

Total No. of Questions : 6]

SEAT No. :

P1330

[Total No. of Pages : 2

TE/Insem./APR-137

T.E. (Chemical)

MASS TRANSFER - II

(2015 Pattern) (Insem.) (Semester -VI) (309351)

Time : 1 Hour]

[Max. Marks :30

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 Or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right 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 containing 60 mole% benzene and 40 mole% toluene is to be flash distilled at atmospheric pressure. One third of the feed is vaporized. Calculate vapour composition and liquid composition for. 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	0.38	0.52	0.63	0.71	0.79	0.85	0.91	0.96	1.0

- b) Derive the Fenske Underwood equation for R_{\min} . **[5]**

OR

- Q2) a)** A liquid feed containing 65 mole% heptane and 35 mole% octane is differentially distilled at 760 mm Hg pressure and final distillate contains 30% heptane. Find the composition of the residue and the percentage of feed distilled. The VLE data are **[6]**

x	0.5	0.46	0.42	0.38	0.34	0.32
y	0.69	0.65	0.61	0.57	0.52	0.49

- b) Describe batch distillation with constant reflux. **[4]**

P.T.O.

Q3) A feed containing 45 mole% benzene and 55 mole% toluene is to be continuously fractionated to produce a distillate containing 90% benzene by mole and a bottom product containing 85% toluene by mole. If the feed rate to the column is 7000 kg/h calculate the bottom and top product rates. Calculate the number of ideal plates if the reflux ratio is 1.5 times the minimum, location of feed plate and the real number of plates if the average plate efficiency is 60%. Find the number of plates at total reflux. The feed is saturated vapour. **[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	0.2	0.36	0.49	0.60	0.69	0.77	0.84	0.90	0.95	1.0

OR

Q4) a) What are the assumptions in McCabe and Thiele method? Discuss each in detail. **[5]**

b) Derive an equation for q-line. **[5]**

Q5) 1200 kg/h of nicotine - water solution is to be extracted with kerosene in a continuous countercurrent system and its concentration is to be reduced from 1.2% to 0.15%. Water and kerosene are immiscible. What is the minimum quantity of solvent required? If 1600 kg/h of solvent is used how many stages are required? Equilibrium data: **[10]**

X	0	0.00101	0.00246	0.00502	0.00998	0.0204
Y	0	0.00807	0.00196	0.00456	0.00913	0.01870

OR

Q6) a) Explain the importance of selectivity, distribution coefficient and recoverability in liquid-liquid extraction. **[5]**

b) Explain the binodal curve in detail. **[5]**

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