U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Chemical Engineering **Duration: 3 hrs.**

Course Code: 22CH7PCBCE **Max Marks: 100**

Course: Biochemical Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Discuss the role of chemical engineers in bioprocess industries.	*CO1*	*PO8*	**05**
	b)		Draw a neat figure of the eukaryotic cell and name all parts.	*CO1*	*PO8*	**05**
	c)		Classify microorganisms based on structure and mention their characteristics.	*CO2*	*PO2*	**10**
			OR			
2	a)		How are microorganisms classified based on the reproductive cycle? Explain.	*CO1*	*PO8*	**10**
	b)		Elucidate the concept of Whittaker's five-kingdom. List the microorganisms in each category.	*CO1*	*PO8*	**10**
			UNIT - II			
3	a)		What is pKa? Explain the effects of shear, temperature and pH on enzyme functionally?	*CO2*	*PO2*	**10**
	b)		Explain the enzyme nomenclature according to enzyme commission.	*CO2*	*PO2*	**10**
			OR			
4	a)		The following data have been obtained for two different initial enzyme concentrations for an enzyme-catalyzed reaction.	*CO3*	*PO4*	**10**

v([E_0] = 0.015 g/L) (g/L min)	[S] (g/L)
1.14	20.0
0.87	10.0
0.70	6.7
0.59	5.0
0.50	4.0
0.44	3.3
0.39	2.9
0.35	2.5

i. Find K_m and k_2

			ii. Find V_m for $[E_0]$ = 0.015 g/L. Use Hanes-Woolf plot.			
		b)	Explain the lock and key theory for the enzyme-substrate complex with suitable example.	*CO3*	*PO4*	**10**
			UNIT - III			
	5	a)	Mention the types of enzyme inhibition kinetic effects. Briefly elucidate the competitive and non-competitive inhibition.	*CO5*	*PO4*	**10**
		b)	What is enzyme immobilization? Explain the methods of immobilization.	*CO5*	*PO4*	**10**
			OR			
	6	a)	Develop a model for uncompetitive inhibition and state all assumptions and draw the plots.	*CO5*	*PO4*	**10**
		b)	What is substrate inhibition? Derive the model for the same. State all assumptions and draw the plot.	*CO5*	*PO4*	**10**
			UNIT - IV			
	7	a)	A new strain of yeast is being considered for biomass production. The following data were obtained using a chemostat. An influent substrate concentration of 800 mg/L and an excess of oxygen were used at a pH of 5.5 and T = 35°C. Calculate $Y^M_{X/S}$, m_S, k_d, μ_m, and K_s using the following data.	*CO5*	*PO4*	**16**
		b)	What is the logistic equation?	*CO4*	*PO4*	**04**
			OR			
	8	a)	Discuss the importance of the Monod equation with respect to substrate-limited growth.	*CO4*	*PO4*	**10**
		b)	With a neat schematic diagram, explain the working of an ideal chemostat. Show that μ_g = D for the chemostat.	*CO6*	*PO7*	**10**
			UNIT - V			
	9	a)	Explain the sterilization process used for the control of microorganisms.	*CO6*	*PO7*	**10**
		b)	Explain in detail the mechanical methods and non-mechanical methods of cell disruption.	*CO6*	*PO7*	**10**
			OR			
	10	a)	Explain the mechanism of affinity chromatography. What are the limitations and applications of bio-affinity chromatography?	*CO6*	*PO7*	**06**
		b)	Discuss how freeze-drying is carried out.	*CO6*	*PO7*	**06**
		c)	Explain fermentation technology with the essential requirements of a bioreactor.	*CO6*	*PO7*	**08**

Dilution rate (h^{-1})	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Carbon concentration (mg/L)	16.7	33.5	59.4	101	169	298	702
Cell concentration (mg/L)	366	407	408	404	371	299	59

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