Total No. of Questions : 10]

SEAT No. :

P3572

[Total No. of Pages : 3

[4959] - 1173

B.E. (Chemical)

CHEMICAL ENGINEERING DESIGN - II

(2012 Pattern) (End. Sem.)

Time : 2 1/2 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data if necessary.*

Q1) Find the column diameter of a plate column for the following specifications Feed stream : 10% w/w acetone in aqueous stream, 20ºC, 13000 kg/h. No. of theoretical stages 16, slope of bottom operating line = 5, slope of top operating line = 0.57, X_D = 0.94 (98% w/w), X_W = 50 ppm, R = 1.35, plate efficiency = 60%, plate pressure drop = 100 mm, Vapor density at bottom = 0.72 kg/m^3, liquid density at bottom = 954 kg/m^3, surface tension at bottom = 57 x 10^{-3} N/m, Vapor density at top = 2.05 kg/m^3, liquid density at bottom = 753 kg/m^3, surface tension at top = 23 x 10^{-3} N/m, surface tension at bottom = 57 x 10^{-3} N/m, K_{1top} = 0.09 and $K_{1\ Bottom}$ = 0.075. **[10]**

OR

Q2) a) Explain in detail Cornell's method. Give the necessary equations. **[8]**

b) What is the function of weir on a plate and what is effect of weir height on column performance? **[2]**

Q3) a) The following data are obtained for a packed column used for absorption: **[8]**

mG_m/L_m	0.5	0.6	0.7	0.8	0.9	1.0
N_{OG}	4.8	5.2	6.5	8.0	10.8	19.0

Select the optimum value of mG_m/L_m and give reasons.

b) What are the various areas on a plate? **[2]**

P.T.O.

OR

Q4) a) 30 kg/sec of water is to be transported through a steel pipeline to a location 2km away. The frictional pressure drop across the pipeline is 50,000 N/m^2. Find the diameter of the pipeline. Roughness of pipeline is 4.1×10^{-5}. Density = 995 kg/m^3, viscosity of water 0.8×10^{-3} $N.s/m^2$ **[4]**

b) What are the different types of pipe supports? **[6]**

Q5) a) Natural gas with a specific gravity 1.20 at 1,43,000 kPa and 45ºC is being blown down to 1,02,000 kPa. The flow rate could be from 95 m^3/day to 39 m^3/day. The drop through the pressure reducing regulator is 3,100 kPa, leaving 1,000 kPa for the pipe. The pipe length is 140 m upstream of the regulator and 8.7 m downstream. Determine the upstream and downstream pipe diameters.

Molecular weight of gas = 20, $\psi = 0.6$. **[8]**

b) What are the desirable properties of a piping material? **[8]**

OR

Q6) a) What are the major considerations in pipeline design for transportation of crude oil? **[8]**

b) Water is to flow through a pipeline with 25mm I.D. for a distance of 2km. The pressure drop = 10m of water. Density of water = 1000 kg/m^3, viscosity of water = 1mNs/m^2. Estimate the flow rate of water through the pipeline. **[8]**

Q7) a) What is Dowtherm? Explain its uses. **[6]**

b) What is the need for treating water for use in a boiler? **[6]**

c) Explain the functioning of a tube type boiler. **[6]**

OR

Q8) a) What is process air and instrument air? **[6]**

b) What are the various instruments required for boilers? **[6]**

c) What is the importance of dryness of steam? **[6]**

Q9) a) What are start up and shut down procedures in a plant? Explain in detail. **[8]**

b) Write about pump maintenance. **[8]**

OR

Q10) a) Write in detail about HAZAN studies. **[8]**

b) Write a note on safety measures in process industries. **[8]**