

Total No. of Questions : 10]

SEAT No. :

P3995

[4959]-1180

[Total No. of Pages : 3

B.E. (Chemical)

c-PIPING DESIGN AND ENGINEERING (Elective - II)

(2012 Course) (Semester - I) (409345) (End Sem)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain the role of piping engineer in Construction and Commissioning phase of a chemical process? **[5]**

b) Discuss the three methods used for sizing of Rupture Disk as per ASME code? **[5]**

OR

Q2) a) Explain the pipe sizing procedures based on the different criteria? **[7]**

b) Discuss the economic pipe sizing with least annual cost approach? **[3]**

Q3) a) Which are the different elements alloyed in carbon steel for modifying its chemical composition to obtain the desired mechanical and physical properties? **[6]**

b) Discuss in detail with working principle and types of Balance bellows PRV? **[4]**

OR

Q4) a) What are the selection criteria for gaskets? **[4]**

b) Discuss the different guidelines in selecting a suitable valve for any application? **[6]**

P.T.O.

- Q5) a)** Discuss the significance of Churchill and Swamee-Jain equation for calculation of friction factor in Compressed-Air Piping Systems? A pipe is to be designed to carry 150 CFM free air at 100 psig and 80°F. If the pressure loss must be limited to 5 psi per 100 ft of pipe, what is the minimum pipe diameter required? [8]
- b) Explain the types of two phase flow and their characteristics linear velocity? [8]

OR

- Q6) a)** Calculate the friction factor and transmission factor using the Colebrook-White equation for a 16-in (0.250-in wall thickness) gas pipeline at a flow rate of 100 MMSCFD. Flowing temperature = 80°F, gas gravity = 0.6, viscosity = 0.000008 lb/(ft.s), base pressure = 14.73 psia, and base temperature = 60°F. Assume a pipe internal roughness of 600 microinches. [8]
- b) Discuss the concept of Deposition Velocity? Calculate the deposition velocity of a heterogeneous slurry with a solid specific gravity of 3.0 in water, for a pipeline with an 8-in internal diameter. The particle size = 1 mm, and volume concentration = 15 percent.
Data: Froude number $F_L = 1.45$? [8]

- Q7) a)** Write down the different insulation material classifications mostly used in the industrial and commercial piping industry? [8]
- b) Explain the design procedures for insulation of piping based on the different criteria's? [8]

OR

- Q8) a)** Calculate the heat loss per square foot of surface area for steam pipe insulated with calcium silicate. Following data is available: [8]
Pipe size: NPS 6 (DN 150), 6.625 in (168 mm) actual OD
Operating temperature: 400 F (204°C), Ambient temperature: 75 F (24°C)
Insulation thickness: 2 in (51 mm) nominal & 2.11 in (54 mm) actual
Insulation type: Calcium silicate, Length of pipe: 75 linear ft (22.8 m)
- b) Explain critical thickness of insulation and insulation materials for cold piping? [8]

- Q9)** a) Explain the types of plot plan and their advantages? [9]
b) Discuss piping isometrics and bill of material? [9]

OR

- Q10)**a) Discuss in detail the typical piping layout considerations for the equipments [9]
i) Reactors
ii) Storage tanks
b) Explain the concept of PFD, P & ID and utility diagram? [9]

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