Sr. No. of Question Paper : 7972   F-2   Your Roll No................

Unique Paper Code   : 1141202

Name of the Course   : **B.Tech. Polymer Science**

Name of the Paper   : Unit Operations (DC–1.4)

Semester   : II

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **five** questions in all.

3. Question No. **1** is compulsory.

4. Use of calculator is allowed and log table may be provided.

1. (a) By using definitions and standards convert atmospheres to pound force square inch.

   (b) Explain jet mixers in fluid mixing.

   (c) Define Wein's law of displacement for black body radiation.

   (d) Explain force circulation evaporators and its significance.

   (e) Define evaporator capacity in term of heat transfer.

   (f) Describe type of plate efficiency in distillation process.

   (g) Explain Newtonian and non-Newtonian fluid with example.

   (h) Illustrate thermal conductivity and steady state conduction.

   (i) Write short note on air cooled heat exchangers.   (9×3)

2. (a) In the manufacturer of acetic acid by oxidation of acetaldehyde, 100 mole of acetaldehyde is feed to reactor per hour. The product leaving the reactor contains 14.81% acetaldehyde, 59.26% acetic acid and rest is oxygen. Find percentage conversion of acetaldehyde.

(b) Explain equation for flash distillation of binary mixtures.

(c) Describe leaching and moving bed leaching. (5,4,3)

3. (a) Derive the equation for steady-state heat transfer through a spherical shell of inner radius r_1 and outer radius r_2.

(b) Explain kettle type boilers.

(c) Write short note on azeotropic and extractive distillation. (5,4,3)

4. (a) Derive Bernoulli equation without friction.

(b) Write short note on types of agitator impliers.

(c) Discuss relationship between murphee efficiency and local efficiency. (5,4,3)

5. (a) The carbon mono oxide is reacted with hydrogen to produce methanol. Calculate from the reaction,

   (i) Stoichiometric ratio of H_2 to CO

   (ii) Moles of CH_3OH produced per moles of CO reacted

   (iii) Weight ration of CO to H_2 if both are fed to reactor in stoichiometric proportion

   (iv) Quantity of CO required to produce 1000 kg of methanol

   (v) Quantity of H_2 required to produce 1000 kg of methanol

(b) Discuss combined heat transfer equation using conduction-convection and radiation.

(c) Write short note on type of evaporators. (5,4,3)

6. (a) Derive equation for quantitative calculation of radiation between two black surfaces.

(b) Discuss penetration theory of mass transfer.

(c) Explain Fourier law of heat transfer. (5,4,3)

(100)