Ex/BESUS/ EE-611/06

B.E. (CST) Part-Ill 6th Semester Examination, 2006

Transducer and Instrumentation
(EE-611)

Time : 3 hours **Full** Marks : **100**

Use *separate answerscript for each half.*
Answer SIX questions, taking THREE from each half.
***Two** marks are reserved for neatness in each half.*

FIRST HALF

1. a) Explain the following terms with examples :
(i) Primary & secondary transducers, (ii) Active and passive transducers, (iii) Analog and digital transducers.

b) State the advantages of "electrical transducers".

c) Describe the block diagram of a data acquisition system and explain the function of each block. (6+3+7)

~*T.* "a") Distih^uTsffBetween a "resistance strain gauge" and "semiconductor strain gauge" on counts of linearity, accuracy, sensitivity and temperature dependance.

b) State the application areas of strain gauges.

c) A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m^2. The modulus of elasticity of steel is 200 GN/m^2. Calculate the percentage change in the value of the gauge resistance due to the applied stress. (7+3+6)

3. a) Draw and explain, how the LVDT can be used for the measurement of linear displacement.

b) State the advantages and disadvantages of LVDT.

(c) The output of an LVDT is connected to a 5V voltmeter through an amplifier with amplification factor 250. An output of 2mV appears accross the terminal of LVDT, when the core moves through a distance of 0.5 mm. Calculate the sensitivity of the LVDT and the whole set up. The mili-voltmeter scale has 100 divisions. The scale can be read to V5 of a division. Calculate the resolution of the instrument. (6+3+7)

4. a) Classify and briefly describe the various types of capacitive transducers.

b) How the parallel plate capacitor type transducer is used for liquid level detection. Draw the scheme and analyse. (8+8)

(EE-611)

Write short notes on <u>any two</u> of the following : (8x2)

a) Synchros

b) Digital transducers

c) Piezo-electric transducers

d) Temperature sensors.

SECOND HALF

6. a) Design a second order low pas filter (Butterworth type) with a cut-off frequency of 1 kHz. Select capacitor C of value 0.16 micro-Farad. What is the dc gain of the filter?

b) If one has to design a second order high pass filter with a low frequency cut off at 1 kHz, what changes are to be made in the circuit for low pass filter? Justify your statement (10+2+2+2)

7. a) Design a square-wave generator using OPAMP and R, C for 10 kHz oscillation. Take feedback factor (3 equal to 0.5. Choose capacitance of the order of 1 micro-Farad.

b) How do you modify the circuit for square wave generator to get a monostable multivibrator? If V_z is equal to 10 V, what will be the delay time with the same charge discharge circuit as in the square-wave generator? (8+4+4)

8. a) What are the two conditions for getting sustained sinusoidal oscillation from the output of an amplifier with feedback?

b) Design a Wein-Bridge sinusoidal oscillator circuit for 10 kHz oscillation. Select values of C in the order of micro-Farad and values of R in the order of K ohms. (8+8)

9. a) What are the essential properties of an Instrumentation amplifier?

b) Why a simple subtractor circuit using single OPAMP is not an ideal instrumentation amplifier.

c) Explain the operation of a three-opamp realisation of Instrumentation amplifier. (6+4+6)

10. Write short notes on <u>any two</u> : (8+8)

(a) V-I converter with grounded load

(b) Improved S/H circuit

(c) Isolation amplifier

(d) Flash type ADC.