Reg. No. : | | | | | | | | | | | | |

Question Paper Code:U5C03

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

Biotechnology

21UBT503 – MASS TRANSFER OPERATIONS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 2 = 20 Marks)

1.	Identify the system where mass transfer takes place.	CO1U
2.	A reactor is filled with component A and is allowed to diffuse to another reactor holding component B through a pipe. Suddenly, the temperatures of both the reactors are increased. Predict the changes that occur in the transfer of mass in the system.	CO2App
3.	List 4 ways in which distillation can be done.	CO1U
4.	Identify the characteristics of the solvents selected for absorption.	CO1U
5.	Mention the significance of q- line.	CO1U
6.	Define Distillation	CO1U
7.	Sketch the L-L equilibria curve.	CO1U
8.	Differentiate extract and raffinate.	CO1U
9.	Define rate of drying.	CO1U
10.	Is drying and sublimation same? Justify your answer.	CO3App

PART – B (5 x 16= 80Marks)

11.	(a)	Elucidate the theory proposed by Whitman explaining the concept of interphase mass transfer.	CO1U	(16)
		Or		
	(b)	Derive an expression for Steady state diffusion of oxygen through non diffusing nitrogen and equimolar counter diffusion.	CO1 U	(16)
12.	(a)	1000 m^3/h of a gas mixture containing 10 mole % solute and rest inert enters an absorber at 300 K temperature and 106.658 kPa	CO2 App	(16)

pressure. 90% of the original solute is removed. Solute-free water used for absorption contains 5 mole % solute when it leaves the absorber from the bottom. Evaluate the solvent flow rate to the absorber.

Or

	(b)	Gas containing 2 % by volume solute A is fed to an absorption tower at a rate of 0.35 m3/s at 299 K (26ºC) and 106.658 kPa pressure, and 95 % of the original solute is removed by absorbing it in a solvent B. Solvent containing 0.005 mole fraction of solute enters the tower at the top and the exit liquid streams from the absorption tower contains 0.12 mole A per mole B. Evaluate the flow rate of the solvent entering the absorption tower on solute-free basis.	CO2 App	(16)
13.	(a)	A mixture of benzene and toluene containing 40 mole % benzene is to be separated to give a product of 90 mole % benzene from the top and a bottom product with not more than 10 mole % benzene. Using an average value of 2.4 for the volatility of benzene relative to toluene, calculate the number of theoretical plates required at total reflux.	CO1 U	(16)
		Or		
	(b)	Elucidate McCabe thiele method for separating a feed containing 70% vapour and the procedure for finding the number of stages in the distillation column for such feed.	CO1 U	(16)
14.	(a)	Sanjay wants to extract lycopene from tomatoes. Suggest him a method for extraction of the same. Write a report explaining the principle and the mechanism involved in the technique that you have suggested.	CO4-Ana	(16)
		Or		
	(b)	Analyze the purpose of L-L extraction equipment in Pharmaceutical industry taking a real-time example.	CO4-Ana	(16)
15.	(a)	Explain in detail the principle, mechanism and application of any 2 dryers in industries	CO1 U	(16)
		Or		
	(b)	Explain in detail about adsorption isotherms.	CO1 U	(16)