

TED (15) 6072
(Revision -2015)

Reg. No.....
Signature

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, OCTOBER/NOVEMBER – 2018**

MASS TRANSFER OPERATIONS II

[Maximum Marks: 100]
(Graph sheets are to be issued)

[Time: 3 hours]

PART-A
(Maximum Marks -10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. List *two* advantages of super critical fluid extraction.
2. Differentiate between extract and raffinate.
3. Define crystallization.
4. Define an ideal plate in fractionation.
5. Define the term entrainment.

(5×2=10)

PART – B
(Maximum marks: 30)

II Answer *any five* of the following questions. Each question carries 6 marks.

1. Draw a neat sketch of Boll man extractor and label its parts.
2. Mention applications of solid-liquid extraction.
3. List the factors to be considered in selecting suitable solvent for liquid-liquid extraction.
4. Define (i) solubility (ii) super saturation
5. $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystals are formed by cooling 100 kg of 30% by weight aqueous solution of Na_2SO_4 . The final concentration of solute in the solution is 10%. Determine the weight of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystals formed. (At. Wt: Na = 23, O = 16, S = 32, H = 1).
6. Draw the layout of fractionation column and accessories.
7. Explain the concept of minimum reflux ratio.

(5×6=30)

PART – C

(Maximum marks: 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT-I

- III (a) Draw a neat sketch of Kennedy extractor and label its parts. 7
(b) Describe the working of Pachuca extractor. 8

OR

- IV (a) Explain heap leaching. 7
(b) Explain the working of a Rotocel extractor. 8

UNIT-II

- V (a) Explain equilateral triangular diagram for Liquid – liquid extraction 7
(b) Explain the constructional details of Rotating Disk contactor. 8

OR

- VI (a) Differentiate between Distillation and Extraction 7
(b) Describe the working of spray towers used for extraction. 8

UNIT-III

- VII (a) Draw a neat sketch of evaporative crystalliser and label its parts. 7
(b) Explain four methods of super saturation. 8

OR

- VIII (a) Explain solubility curves. 6
- (b) An aqueous solution of Na_2CO_3 containing 15% carbonate by weight is subjected to crystallisation at the rate of 1000 kg/hr by evaporation and cooling to 278 K. 40% of the water in the feed is evaporated. If the solubility of Na_2CO_3 at 278 K is 9.0% (by weight), determine
- (i) the quantity of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ crystals formed
- (ii) the yield of crystals.
- (At. Wt: Na = 23, O = 16, C = 12, H = 1). 9

UNIT-IV

- IX (a) List the assumptions of McCabe -Thiele method. 5
- (b) Define 'q' factor and derive equation for 'q' line. 10

OR

- X (a) A plate column equipped with a total condenser and a kettle-type reboiler is used to separate 100 kmol/hr of a benzene-toluene solution containing 50 mol% benzene into a distillate product containing 95 mol% benzene and bottom product containing 5 mol% benzene. The column is operated at 101.3 kPa. The feed is partially vaporised and is one-third vapour and two-third liquid. Using an average relative volatility of 2.39, determine the following:
- (i) The minimum number of plates required
- (ii) The minimum reflux ratio 15