Registration No. : | | | | | | | | | | |

*Total number of printed pages – 2*

**B. Tech**
**PCCH 4306**

# Sixth Semester Back Examination – 2015

## MASS TRANSFER - II

## BRANCH : CHEM

### QUESTION CODE : M 234

**Full Marks – 70**

**Time : 3 Hours**

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*Answer Question No. 1 which is compulsory and any five from the rest.*
*The figures in the right-hand margin indicate marks.*
*Assume suitable notations and any missing data wherever necessary.*
*Answer all parts of a question at a place.*

1. Answer the following questions : 2×10

   (a) What is double-solvent extraction ?

   (b) What do you understand by a solutropicsystem ?

   (c) For all useful extraction operations, the selectivity is _____ .

   (d) The size of adsorbent solids is usually in the range of _____ to _____ .

   (e) Write any two processes upon which the rate of ion-exchange depends.

   (f) A wet solid is to be dried from 80 to 5 % moisture, wet basis. Calculate the moisture to be evaporated per 100 kg of dried product.

   (g) What are bound and unbound moisture ?

   (h) What is critical moisture content ?

   (i) Vegetable oils are removed from oil seeds by leaching with _____ while tannin is dissolved out of various tree barks by leaching with _____ .

   (j) Discuss the effect of temperature on leaching.

2. (a) Draw and explain the equilateral triangular diagram with suitable notations. 5

   (b) Discuss briefly any five criteria for selection of solvent for liquid-liquid extraction. 5

**P.T.O.**

3. 990 kg/h of a nicotine-water solution containing 1% nicotine isextracted with kerosene to reduce the nicotine content to 0.1%. Water and kerosene are immiscible solvents. Calculate the minimum solvent required in kg/h. And if 1100 kg/h of solvent is used, calculate the number of theoretical stages required. The following equilibrium data may be used : 10

| x = kg nicotine/kg water | 0 | 0.00101 | 0.00246 | 0.00502 | 0.00998 | 0.02040 |
|---|---|---|---|---|---|---|
| y = kg nicotine/kg kerosene | 0 | 0.00807 | 0.00196 | 0.00456 | 0.00913 | 0.01870 |

4. (a) Mention the nature of adsorbents. 5

   (b) With suitable examples, discuss the principle of ion-exchange. 5

5. With a neat diagram, derive various equations for a three-stage cross-current leaching operation with a suitable graphical representation of the various streams. 10

6. (a) Draw and explain the rate of drying curve. 5

   (b) Discuss the construction and working of a rotary drum dryer. 5

7. A batch of solid is dried from 28 % to 6 % moisture, wet basis. The initial weight of the solid is 380 kg and the drying surface is 0.15 $m^2$/40 kg dry weight. The critical moisture content is 18 % dry basis and the constant drying rate is 0.32 $kg/m^2.h$. For the falling rate period, the following data may be used. 10

| Moisture content, % dry basis | Rate of drying, $kg/m^2.h$ |
|---|---|
| 25 | 0.30 |
| 21.9 | 0.27 |
| 19 | 0.24 |
| 16 | 0.21 |
| 13.6 | 0.18 |
| 11 | 0.15 |
| 8.2 | 0.07 |
| 7.5 | 0.04 |
| 6.4 | 0.03 |

8. Write short notes on any **two** : $5 \times 2$

   (a) Rotating disk contactor

   (b) Adsorption isotherms

   (c) Bollmann extractor

   (d) Fluidized bed dryer

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