2008 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH SUPPLIMENTARY EXAMINATIONS
MASS TRANSFER OPERATIONS-II
(CHEMICAL ENGINEERING)

TIME-3 HOUR
MARK-80

ANSWER ANY FIVE QUESTIONS.ALL QUESTIONS CARRY EQUAL MARKS

1. (a) What is the effect of pressure on packed tower height.

(b) Is there any role molecular weight of solvent in absorption operation?

(c) Why absorption operation may not be considered as isothermal operation?

(d) Write short notes on ideal solutions.

2. Show that Z= HtoL NtoL for stripper.

3. A feed solution containing 4000kg of water and 20kg of acetic acid is to be extracted with benzene solvent to recover 80% acetic acid by weight. The equilibrium data is: S.No x'= gm acetic acid per kg water x'= gm acetic acid per kg benzene
1 0.920 1.020
2 1.140 1.620
3 1.525 2.910
4 2.04 5.35
5 3.29 20.10
6 5.23 36.0
Calculate:
(a) The number of cross - current stages required, if 1000 kg of benzene per stage is used and

(b) The concentration of acetic acid in the combined extract.

4. Discuss continuous countercurrent multistage extraction and explain how it is shown on a triangular chart. Indicate how the quantities and compositions of extract and raffinate are computed. For a given separation indicate how the number of equilibrium stages required is found.

5. (a) Explain the concept of HETP and HTU.

(b) With the help of a neat sketch explain the construction and working of centrifugal extractor.

6. (a) Discuss in detail about Adsorption equilibrium.

(b) Explain about adsorption Hysterisis.

(c) For adsorption from dilute liquid solutions in stagewise countercurrent operations, where the Freundlich equation describes the adsorption equilibrium, derive analytical expressions in terms of n,m, Yo and YN, for the minimum adsorbent/solvent ratio when fresh adsorbent is used.

7. (a) Discuss fixed bed adsorption and its application in food industry.

(b) Apply Freundlich equation for multi stage cross-current adsorption operation and derive $(Y_1/Y_2)^{1/n} - 1/n$ $(Y_0/Y_1) = 1-Y_n$

8. Ground nut oil is extracted from granulated ground nut meal in a counter-current multi-batch arrangement using ether as solvent. The solids charge contains 0.35 kg oil/kg exhausted meal and it is desired to obtain a 90% oil recovery. How many theoretical stages are required if 50 kg ether is used per 100 kg untreated solids. The entrainment data are as below.

Concentration of oil 0.1 0.2 0.3 0.4 0.5 0.6 0.67 kg oil/kg solution Entrainment: 0.28 0.34 0.40 0.47 0.55 0.66 0.8 Kg solution/ Kg extracted meal