2024 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. Define the terms: Absolute pressure, Gauge pressure and Vacuum. 1 a) 6 Convert (i) 50 kPa into Bar and (ii) 25.6 Torr into Pascal. 4 Explain, with the schematic diagram, the principle of operation of well type b) manometer. Mention its advantages and disadvantages. 6+4 Write down the R-T relationship and temperature range of thermistor. Draw its R-2 a) T characteristic. Mention its advantages and disadvantages. 6 Determine A for a thermistor having  $\beta = 4200$ K and resistance 50k $\Omega$  at 25<sup>o</sup>C. b) Calculate the value of temperature coefficient of resistance (TCR) of thermistor at 75<sup>°</sup>C. 6 What you mean by cold junction compensation (CJC) of a thermocouple? c) 2 Explain, with circuit diagram, the bridge method for cold junction compensation. 6 Define Raynold number. How Raynold number is related to the laminar and 3 a) turbulent flow pattern? 4 Starting from Bernoulli's theorem, derive the volume flow rate for orifice meter. b) Draw the pressure variation curve for orifice meter. 10+2What are the different types of tapping in orifice plate flow meter? c) 4 Explain, with the schematic diagram, the principle of operation of (i) turbine flow meter, and (ii) Doppler shift ultrasonic flow meter. Mention their advantages and 4 disadvantages. 8+8+4 तमसो मा ज्योतिगेमय Explain, with the schematic diagram, the principle of operation of (i) bubbler method 5 and (ii) nucleonic level gauge for liquid level measurement. Mention their advantages and disadvantages. 8+8+4 Explain, with the schematic diagram, the principle of operation of flapper-nozzle system. 6 Explain how a flapper-nozzle system can be used to develop a current to pressure converter. 10+10 7 Write short notes (any two): 10 + 10

- a) Electromagnetic flow meter
- b) Cold cathode ionization gauge
- c) Optical pyrometer
- d) Capacitive level gauge