



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year: 2025-2026	Semester: VI
Class: TY	Program: B.Tech
Branch Code: CHE	Pattern: 2022
Name of Course: Mass Transfer II	Course Code: CHE223011
Max. Marks: 60	Duration: 2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome of the Question/sub-question.

Marks CO

Question No. 1

- 1a) Explain Flash distillation with neat diagram and write its applications. (6) CO1

Question No. 2

- 2a) What are the selection criteria for choosing a solvent in liquid-liquid extraction? (6) CO2

Question No. 3

- 3a) In a single-stage leaching operation, 120 kg of vegetable seeds containing only oil and inert solids is contacted with fresh hexane to extract the oil. After the leaching process, the underflow stream consists of 96 kg of inert solids and 70 kg of retained solution containing 2.5 wt% oil and 97.5 wt% hexane. The overflow stream contains 170 kg of solution with 6.2 wt% oil and 94.8 wt% hexane. Assuming no losses during the process and that all the hexane used is fresh, calculate the total amount of oil in the original feed, the total amount of hexane used for extraction, and the extraction efficiency of oil recovered in the overflow stream. (8) CO3

OR

- 3b) Explain multistage cross-current leaching operation with material balance equation. (8) CO3
- 3c) A 120 kg batch of soybean meal containing 108 kg of inert solids and 12 kg of oil is subjected to oil extraction using 60 kg of fresh ethanol in each of two cross-current leaching stages. In the first stage, the solid-liquid mixture in the underflow retains solution at a solid-to-liquid ratio of 2:1, and the retained liquid contains 4 wt% oil. In the second stage, the underflow retains solution at a 1.5:1 ratio, with the retained liquid containing 1.5 wt% oil. (8) CO3

1. Determine the amount of oil recovered in the overflow streams of both stages.
2. Calculate the percentage recovery of oil after the two-stage process.

OR

- 3d) Describe the construction, operation, advantages, and limitations of filter press leaching. (8) CO3

Question No. 4

- 4a) Solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The (8) CO4

original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.96. Calculate the necessary dosage of the fresh carbon per 2000 kg solution for a single stage process. The data for an equilibrium isotherm is as follows:

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

OR

- 4b) Differentiate between physical and chemical adsorption. (8) CO4
4c) Explain single stage and multistage mass balance of adsorption. (8) CO4

OR

- 4d) Explain ion exchange process? Write its applications. (8) CO4

Question No. 5

- 5a) Explain the material balance of Crystallization. (8) CO5

OR

- 5b) Explain Swenson-Walker Crystallizer with neat diagram and enlist its application. (8) CO5
5c) Explain Ultrafiltration and Nanofiltration with neat diagram. (8) CO5

OR

- 5d) Describe the classification of membrane processes. (8) CO5

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