

(Time: 3 Hours)

Marks: 80

- N.B. 1 Question number ONE is compulsory
2 Attempt any THREE questions out of remaining FIVE
3 Figure to right indicate full marks

- Q1. Solve any following **any four**: [20]
a. Explain the layer of protection analysis (LOPA) in details.
b. Explain electromagnetic type of flow measurement.
c. Explain Wheatstone bridge in detail.
d. Differentiate between piezoelectric and elastic sensing element.
e. Write short note on relief valve.
- Q2.(a) . Describe with neat sketches the construction and working of linear variable differential transformer for pressure measurement with advantages and disadvantages. [10]
(b) Explain Mechanical and Electronic amplifier in Detail . [10]
- Q3 (a) The output of a thermocouple measuring temperatures from 40 °C to 200 °C is Linearly represented by the standard current range of 6-22 mA. Then, [10]
(i) What is the current at 110 °C? (ii) What temperature does a current of 9 mA represent?
(iii) What is the current at 140 °C? (iv)What temperature does a current of 8.2 mA?
- (b) A barium titanate crystal has the dimensions of 5mmx5mmx1.25mm. [10]
The force acting on it is 5N. The charge sensitivity of barium titanate is 150pC/N and its permittivity is 12.5×10^{-9} F/m. If the modulus of elasticity of barium titanate is 12×10^6 N/m². Calculate the strain and capacitance.
- Q4 (a) Explain PLC in detail with simple program for on and off of a lamp [10]
(b) Draw a neat sketch to show the essential parts of Bourdon tube pressure gauge [10]
- Q5 (a) Explain the importance of calibration and also state calibration of pressure sensors using the dead weight piston gauge. [10]
(b) A Piezoelectric sensor is made up of quartz. The voltage sensitivity for quartz is about 0.075 V/(m.Pa). How much pressure in bars should be applied, to create a potential difference of 15V, if the thickness of the material is 4cm? [10]
6. Write short notes on (**any four**) [20]
a. Explain SIL classification
b. Thermistors
c. Hot wire anemometer.
d. Turbine type flow meter.
e. Resistive sensing element
