TE/Insem/APR - 37
T.E. (Chemical)
MASS TRANSFER - II
(Semester - II) (2012 Pattern)

Time : 1½ Hours]   *[Max. Marks : 30*

Instructions to the candidates :
1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*
5) *Assume suitable data if necessary.*

Q1) a) A mixture of A (more volatile) and B containing 55 moles % of A is subjected to flash distillation at atmospheric pressure till 65% of the feed is vaporized. Calculate the composition of the distillate and residue. Equilibrium data : **[5]**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0	0.22	0.39	0.52	0.63	0.71	0.79	0.85	0.91	0.96	1.0

b) Explain the process of batch distillation at constant reflux. **[5]**

OR

Q2) a) An equimolar 1200 kmol of a mixture of benzene and toluence is differentially distilled at atmospheric pressure so that the residue has a concentration of 35% benzene. Calculate the composition of the distillate and amount of liquid distilled. The equilibrium data is as follows : **[5]**

x	0.3	0.35	0.39	0.43	0.46	0.52
y	0.5	0.55	0.58	0.63	0.65	0.70

b) Explain the process of batch distillation under variable reflux. **[5]**

Q3) A binary mixture of methanol and ethanol containing 30% methanol, is to be separated to get 95% methanol in top product and 5% in bottom product. All percentages are by weight. Calculate the minimum reflux if 30% of the feed is vaporized. Find the number of theoretical stages required if a reflux ratio of twice the minimum is used. **[10]**

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0	0.16	0.3	0.43	0.53	0.63	0.72	0.8	0.87	0.94	1.0

OR

Q4) a) Describe the condition of cold feed in distillation. **[5]**

b) Derive the material balance equations for top and bottom operating lines in fractionation. **[5]**

Q5) a) A solution of 0.3 gms of iodine in 1 lit of water is to be extracted using 25 ml of carbon disulphide in each stage, which is immiscible with the water. Equilibrium relation is given by $Y = 595 X$ where Y = kg iodine/lit. carbon disulphide and X = kg iodine/lit. water. Determine the percentage of solute extracted if the extraction is carrid out in 2 cross current stages. Find the final raffinate concentration. **[5]**

b) Explain bimodal curve in detail. **[5]**

OR

Q6) a) In detail explain the steps for finding number of stages in multi - stage countercurrent extraction with triangular diagram for a pair of partially miscible solvents. Give all the relevant equations. **[7]**

b) Define selectivity and distribution coefficient and give their importance. **[3]**

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