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:V
Class:TY	Program:B.Tech
Branch Code:CHE	Pattern:2022
Name of Course:Mass Transfer I	Course Code:CHE223001
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 and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Differentiate between molecular diffusion and eddy diffusion in mass transfer.	(6)	CO 1
Question No. 2			
2a)	Discuss the factors to be considered for the selection of a suitable solvent for gas absorption process.	(6)	CO 2
Question No. 3			
3a)	In a vessel at 101.3 kN/m^2 and 300 K, the percentage relative humidity of the water vapour in the air is 25. If the partial pressure of water vapour when air is saturated with vapour at 300 K is 3.6 kN/m^2, calculate: (a) Partial pressure of the water vapour in the vessel; (b) Specific volumes of the air and water vapour; (c) Humidity of the air and humid volume; and (d) Percentage humidity.	(8)	CO 3
	OR		
3b)	Moist air at 310K has WBT of 300 K. The latent heat of vaporization of water at 300K is 2440KJ/kg, estimate the humidity of the air and the percentage relative humidity. The total pressure is 105KPa and the vapor pressure of water vapor at 300K is 3.60KPa and 6.33KPa at 310K.	(8)	CO 3

3c)	Describe the following terms in humidification operation; 1. Absolute Humidity 2. Relative Saturation 3.Percentage saturation humidity 4. Wet Bulb Temperature	(8)	CO 3
	OR		
3d)	Derive an equation for height of packing required in forced draft counter current cooling tower in terms of Z = HTU × NTU	(8)	CO 3

Question No. 4

4a)	Which are the various equipment used for gas-liquid contact in Mass transfer. Explain sparged vessel with neat sketch.	(8)	CO 4
	OR		
4b)	Differentiate between tray column and packed column for gas-liquid mass Transfer.	(8)	CO 4
4c)	Enlist the column internal parts of packed column and explain in details.	(8)	CO 4
	OR		
4d)	Describe the following operating characteristics in plate column 1.Flooding 2.Weeping 3.Entrainment 4. Pressure drop	(8)	CO 4

Question No. 5

5a)	A certain material was dried under constant drying conditions and it was found that 2 hours are required to reduce the free moisture concentration from 20% to 10%. How much time would be required to reduce the free moisture to 4%? Assume that no constant rate period is encountered. Equilibrium moisture content is zero and falling rate period is linear.	(8)	CO 5
	OR		
5b)	Slabs of paper pulp 1 m x 1 m x 0.015 m is to be dried under constant drying conditions from 66.7% to 30% moisture. The value of equilibrium moisture for the material is 0.5%. If the critical moisture content is 60% and the rate of drying of critical point is 1.5 kg/hr.m^2. Calculate the drying time. The dry weight of each slab is 2.5 kg. Assume all moisture contents are on wet basis.	(8)	CO 5
5c)	Describe the rate of drying curve in drying operation in details with neat sketch.	(8)	CO 5
	OR		
5d)	Discuss on the purpose of drying and the factors affecting rate of drying.	(8)	CO 5

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