SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

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B.Tech. || CHE || 4th Sem.
Chemical Process Instrumentation
Subject Code:BTCH-404
Paper ID:

Time allowed: 3 Hrs

Max Marks: 60

Important Instructions:
- All questions are compulsory
- Assume any missing data
- Additional instructions, if any

PART A (10x 2marks)

Q. 1.   Short-Answer Questions:
   (a) Briefly explain the principle of humidity measurement.
   (b) Draw any viscometer.
   (c) Compare various types of controllers.
   (d) What are the factors to be considered while selecting a flow meter
   (e) Give the importance of Process instrumentation in process industry.
   (f) Define the term thermocouples and give its various applications
   (g) Give the comparison of various types of flow measuring devices.
   (h) Draw bellow gauge.
   (i) State different vacuum pressure measurement techniques?
   (j) Name few dynamic errors.

PART B (5×8marks)

Q. 2.   CO1

   a) A home thermometer for on-off control of room temperature produces a cycle with a 30 min period and 3° F amplitude. If thermometer with a lag of 4.0 min is placed beside it, what cycle should it indicate? Assume the thermometer to be first order type instrument.

   b) Discuss the dynamic response of first order system with step input.

                                    OR

   a) Calculate the dynamic error and lag in a first order instrument with a time   CO1
      constant of 10 msec, when it is required to measure an input x=5 sin100 r
      Assume an unit conversion factor.

   b) Discuss in detail the response of second order system with sinosudial input

Q. 3.   a) Discuss in detail with the help of neat and clean diagram Bourdon gauge   CO2

b) With the help of neat and clean diagram explain the Principle, Construction and Working of any one type Thermocouple along with Resistance thermometer along with its response curves, applications, advantages, disadvantages and various industrial areas.

OR

a) A thermocouple junction is roughly spherical with a diameter of 1/16 inch. The junction material density is ... lb/ft³ and a specific heat of ... Btu/lb °F. The heat transfer coefficient is ... Btu/hr·ft²·°F. Consider it's time constant and design a high frequency compensating circuit for the same.

b) Discuss with the help of diagram non-differential and non-differential method of measuring liquid level.

Q.4 a) Calculate the mass flow rate in a pipeline when an orifice plate has a measured head of ... inch of water. The flow line orifice is ... psig and temperature 200 °F. Maintenance is ... 350 °F. Assume Cv = 1.0.
    b) Give the application, Principle, Construction of Gas Chromatography techniques.

OR

a) A cylindrical float of diameter 1 cm and height 5 cm works in a rotameter tube. The rotameter is tapered at 3° from bottom and ... for a flow rate of ... if the float works at a height of 2.5 cm from the reference level, estimate the ... ratio and Cd flow coefficient for water flow. The float density is 4 times the fluid density.

b) Derive an equation for coefficient of change for rotameter.

Q.5 Explain with the help of diagram various Recording and Indicating instruments.

OR

Differentiate with the help of a diagram Signalling and transmitting instruments.

Q.6 Draw and explain any instrumentation diagram related to process engineering industry. Explain all the symbols used in the diagram.

OR

Draw and explain in detail Process and instrumentation diagram of multiple effect type evaporators used in process engineering industry?