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TED (10) 5083
(Revision - 2010)

Reg. No.....
Signature

FIFTH SEMESTER DIPLOMA EXAMINATION IN POLYMER TECHNOLOGY
MARCH - 2015

CHEMICAL ENGINEERING

[Maximum Marks: 100]

[Time : 3 Hours]

PART - A
(Maximum Marks: 10)

Marks

- I. Answer all questions in one or two sentences. Each question carries 2 marks.
1. What are the various systems of units?
 2. Define thermal conductivity.
 3. List the factors affecting the heat transfer coefficient.
 4. State the law of conservation of Mass.
 5. What is azeotrope?

(5x2=10)

PART - B
(Maximum Marks : 30)

- II. Answer any five of the following questions. Each question carries 6 marks.
1. List the fundamental quantities and its units in SI and MKS systems.
 2. Define and Explain Fourier's law of the thermal conduction.
 3. Distinguish between steady state and unsteady state conduction.
 4. Explain the terms (a) Recycle (b) Bypass
 5. Explain the working of packed column for absorption.
 6. Explain simple distillation with a figure.
 7. Explain the advantages and applications of steam distillation.

(5x6=30)

PART - C
(Maximum Marks:60)

[Answer one full question from each unit. Each question carries 15 marks]

UNIT-I

- III. a. Convert a volumetric flow rate of $2 \text{ m}^3/\text{s}$ to Ltr/Sec. (3)
b. Explain the concept of unit operation and unit process with example. (9)

OR

- IV. a. Find the molecular weight of (i) H_2SO_4 (ii) Na_2SO_4 (6)
b. Prepare flow diagram for (a) Distillation (b) Evaporation (9)
(c) Extraction

UNIT-II

- V. a. Explain the characteristics of good insulating materials. (6)
b. A steam pipeline, 150/160mm in diameter, carries steam. The pipe line is lagged with a layer of heat insulating material ($k=0.08 \text{ W}/(\text{m.k})$) of thickness 100 mm. The temperature drops from 392.8K (119.8°C) to 313 K (40°C) across the insulating surface. Determine the rate of heat loss per 1 m length of pipe line. (9)

OR

- VI
- Derive an equation to calculate heat transfer through spherical wall. (7)
 - Estimate the heat loss per m^2 of the surface through a brick wall 0.5m thick when the inner surface is at 400 K (127°C) and the outside surface is at 310 K (37°C). Thermal conductivity of the brick may be taken as $0.7 \text{ W}/(\text{m.k})$. (8)

UNIT - III

- VII. a. Explain Co current and counter current extraction. (7)
b. Explain the various types of tower packing used in a absorption tower and its characteristics. (8)

OR

- VIII. a. Explain the working of long vertical tube evaporator. (7)
b. Explain with flow diagram (i) absorption (ii) extraction (8)

UNIT - IV

- IX. a. Explain the fractional distillation. (7)
b. A mixture of benzene toluene boils at 368 K under a pressure of 101.325 kPa. Determine the composition of the boiling liquid assuming that mixture obeys Raoult's law.
At 368 k, the vapour pressure of benzene is 155.56 kPa and that of toluene is 63.98 kPa. (8)

OR

- X. a. State (i) Raoult's (ii) relative volatility. (8)
- b. Calculate the equilibrium compositions of the liquid and the vapour phases for a mixture of methyl alcohol and water at a temperature of 323 K and under a pressure of 40 kPa.
- Assume that both liquid and vapour behave ideally.
- Data : V.P. Of methanol at 323 K = 53.32 kPa
- V.P. Of water at 323 K = 12.33 kPa. (7)

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