

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025***Fourth Semester***Chemical Engineering****CH3451 Mass Transfer I***(Use of Steam Tables and Mass Transfer data book can be permitted)**Regulations - 2021**Duration : 3 Hrs**Maximum : 100 Marks***PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Define molecular diffusion and eddy diffusion.	L1	1	2
2.	How does diffusion occur in solids?	L2	1	2
3.	Define mass transfer coefficient.	L1	2	2
4.	What is meant by HTU and NTU?	L1	2	2
5.	Define humidity and dew point temperature.	L1	3	2
6.	Distinguish between spray pond and spray tower.	L2	3	2
7.	Define moisture content on wet basis and dry basis.	L1	4	2
8.	What is the principle involved in fluidized bed dryer?	L2	4	2
9.	Define Crystallization.	L1	5	2
10.	What is the purpose of agitator in a crystallizer?	L2	5	2

PART - B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Derive an expression for finding the mass flux of a component in a binary gas mixture. (i) Diffusion of gas A through non-diffusing on B (ii) Equimolar counter diffusion under steady state Or	L4	1	16
	b Alcohol is diffusing from gas to liquid and water from liquid to gas under conditions of equimolar counter diffusion at 35° C and 1 atm pressure. The molar concentration of alcohol on the two sides of a gas film 0.2 mm thick is 90% and 10% respectively. Assuming the diffusivity of alcohol-water vapour to be 0.18 cm ² /s, calculate the rate of diffusion of alcohol and water in kilograms per hour through an area of 100 cm ² . Molecular weight of alcohol =7.41.	L3	1	16
12.	a Derive the relation between local and overall mass transfer coefficient. Or	L3	2	16
	b Discuss in detail about the differential and stage wise contact operations.	L3	2	16

13.	a An air (B) - water vapour (A) sample has dry bulb temperature 55°C and an absolute mass humidity of 0.030 kg of water/kg of dry air at 1 standard atmospheric pressure. Find the percentage humidity, absolute molar humidity, humid volume, humid heat, enthalpy and partial pressure of water vapour. Vapour pressure of water at 55°C = 118 mmHg Heat capacity of air = 1005 J/kg° C Heat capacity of water vapour = 1884 J/kg° C Latent heat of water vapour = 2502.3 kJ/kg Or b Explain in detail on the construction, advantages and limitations of both Natural draft and Forced draft cooling towers with a neat sketch of it.	L3	3	16
14.	a Classify the dryers. With the help of neat sketch explain the construction and working of different types of dryers. Or b A tunnel dryer is being designed for drying apple halves from initial moisture content of 70% (wet basis) to final moisture content of 5% (wet basis). An experimental drying curve for the product indicates that the critical moisture content is 25% (wet basis) and the time for constant drying is 5 min. Based on the information provided; estimate the total drying time for product.	L3	4	16
15.	a Explain the principle of wet bulb thermometry. Or b 2500 kg of KCl are present in a saturated solution at 80° C. The solution is cooled to 20° C in an open tank. The solubility of KCl at 80°C and 20°C are 55 and 35 parts per 100 parts of water. Assuming water equal to 5% by weight of solution is lost by evaporation; calculate the weight of crystals obtained.	L4	5	16