B.E. (MET) Part-II
3rd Semester FINAL Examination, 2011
Sub: Instrumentation and Control (ET-306)

Full Marks – 70. Time – 3 Hrs.

Answer any **Five** questions
Answer should be brief and to the point
Unnecessary lengthy answers may result in ***loss of marks***.

1. a) What is transducer? What are the differences between active and passive transducer? State the advantages of electrical transducers.

   b) A displacement transducer with a shaft stroke of 3 in is applied to the circuit of Resistance Position Transducer. The total resistance of the potentiometer is 5 k ohm. The applied voltage is 5 volt, when the wiper is 0.9 in from the terminal position, what is the value of output voltage?

   c) Explain the following terms with example: Photo voltaic cell, Piezo electric transducer. [4+4+6]

2. a) Define Gauge Factor of a Strain Gauge, Deduce the relation between gauge factor and Poisson's ratio.

   b) A resistance strain gauge with a gauge factor of 3 is cemented to a steel member, which is subjected to a strain of 2×10^{-6}. If the original resistance value of the gauge is 120ohm, Calculate change in resistance.

   [8+6]

3. a) With proper diagram explain the operation of LVDT.

   b) An LVDT has a secondary voltage 6 V for a displacement of +11.5mm. Determine the output voltage for a core displacement of 8 mm from its control position

   c) Explain the operation of Thermocouple.

   [6+4+4]

4. a) Write short notes (Any Two) on : Inductive Transducer , RTD , Magnetic Flow meter.

   b) What do you mean by Thermistor. Write various configurations of Thermistor.

   [8+6]

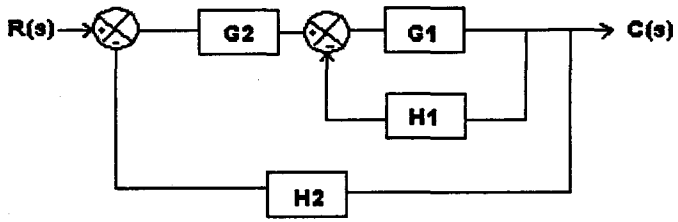
5. a) What do you mean by Open loop and closed-loop system? Write the advantages of a closed-loop system.

b) For Unit Ramp input find out Steady State Error.

c) Define 'Delay time' , 'Settling time' and 'Peak Overshoot'.

[4+4+6]

6. a) Derive the closed loop transfer function for unit feedback, and Obtain the transfer function C (S) /R (S) of the following block diagram.



b) Describe and compare the characteristics of Proportional plus Derivative control and Proportional plus Integral control.

[7+7]

7. a) What do you mean by linear time invariant system?
b) Find out frequency domain form of following Signals using Laplace transform. Unit impulse, Unit step, and Sinusoidal signal.
c) Define the terms 'stability' & 'sensitivity'. Show that sensitivity of a open loop system is 1. [2+6+6]

8. a) What do you mean by Single channel Data Acquisition System? Define Resolution.
b) For a five bit resistive divider find out output voltage for a digital input of 10110 (assuming 0=0 volt and 1=+10 volt) .
c) Explain with diagram Ladder type D/A Converter.

[6+4+4]