Total No. of printed pages = 3

19/5th Sem/UIE503

2021

# INDUSTRIAL INSTRUMENTATION

Full Marks – 100

Time – Three hours

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

Answer any *five* question.

1. (a) Define the terms : Absolute pressure, Gauge pressure and Vacuum. 6

   What is the gauge pressure experienced by a pressure sensor, if the atmospheric pressure of a fluid is 5.4 atm, absolute pressure is 15.3 atm and differential pressure is 1.2 atm ? 4

   (b) Explain, with the schematic diagram, the principle of operation of inclined tube manometer or Mcleod gauge. 6

   (c) The pressure in ionization gauge chamber is $10^{-5}$Torr for a plate current of $10^{-6}$A. What should be the grid current to have a sensitivity of 100/Torr ? 4

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2. (a) Write down the R-T relationships and temperature range of Pt100 RTD. Draw its characteristic. Mention its advantages and disadvantages. 6

(b) Determine A for a thermistor having $\beta$=4200K and resistance 100 k$\Omega$ at 25°C. Calculate the value of temperature coefficient of resistance (TCR) of thermistor at 0°C and 50°C. 6

(c) What do you mean by Cold Junction Compensation (CJC) of a thermocouple ? Explain, with circuit diagram, the bridge method for cold junction compensation. 3+5=8

3. (a) Define Raynold number. How Raynold number is related to the laminar and turbulent flow pattern ? 4

(b) Starting from Bernoulli's theorem, derive the volume flow rate for venturimeter. 10

Draw the pressure variation curve for venturimeter. 2

(c) What are the different types of tapping in orifice plate flow meter ? 4

4. Explain, with the schematic diagram, the principle of operation of (i) Electromagnetic flow meter, and (ii) Doppler shift ultrasonic flow meter. Mention their advantages and disadvantages. 8+8=16

5. Explain, with the schematic diagram, the principle of operation of (i) bubbler method and (ii) capacitive level gauge for liquid level measurement. 8+8=16

   Mention their advantages and disadvantages. 4

6. Explain, with the schematic diagram, the principle of operation of flapper-nozzle system. 10

   Explain how a flapper-nozzle system can be used to develop a current to pressure converter. 10

7. Write short notes on any *two* of the following : 10×2=20

   (a) Vortex shedding flow meter

   (b) Cold cathode ionization gauge

   (c) Current to pressure converter

   (d) Radiation level gauge.