

22609

23242

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following: 10**
- State Fick's law of diffusion.
 - Give the names of gas absorption equipments.
 - State Raoult's Law in distillation.
 - Define H.E.T.P.
 - Define “Drying”.
 - Define extraction as unit operation.
 - Define crystallization.
- 2. Attempt any THREE of the following: 12**
- Describe optimum reflux ratio.
 - Draw a neat sketch of flash distillation.
 - Compare distillation and extraction.
 - Describe the concept of flooding and loading velocities in packed column.

P.T.O.

- 3. Attempt any THREE of the following:** **12**
- a) Draw the diagram of spray dryer.
 - b) Draw the diagram of vacuum crystallizer.
 - c) Explain mixer settler with neat sketch used for extraction.
 - d) Explain simple or differential distillation with neat sketch.
- 4. Attempt any THREE of the following:** **12**
- a) Draw the diagram of Rotating Disc Contactor (RDC) used in liquid liquid extraction.
 - b) Compare distillation with gas absorption. (any four points)
 - c) Draw neat labelled sketch of rate of drying curve.
 - d) Explain the role of diffusion in mass transfer operations.
 - e) Explain Mier's super saturation theory.
- 5. Attempt any TWO of the following:** **12**
- a) Explain packed column with neat sketch used in gas absorption.
 - b) Describe construction and working of tray dryer with neat sketch.
 - c) A hot solution containing 5000 kg of Na_2CO_3 and water with a concentration of 25% by wt. Na_2CO_3 is cooled to 293 K and crystals of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ are precipitated. At 293 K the solubility is 21.5 kg anhydrous Na_2CO_3 per 100 kg of total water. Calculate the yield of hydrated Na_2CO_3 crystals obtained if 5% of the original water in the system evaporates on cooling?

6. Attempt any TWO of the following:**12**

- a) A feed of 50 mole % Benzene and 50 mole % octane is fed to a pipe still through a P.R.V. and then into a flash disengaging chamber. The vapour and liquid leaving the chamber are assumed to be in equilibrium. If fraction of the feed converted to vapour is 0.5. Find the composition of the top and bottom product.

Equilibrium data for system is

Mole fraction of Benzene in liquid (x)	Mole fraction of Benzene in vapour (y)
1	1
0.69	0.932
0.4	0.78
0.192	0.538
0.045	0.1775
0	0

- b) Write the selection criteria of solvent used in gas absorption.
- c) Describe with sketch construction and working of drum dryer.
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