. Find the linear

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displacement when the resistance of the potentiometer as measured by Wheatstone bridge is 3850  $\Omega$  and 7560  $\Omega$ .

If it is possible to measure a minimum value of 10  $\Omega$  resistance with the above arrangement, find the resolution of potentiometer in mm. 5

- 5. (a) Write short note on capacitive transducer for measurement of level of a non-conducting liquid. 4
- (b) A parallel plate capacitive transducer is employed as a liquid level indicator in a chemical plant such that plates are immersed in liquid with the movable plate of transducer touching the upper surface of liquid. With the change in level of liquid, the movable plate of transducer is displaced. If the overlapping area of plates,  $A = 1 \text{ m}^2$  and the capacitance is found to be 29.5 nF, determine the change in the level of the liquid. Given  $\epsilon_r$  for liquid = 80,  $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/M}$ . 4
- 6. (a) How transducers working on principle of production of Eddy currents. 3
- (b) Explain the construction and principle of working of a linear voltage differential transformer (L.V.D.T.). Explain how the magnitude and direction of the displacement of cone of a L.V.D.T. is detected.

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