

Registration No.

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Total number of printed pages - 02

**B.TECH**  
**PCCH4306**

**6<sup>th</sup> Semester Regular / Back Examination 2015-16**

**MASS TRANSFER – II**

**BRANCH : Chemical**

**Time : 3 Hours**

**Max Marks : 70**

**Question Code : W331**

**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 x 10**

- (a) Define fractional extraction.
- (b) Name the extraction used for corrosive and foamy liquid separation.
- (c) What is selectivity of solvent? Mention its value for better extraction.
- (d) State the Freundlich equation.
- (e) Which leaching solvent is used for removing gold from its ore?
- (f) Write applications of ion-exchange.
- (g) What are the factors affecting rate of drying?
- (h) Which adsorbent is used for decolorizing petroleum products?
- (i) What are freeze drying and what types of materials are dried by it?
- (j) Differentiate between direct and indirect dryers.

2. A 2000 kg of pyridine-water solution, 50% pyridine is to be extracted with an equal amount of chlorobenzene. The raffinate from 1st extraction is to be re-extracted with a weight of solvent equal to raffinate weight and so on. Determine theoretical stages required and total quantity solvent required to reduce the pyridine concentration to 2%.

| Extract phase |               |       | Raffinate phase |               |       |
|---------------|---------------|-------|-----------------|---------------|-------|
| 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         | 79.9          | 1.15  | 11.05           | 0.24          | 88.71 |
| 28.6          | 69.15         | 2.25  | 25.5            | 0.58          | 73.92 |
| 35.05         | 61            | 3.95  | 44.95           | 4.18          | 50.87 |
| 40.6          | 53            | 6.4   | 53.2            | 8.9           | 37.9  |
| 49            | 37.8          | 13.2  | 49              | 37.8          | 13.2  |

3. Vegetable oil is to be extracted from vegetable oil seeds using ether as a solvent. 100kg of oil seed contains 20% of oil. Amount of ether used in each stage is 30kg. The equilibrium data table is as below.

|   |      |      |     |      |      |      |      |
|---|------|------|-----|------|------|------|------|
| y | 0    | 0.1  | 0.2 | 0.3  | 0.4  | 0.5  | 0.6  |
| N | 3.57 | 2.94 | 2.5 | 2.13 | 1.82 | 1.51 | 1.25 |

Calculate the different compositions for 3-stage cross-current operation. Also determine the amount of oil extracted from vegetable oil seeds.

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4. Experiments on decolorisation of oil yielded the following equilibrium relationship:  $y=0.5x^{0.5}$  where, y= gm of color removed/gm of adsorbent and x = color in oil, gm of color/1000gm of color-free oil. 200 kg of oil containing 1 part of color to 3 parts of oil is agitated with 50kg of the adsorbent. Calculate the % of color removed if:
- All 50kg adsorbent is used in one step.
  - 30kg adsorbent is used initially, followed by another 20kg of adsorbent.

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5. A wet solid is to be dried from 45 to 12% moisture content under constant drying conditions in 6.8hrs. If the equilibrium and critical moisture content is 3% and 15% respectively, how long it will take to dry the solids to 5% moisture content under same condition? All the moisture contents are on wet basis.

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6. (a) Explain construction, working principle and application of pulse column with neat sketch.
- (b) Explain rate of drying with suitable plot.
7. (a) Discuss in details about Rotocel extractor with neat sketch.
- (b) Differentiate between physical and chemical adsorption.

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8. Write short notes on any **TWO**:

5 x 2

- Pachuca tank
- Tray dryer
- Mixture rule
- Principle of ion-exchange

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