Total No. of printed pages = 4

CAI-602/T&SC/6th Sem/2017/M

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 *seven* questions.

1. Describe the different functional elements of a measurement system with the help of suitable example. 10

2. (a) Define the following :

   Bandwidth, Time Constant, Inverse transducer, Reproducibility and Precision. 5

   (b) Is load cell an active transducer ? Explain the working of load cell. 1+4=5

3. (a) What type of material is used for the construction of thermistor ?

   Describe the working of thermistor. 1+4=5

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(b) Illustrate the working of LVDT with the help of neat diagram. 5

4. (a) Explain how displacement can be measured using capacitive transducer ? 5

(b) A pressure measuring instrument uses a capacitive transducer having a spacing of 4 mm between its diaphragms. A pressure of 600kN/m^2 produces an average deflection of 0.3 mm of the diaphragm of the transducer. The transducer which has a capacitance of 300 pF before application of pressure and is connected in an oscillator circuit having a frequency of 100 kH$_Z$. Determine the change in frequency of the oscillator after the pressure is applied to the transducer. 5

5. (a) Derive the output voltage across a piezo electric transducer when a load of resistance $R_L || C_L$ is connected across it. 7

(b) A quartz piezo electric crystal having a thickness of 2 mm and voltage sensitivity of 0.055 Vm / N is subjected to a pressure of 1.5 MN/m^2. Calculate the voltage output. If the permittivity of quartz is $40{\cdot}6 \times 10^{-12}$ F/m, determine its charge sensitivity. 3

6. (a) Write about an application of hall effect transducer with the help of necessary diagram. 5

(b) Explain a method to sense the seismic pick up. 5

7. (a) How a photodiode can be used to sense the light intensity ?
What type of optoelectronic device is more sensitive to light intensity ? 4+1=5

(b) Explain the working of tachogenerator. 5

8. (a) Explain a method how a non-linear signal can be linerized. 5

(b) What do you mean by impedance matching ? With the help of necessary diagram, describe the operation of I to V Converter. 1+4=5

9. (a) Explain how successive approximation type A/D Converter works. 6

(b) Describe the operation of encoder and decoder used in DAS. 4

10. Write short notes on any two of the following :

(i) RTD

(ii) Ultrasonic transducer

(iii) Shaft encoder. 2×5=10