

Registration No :

--	--	--	--	--	--	--	--	--

Total Number of Pages : 02

B.Tech  
PCE4I101

4<sup>th</sup> Semester Regular / Back Examination 2018-19

MASS TRANSFER-II

BRANCH : CHEM, PT

Time : 3 Hours

Max Marks : 100

Q.CODE : F266

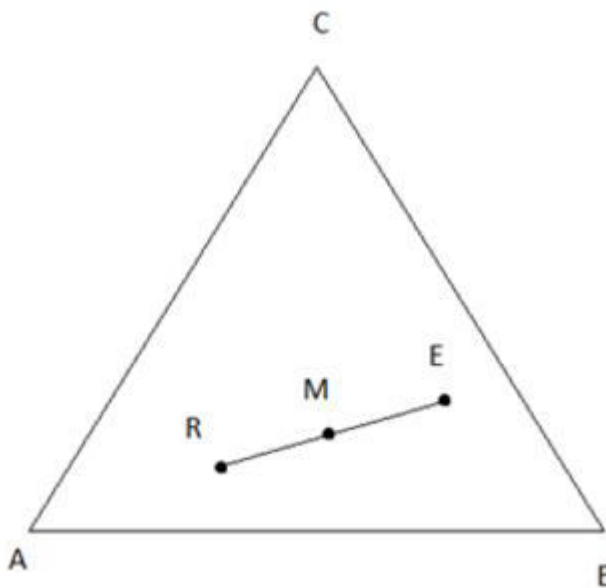
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- What is the range of solid hold-up in rotary dryer?
- At what temperature extraction of sugar from sugar beet is achieved using water?
- What is the size range of meso- pores?
- Give an example of application of solvent extraction for waste water treatment.
- Explain plait point with a neat diagram.
- What is adsorption hysteresis?
- Mention the factors influencing the fraction of liquid retained in the underflow in leaching operations.
- Draw a typical gas and solid temperature profiles for drying of a non- hygroscopic solid in a cocurrent rotary dryer.
- Find the mixture M in kg if R is 4 kg and E is 10 kg, where E is extract and R is raffinate



- Write and explain Freundlich equation.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Discuss about batch and continuous drying equipments.
- Explain the construction and operation of Drum drier with neat diagram.
- Discuss the important factors affecting the rate of leaching of a solute from a solid substance.
- Describe the important factors affecting the selection of a Liquid – Liquid Extractor .
- 400kg/hr of mustard cake is to be extracted in a counter-current cascade with ether to recover oil. The ether which has been partially purified contains 5% oil. The fresh cake contains 15% oil and is to be extracted to a composition of 2% oil (on solvent free basis). If 200kg of solvent is to be used, what % of oil entering with the cake is recovered in the extract?

- f) What are the different criteria for the selection of a good adsorbent.
- g) Explain the steps in design of dryers.
- h) Graphically explain different types of moisture in a wet solid.
- i) Derive the equation for total drying time.
- j) Describe the theory of adsorption.
- k) Explain the construction and operation of Rotating fixed-bed adsorber with neat diagram.
- l) Write short notes on any two of the following :
- Effect of temperature on ternary equilibria
  - Industrial adsorbents
  - Ion exchange

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** 3000kg of pyridine-water solution containing 45% pyridine is extracted with chlorobenzene two times and each time with 2600kg of solvent. Determine the concentration of pyridine in the final raffinate. Equilibrium tie-line data for the system water-pyridine-chlorobenzene at 25°C are given below: **(16)**

Pyridine	Chlorobenzene	Water	Pyridine	Chlorobenzene	Water
0	99.95	0.05	0	0.08	99.92
11.05	88.28	0.67	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.28	1.62	18.90	0.38	80.72
18.60	69.15	2.25	25.50	0.58	73.92
31.55	65.58	2.87	36.10	1.85	62.05
35.05	61.00	3.95	44.95	4.18	50.87
40.60	53.00	6.40	53.20	8.90	37.90
49.00	37.8	13.2	49.00	37.80	13.20

- Q4** A solution of washed raw can sugar is coloured by the presence of impurities. It is to be decolourised by treatment with an adsorptive carbon in a contact filtration plant. The data for an equilibrium isotherm is given below. The original solution has a colour concentration of 9.6 measured on an arbitrary scale and it is desired to reduce the colour to 0.96. Calculate the necessary dosage of fresh carbon per 2000kg solution for a single stage operation. **(16)**

<b>Kg carbon/ Kg solution</b>	0	0.001	0.004	0.008	0.02	0.04
<b>Equilibrium colour</b>	9.6	8.6	6.3	4.3	1.7	0.7

- Q5** One type of paper board of  $0.13 \times 0.16 \times 0.07 \text{m}^3$  in size is to be dried from initial moisture content of 60% to 6% on wet basis. The rate of drying at constant rate period is  $9.2 \text{kg/m}^2 \cdot \text{hr}$ . The critical moisture content was 25% and the equilibrium moisture content was 2%. The paper board is to be dried from two larger sides only and has a bone-dry density of  $180 \text{kg/m}^3$ . Determine the time required for drying assuming the falling rate to be linear. **(16)**
- Q6** Derive the equation for multistage counter-current leaching operation with suitable diagram and necessary plots. **(16)**