U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 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.

			CO	PO	Marks
		UNIT - I			
1	a)	Enumerate on the role of chemical engineers in bioprocess industry.	*CO1*	*PO8*	**10**
	b)	Enumerate on classification of microorganisms based on their structure.	*CO1*	*PO8*	**10**
		OR			
2	a)	How are the microorganisms classified under reproduction cycle?	*CO1*	*PO8*	**10**
	b)	Outline the general production of enzymes in bioprocess industries with two examples.	*CO1*	*PO8*	**10**
		UNIT - II			
3	a)	What are proteins? Enumerate on their structure.	*CO1*	*PO8*	**12**
	b)	Discuss in brief about enzyme nomenclature.	*CO3*	*PO4*	**08**
		OR			
4	a)	Derive Michaelis-Menten equation considering a simple enzyme kinetics with one substrate stating all the assumptions	*CO4*	*PO4*	**10**
	b)	Initial rates of an enzyme-catalyzed reaction for various substrate concentrations are listed below.	*CO4*	*PO4*	**10**

S, (mol/L)	υ, mol/(L.min) × 10^6
4.1×10^{-3}	177
9.5×10^{-4}	173
5.2×10^{-4}	125
1.03×10^{-4}	106
4.9×10^{-5}	80
1.06×10^{-5}	67
5.1×10^{-6}	43

Evaluate υ_{max} and K_m using Lineweaver-Burk plot.

		UNIT - III			
5	a)	Derive an inhibition model for the enzymatic reaction in which the substrate and inhibitor are always competing for the active sites. State all assumptions.	*CO5*	*PO4*	**10**

<table>
<tr><td></td><td></td><td>b)</td><td>Derive an expression for enzymatic reaction in which the substrate and inhibitor are non-competitive</td><td>CO5</td><td>PO4</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>Experimental data on hydrolysis of start with α amylase is given in the table below.
<table>
<tr><th>Inhibitor</th><th>Inhibitor concentration, mg/ml</th><th>Substrate concentration mg/ml</th><th>Relative hydrolysis velocity</th></tr>
<tr><td>None</td><td>0</td><td>12.56
9
6.33
4.28
2.34
1.00</td><td>101
92.4
82.7
70.9
65
28.8</td></tr>
<tr><td>Maltose</td><td>12.7</td><td>10
5.26
3.33
1.89
1.67</td><td>77
62.5
51.4
37
34.2</td></tr>
</table>
Determine MM constant k_m and type of inhibition</td><td>CO5</td><td>PO4</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain enzyme immobilization with examples</td><td>CO5</td><td>PO4</td><td>08</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Enumerate on transient growth kinetics of bioreactors.</td><td>CO6</td><td>PO7</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>Discuss on quantification of growth kinetics.</td><td>CO4</td><td>PO4</td><td>08</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>8</td><td>a)</td><td>Discuss in detail about Monod growth kinetics.</td><td>CO4</td><td>PO4</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>What do you mean by washout condition in bioreactor? Explain</td><td>CO6</td><td>PO7</td><td>08</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>9</td><td>a)</td><td>Discuss in detail about aseptic aerobic fermentation process.</td><td>CO4</td><td>PO4</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>What is sterilization? Briefly describe the same for bioprocess equipment.</td><td>CO4</td><td>PO4</td><td>08</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>a)</td><td>Elaborate on chromatography technique used in bioprocess industries.</td><td>CO6</td><td>PO7</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>Discuss on freeze drying methods used in biotechnology with any one example.</td><td>CO6</td><td>PO7</td><td>08</td></tr>
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