53 (IE 701) ININ

2014

INDUSTRIAL INSTRUMENTATION

Paper : IE 701

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any 5 (five)*** *questions.*

1. *(a)* Describe the construction and working of a U-type manometer.
What is the maximum pressure that a manometer can measure ? 5

(b) What are the pressure gauges used in pressure measurement ? Explain in brief the construction and working of these pressure gauges. 10

(c) A strain gauge is bonded to a beam which is $12cm$ long and has a cross-sectional area of $3 \cdot 8cm^2$. The unstrained resistance and gauge factor of the strain gauge are 220Ω and 2·2 respectively. On the application of load the resistance of the gauge changes by $0 \cdot 015\Omega$. If the modulus of elasticity for steel is $207\, GN/m^2$, calculate

(i) The change in length of the steel beam

(ii) The amount of force applied to the beam. 5

2. (a) Explain the basic principle and operation of capacitive pressure transducer. Also draw the signal conditioning circuit and mention the advantages and disadvantages of the transducer. 8

(b) How ionization gauges are used to measure vacuum ? Explain with a diagram. 6

(c) With the help of a diagram, describe the working of LDVT as a pressure transducer. Also mention *two* advantages. 6

3. (a) Explain the construction and working of a potentiometric accelerometer. 5

(b) Describe the principle of operation of Bridge type Gas densitometer. 5

(c) How rotameter type viscometer is used for the measurement of viscosity ? Explain. 5

(d) What do you mean by load cell ? Explain how force measurement is done by using strain gauge load cell ? 5

4. (a) Describe the principle of operation of a drag cup type tachogenerator. 5

(b) What are filled in systems used in temperature measurements ? Explain in brief the basic principle, governing equation and construction of each filled in system. 10

(c) Mention the thermoelectric laws. What are Peltier and Seebeck effect ? 5

5. (a) Describe the operation of total radiation type pyrometer with a suitable diagram. Name the commonly used radiation detectors. Explain the operation of *any one* of them. 10

(b) Define the following terms : 8

(i) Viscosity

(ii) Newtonian fluids

(iii) Laminar flow

(iv) Turbulent flow.

(c) What are the sources of error in filled in systems for temperature measurements ? 2

6. (a) Describe the basic principle, construction and operation of optical pyrometer.

Mention the advantages and disadvantages of the pyrometer. 10

(b) Describe any method for cold junction compensation of a thermocouple. 5

(c) Write *two* factors that determine the choice of material for resistive temperature detector. 2

(d) Draw the signal conditioning circuit for RTD and explain how temperature measurement is done by the circuit ? 3

7. Write short notes on : ***(any four)*** 5×4=20

(a) Dead Weight Tester

(b) D.C Tachogenerator

(c) Seismic Transducer

(d) Piezoelectric Pressure Transducer

(e) Pirani Gauge

(f) Bimetallic Thermometer.
