



Assume any missing data....Exam is two pages.

Attempt the following questions:

Max. Marks (50)

Question 1:

(20marks)

(1-a) Describe the difference between the following:

(12marks)

- Active and Passive transducers.
- Sensitivity and Resolution.
- LVDT and push-pull displacement sensors.
- Incremental and absolute encoders.
- Bimetallic strip and thermocouples temperature sensors.
- Hall Effect and optical encoder sensors.

(1-b) A displacement sensor has an input range of 0.0 to 3.0 cm. Results from a calibration experiment are given in the table below

(8marks)

Displacement x (cm)	0.0	0.5	1.0	1.5	2.0	2.5	3.0
Output voltage (mV)	0.0	16.5	32.0	44.0	51.5	55.5	58.0

Calculate the maximum non-linearity as a percentage of the full-scale deflection (f.s.d.)

Question 2:

(16marks)

(2-a) The individual sensitivities of different elements comparing a temperature measuring system are: Transducer =  $0.7 \text{ ohm}/^{\circ}\text{C}$ , Wheatstone bridge =  $0.03 \text{ v/ohm}$ , amplifier =  $100 \text{ v/v}$ , pen recorder =  $1.5 \text{ mm/v}$ . Determine the overall sensitivity and the temperature change corresponding to a pen recorder movement of 20mm. (8marks)

(2-b) A strain gauge is bonded to a beam of 160 mm long and having a cross sectional area of  $4.8 \text{ cm}^2$ . Young's modulus for steel is  $200 \text{ G Pa}$ . the strain gauge has an unstrained resistance of  $300 \Omega$  and a GF of 2. When a load is applied, the resistance of gauge changes by  $0.022 \Omega$ . Find the change in length of the steel beam and the amount of force applied to the beam. (8marks)

Question 3:

(3-a) The output of an LVDT is connected to a 10A ammeter through an amplifier whose amplification factor is 250. An output of 3 mA appears across the terminals of LVDT when the core moves through a distance of 0.83 mm. (8marks)

I. Calculate the sensitivity of LVDT and that of whole set up.

The milli\_ammeter scale has 100 divisions. The scale can be read to 1/10 of a division.

II. Determine the resolution of the instrument in mm.

(3-b) A  $250\ \Omega$  platinum RTD is being used to measure the temperature of an oven. The present resistance reading is  $330\ \Omega$ . What is the oven's temperature? Temperature coefficient for platinum is  $0.0039\ \Omega/\Omega/^\circ\text{C}$ . (4marks)

(3-c) for R-2R Ladder (DAC) as shown in fig.1 (4marks)

Calculate the analog voltage value that outputs when the switch positions is 1001.

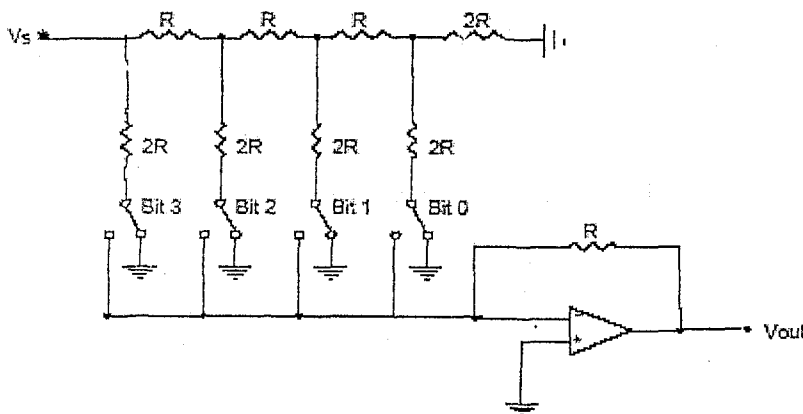


fig.1

With my best wishes,

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