Total number of printed pages: 2 **UG/Sem-V/UIE503**

2022

INDUSTRIAL INSTRUMENTATION

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

Symbols have their usual significances.

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 15.4 atm, absolute pressure is 25.3 atm and differential pressure is 1.2 atm? 4

b) Explain, with the schematic diagram, the principle of operation of well type manometer or Pirani gauge. 6

c) The pressure in ionization gauge chamber is 2.3×10^{-5} Torr for a plate current of 1.8×10^{-6}A. What should be the grid current to have a sensitivity of 150/Torr? 4

2 a) Write down the R - T relationship and temperature range of NTC type thermistor. Draw its characteristic. Mention its advantages and disadvantages. 6

b) Determine A for a thermistor having β = 4200K and resistance 50 kΩ at 25^0C. Calculate the value of temperature coefficient of resistance (TCR) of thermistor at -10^0C and 150^0C. 6

c) What you mean by cold junction compensation (CJC) of a thermocouple? 3

Explain, with circuit diagram, the bridge method for cold junction compensation. 5

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 Orifice meter. 10

Draw the pressure variation curve for Orifice meter. 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) Vortex shedding flow meter. Mention their advantages and disadvantages.	8+8 4
5	Explain, with the schematic diagram, the principle of operation of (i) purge or bubbler method and (ii) capacitive level gauge for liquid level measurement. Mention their advantages and disadvantages.	8+8 4
6	Explain, with the schematic diagram, the principle of operation of flapper-nozzle system. Explain how a flapper – nozzle system can be used to develop a pressure current converter.	10 10
7	Write short notes on any two of the following a) Doppler shift ultrasonic flow meter b) Hot cathode ionization gauge c) Current to pressure converter d) Inclined type manometer	10x2=20

--- : ---