B.Tech Sem - VI (2007 Course) (Chemical Engg.) : SUMMER - 2019
SUBJECT : MASS TRANSFER – II

Day : Wednesday   Time :   02.30 PM TO 05.30 PM
Date : 22/05/2019   Max. Marks : 80
                              S-2019-3102

N.B.:

1) **Q.No.1** and **Q.No.5** are **COMPULSORY**. Out of the remaining questions attempt **ANY TWO** questions from each section.
2) Answer to both the sections should be written in **SAME** Answer book.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Figures to the right indicate **FULL** marks.
5) Assume suitable data if necessary.

SECTION – I

Q.1 **a)** What are the assumptions of McCabe-Thiele method?   [05]

b) What is the significance of relative volatility in distillation?   [05]

c) What is Murphree stage efficiency in distillation?   [04]

Q.2 **a)** The vapour pressure data for n-Hexane (A) -n-Octane (B) system is given [08] below. Compute the equilibrium data and average relative volatility for the system at a total pressure of 101.32 kPa.

T^{0}C	68.7	79.4	93.3	107.2	125.7
P$_A$, kP$_A$	101.32	136.7	197.3	284.6	456.0
P$_B$, kP$_B$	16.1	23.1	37.1	57.9	101.32

b) What do you mean by positive deviation from ideality?   [05]

Q.3 Derive q-line equation   [13]

$$y_q = \frac{q}{q-1}\, x_q - \frac{x_f}{q-1}$$

Q.4 **a)** Describe the condition of flooding, coning and dumping occurring in a [07] distillation column.

b) What are the priming characteristics of a distillation column?   [06]

SECTION – II

Q.5 **a)** Mention the criteria for the selection of solvent in liquid-liquid extraction. [05]

b) Describe temperature swing adsorption.   [05]

c) Describe spiral wound membrane modules.   [04]

P.T.O.

Q.6 a) Explain the triangular coordinates system of liquid –liquid extraction in brief. **[05]**

b) 1000 kg/h of an acetone-water mixture containing 20% by weight of acetone is **[08]** to be counter-currently extracted with trichloroethane. The solvent to be used is solute free. Water and trichloroethane are insoluble in each other. If 90% acetone is to be recovered, estimate the number of stages required if 1.5 times the minimum solvent is used. Equilibrium relationship is $y = 1.65x$ where x and y are weight fractions of acetone in water and trichloroethane respectively.

Q.7 A solution of washed raw ease sugar of 48% sucrose by weight is colored by **[13]** presence of small impurities. It is to be decolorized by adsorption in a continuous counter current plant. Equilibrium data is generated by adding various amounts of activated carbon to separate batches of original solution. The data on the basis of the sugar content is as follows.

$\dfrac{kg\ C}{kg\ sugar}$	0	0.005	0.01	0.015	0.02	0.03
% colour removed	0	47	70	83	90	95

The original colour has a concentration of 20 measured on an arbitrary scale and it is desired to reduce the colour to 2.5% of its original value.
a) Convert the data to x and y.
b) Calculate the amount of carbon required for a feed of 1000 kg solution for a single stage process.
c) Estimate the number of stages required in a continuous counter current operation if the amount of carbon used is 6.14 kg.

Q.8 a) What are carbon molecular sieves? Explain in detail with application. **[07]**

b) What is electrodialysis? **[06]**

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