Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 90017

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024
Fifth Semester
Biotechnology
U19BT516 – HEAT & MASS TRANSFER
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	List the factors affecting the thermal conductivity of a material.	2	K1	CO1
2.	Distinguish between natural and forced convection.	2	K2	CO1
3.	Recall the applications of baffles in the shell and tube heat exchanger.	2	K1	CO2
4.	Define steam economy of an evaporator.	2	K1	CO2
5.	State and explain Fick's law of diffusion.	2	K2	CO3
6.	Define: Schmidt number and Sherwood number.	2	K2	CO3
7.	Define the term: NTU.	2	K1	CO4
8.	List the factors influencing the choice of solvent used in liquid extraction.	2	K2	CO4
9.	State the advantages of steam distillation.	2	K2	CO5
10.	Define adsorption isotherm.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Obtain the expressions for rate heat transfer through plane wall and hollow cylinder.	6+7	K3	CO1

(OR)

	b)	Derive the relationship for forced convection by using dimensional analysis method, Including various dimensionless numbers.	13	K3	CO1
12.	a)	Explain with necessary equations, the steps involved in the design of a shell and tube heat exchanger.	13	K3	CO2
		(OR)			
	b)	With neat sketches, discuss the various methods of feeding in multiple effect evaporators.	13	K2	CO2
13.	a)	Discuss briefly the various analogies in mass transfer operations.	13	K2	CO3
		(OR)			
	b)	Discuss about the film and penetration theories of mass transfer.	13	K2	CO3
14.	a)	i. With neat sketch, explain the working principle of a plate tower used for gas absorption.	7	K3	CO4
		ii. Discuss the classification and types of ternary liquid equilibrium systems.	6	K3	CO4
		(OR)			
	b)	i. Derive an expression to find the height of packing in an absorption tower by NTU and HTU method.	7	K3	CO4
		ii. Discuss the working principle of any one solvent extraction equipment with neat diagram.	6	K3	CO4
15.	a)	i. Explain constant temperature and constant pressure vapour- liquid equilibria.	6	K3	CO5
		ii. Explain the process of flash vaporization with a diagram.	7	K2	CO5
		(OR)			
	b)	i. Discuss Langmuir and Freundlich adsorption isotherms.	10	K3	CO5
		ii. Explain the concept of HETP.	3	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Analyse the importance and applications of combined conduction, convection and radiation in bioprocess industries.	9	K4	CO1
		ii.	Explain types and mechanism of condensation.	6	K2	CO2
			(OR)			
	b)	i.	Discuss in detail, the procedure involved in the determination of number of ideal stages in a continuous fractionating column by McCabe- Thiele method.	9	K3	CO5
		ii.	Write short note on industrial adsorbents.	6	K2	CO5