CBCS SCHEME

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15EE662

Sixth Semester B.E. Degree Examination, June/July 2018
Sensors and Transducers

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define transducer. What are the advantages and disadvantages of electrical transducers? **(06 Marks)**

b. Explain briefly the LVDT with neat diagram. **(04 Marks)**

c. A parallel plate capacitive transducer uses plates of area 250mm^2 which are separated by a distance 0.2mm.

i) Calculate the value of capacitance when the dielectric is air having a permittivity of 8.85×10^{-12}F/m

ii) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm. Also calculate the ratio of per unit change of capacitance to per unit change of displacement

iii) If 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 of capacitance to per unit change in displacement. The dielectric constant of mica is 8. **(06 Marks)**

OR

2 a. Explain the following terms : i) Sensitivity ii) Linearity iii) Resolution iv) Hysteresis v) Accuracy vi) Repeatability. **(06 Marks)**

b. The resistivity of semiconductor material was known to be 0.00912Ωm at room temperature. The flux density in the hall model was 0.48Wb/m^2. Calculate the hall angle for a hall co-efficient of 3.55×10^{-4}m^3/c. **(04 Marks)**

c. Explain the followings with neat diagram :

i) photoemissive cell

ii) photoconductive cell. **(06 Marks)**

Module-2

3 a. What is strain gauge? Explain briefly the followings with neat diagram.

i) Foil type strain gauge ii) Semiconductor strain gauge. **(07 Marks)**

b. A simple electrical strain gauge of resistance 120Ω and having a gauge factor of 2 is bounded to steel having an elastic limit stress of 400MN/m^2 and modulus of elasticity is 200GN/m^2. Calculate the change in resistance,

i) due to a change in stress equal to $\frac{1}{10}$ of the elastic range

ii) due to change of temperature of 20°C if the material is advance alloy. The resistance temperature co-efficient of advance alloy is 20×10^{-6}/°C. **(05 Marks)**

c. Define load cell. Explain briefly hydraulic load cell. **(04 Marks)**

OR

4 a. Explain the followings with neat diagram :
   i) Eddy current proximity sensor
   ii) Pneumatic sensor. **(08 Marks)**

   b. Define digital encoder. Explain various types of digital codes with an example. **(08 Marks)**

Module-3

5 a. Explain the components of a general measurement system with block diagram. **(04 Marks)**

   b. Explain briefly DC and AC signal conditioning system. **(06 Marks)**

   c. State the characteristics of an ideal Op-Amp. Explain the followings :
   i) Buffer amplifier
   ii) Differential amplifier. **(06 Marks)**

OR

6 a. What is a data acquisition system? Explain analog data acquisition system with suitable block diagram. **(04 Marks)**

   b. Explain single channel data acquisition system and multichannel analog multiplexed data equation system with neat diagram **(06 Marks)**

   c. Explain briefly the followings :
   i) Successive approximation analog to digital converter
   ii) R–2R loaded digital to analog converter. **(06 Marks)**

Module-4

7 a. Define "data transmission" and "Telemetry". Explain pneumatic transmission with diagram. **(04 Marks)**

   b. Explain briefly the following :
   i) Voltage telemetering system
   ii) Current telemetering system. **(08 Marks)**

   c. Explain amplitude modulation. **(04 Marks)**

OR

8 a. Define the following terms :
   i) Pressure ii) Atmospheric pressure iii) Gauge pressure iv) Absolute pressure v) Static pressure. **(05 Marks)**

   b. Describe the construction and working of a "Hot–Filament Ionization" gauge. **(05 Marks)**

   c. Describe the construction and working of "Dead Weight Tester". **(06 Marks)**

Module-5

9 a. What is temperature? How are temperature measuring instruments classified? **(07 Marks)**

   b. Give a comparison between "Thermistor" and "Metal Resistor". **(04 Marks)**

   c. Explain briefly the working of radiation pyrometer. **(05 Marks)**

OR

10 a. Explain with a neat sketch the working of electromagnetic flow meter. **(06 Marks)**

   b. Describe the following with neat diagram :
   i) Photoelectric Tachometer
   ii) DC Tachometer. **(06 Marks)**

   c. Explain the liquid level measurement using laser. **(04 Marks)**