Total No. of printed pages = 4

CAI-602/T&SC/6th Sem/M/2014

TRANSDUCER AND SIGNAL CONDITIONING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Define a Transducer. List five physical quantities that transducer measures. 4

   (b) A platinum thermometer has a resistance of 100Ω at 0°C.

   (i) Find the resistance at 90°C, if the platinum has a resistance temperature coefficient of 0.00392/°C.

   (ii) If the thermometer has a resistance of 180Ω, calculate the temperature. 4

   (c) Explain briefly about seeback effect based temperature sensor and its type. 6

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2. (a) What is synchro ? Explain it with suitable example. 7

(b) Explain the operation principle of LVDT. 5

(c) A resistance stain gauge with a guage factor of 3 is cemented to a steel member which is subjected to a stain of 1×10^{-6}. If the original resistance value of the gauge is 130Ω, calculate the charge in resistance. 2

3. (a) What is construction and principle of operation for capacitive transducer in differential arrangement ? 6

(b) A capacitive transducer uses two quartz diaphragms of area 750 mm^2 separated by a distance of 3.5 mm. A pressure of 900 kN/m^2 when applied to the top diaphragm produces a deflection of 0.6 mm. The capacitance is 370 pF when no pressure is applied to the diaphragms. Find the value of capacitance after the application of a pressure of 900 kN/m^2. 3

(c) Write short note on carbon microphone. 5

4. (a) Define piezoelectric effect and derive the equation for charge sensitivity of piezoelectric transducer. 8

(b) A quartz piezoelectric crystal having a thickness of 2 mm and voltage sensitivity of 0.055V-m/N is subjected to a pressure of 1.5 mN/m^2. Calculate the voltage output. If the permittivity of quartz is 40.6×10^{-12} F/m, calculate its charge sensitivity. 2

(c) Write short note on ultrasonic transducer. 4

5. (a) What is Tachogenerator ? Explain its type. 6

(b) Derive the equation for gauge factor in bonded resistance wire stain gauges. 8

6. (a) Explain about losed loop sample-hold circuit and its characteristics. 7

(b) What is A/D converter ? Explain successive approximation method of A/D conversion. 7

7. (a) Write short notes on any *two* : 2×5=10

(i) Resistance thermometer

(ii) Hot wire anemometer

(iii) Data acquisition system.

(b) Distinguish between self inductance and mutual inductance. 4