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

Question Paper Code: U5D03

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

Fifth Semester

Biotechnology

21UBT503 - MASS TRANSFER OPERATIONS

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer All Questions

PART A - (10x 2 = 20 Marks)

1.	Classify the types of diffusion.	CO1- U
2.	Methane diffuses at steady state through a tube containing helium. At point 1, the partial pressure of methane is 55 kPa and at point 2 it is 15 kPa. The points 1 and 2 are 30 mm apart. The total pressure is 101.3 kPa and temperature is 298 K (25ºC). Calculate the flux of CH4 at steady state for equimolar counter diffusion. The diffusivity of methane at the prevailing conditions is 6.75 × 10–5 m2/s.	CO2-App
3.	List 4 ways in which distillation can be done.	CO1 -U
4.	Identify the factors that affects absorption operation.	CO1 -U
5.	Define minimum reflux ratio.	CO1-U
6.	Mention the significance of q- line.	CO1 -U
7.	Sketch the solid-liquid equilibria curve.	CO1-U
8.	Identify the significance of leaching.	CO2-App
9.	List 3 different adsorption isotherms.	CO1-U
10.	100 kg of salt has to be retrived from sea water. Predict the steps that has to be followed in obtaining the same.	CO2-App

PART – B (5 x 16= 80Marks)

11.	(a)	Gas B is diffusing through another gas A which is stagnant. Derive an expression for the above gas when the diffusion takes place under steady state and equimolar counter pattern.	CO2 -App	(16)
		Or		
	(b)	Derive an expression for Steady state diffusion of A (gas) through non diffusing B and equimolar counter diffusion.	CO2- App	(16)
12.	(a)	Elucidate the common methods used in separating components in a solution.	CO4- E	(16)
		Or		
	(b)	Describe in detail about single component absorption with a neat sketch.	CO4- E	(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.	CO2-App	(16)
		Or		
	(b)	Outline the characteristics of Vapour-liquid equilibrium, feed line and role of this feed line in determining the number of stages in distillation column.	CO2-App	(16)
14.	(a)	Elucidate the principle, working, application, advantages and disadvantages of Rotating disc contractor.	CO3- Ana	(16)
		Or		
	(b)	Classify Liquid-Liquid extraction equipment and explain in detail about mixer settler and decantor.	CO3- Ana	(16)
15.	(a)	Explain the principle of adsorption, adsorption equilibria and its application.	CO1-U	(16)
		Or		
	(b)	Explain the principle, mechanism and application of driers in food and pharma industries.	CO1-U	(16)