

**VIT****Vellore Institute of Technology**

(Deemed to be University under section 3 of UGC Act 1956)

SCHOOL OF BIO SCIENCES AND TECHNOLOGY**CONTINUOUS ASSESSMENT TEST -II****FALL SEMESTER 2025-2026**

Programme Name & Branch : M.Sc (Integ) Biotechnology
Course Code : TBIT302L
Course Name : Bioprocess Engineering
Slot : C1+TC1
Faculty Name(s) : Dr M Ramesh Pathy/ Dr S Venkat Kumar
Class Number(s) : VL2025260101029 / VL2025260101026
Date of Examination :
Exam Duration : 90 minutes

Maximum Marks: 50

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Maximum Marks: 50

Q. No	Question	Marks	Course Outcome (CO)	Bloom's Taxonomy (BL)																																																																																	
1.	Using the following experimental data, calculate the effect, mean square and F-test to find the optimized variable using Plackett Burman design <table><tr><th>R u n</th><th>Glu cos e</th><th>Peptone</th><th>Meat extra ct</th><th>Yeast Extra ct</th><th>Organi c salts</th><th>Micro eleme nts</th><th>N a Cl</th><th>Yield</th></tr><tr><td>1</td><td>-1</td><td>-1</td><td>1</td><td>1</td><td>-1</td><td>1</td><td>1</td><td>0.571</td></tr><tr><td>2</td><td>-1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>-1</td><td>1.601</td></tr><tr><td>3</td><td>1</td><td>-1</td><td>-1</td><td>-1</td><td>-1</td><td>1</td><td>1</td><td>2.096</td></tr><tr><td>4</td><td>-1</td><td>1</td><td>-1</td><td>-1</td><td>1</td><td>-1</td><td>1</td><td>0.714</td></tr><tr><td>5</td><td>1</td><td>1</td><td>-1</td><td>1</td><td>-1</td><td>-1</td><td>-1</td><td>7.792</td></tr><tr><td>6</td><td>-1</td><td>-1</td><td>1</td><td>1</td><td>-1</td><td>-1</td><td>1</td><td>0.977</td></tr><tr><td>7</td><td>1</td><td>-1</td><td>1</td><td>-1</td><td>1</td><td>-1</td><td>-1</td><td>7.687</td></tr><tr><td>8</td><td>1</td><td>1</td><td>-1</td><td>-1</td><td>1</td><td>1</td><td>-1</td><td>1.276</td></tr></table> -1 and 1 denotes low level and high level value respectively, NaCl is designated as dummy variables.	R u n	Glu cos e	Peptone	Meat extra ct	Yeast Extra ct	Organi c salts	Micro eleme nts	N a Cl	Yield	1	-1	-1	1	1	-1	1	1	0.571	2	-1	1	1	1	1	1	-1	1.601	3	1	-1	-1	-1	-1	1	1	2.096	4	-1	1	-1	-1	1	-1	1	0.714	5	1	1	-1	1	-1	-1	-1	7.792	6	-1	-1	1	1	-1	-1	1	0.977	7	1	-1	1	-1	1	-1	-1	7.687	8	1	1	-1	-1	1	1	-1	1.276	10	CO3	BL3
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2.	A yeast ($\text{CH}_{1.66}\text{N}_{0.13}\text{O}_{0.40}$) is growing aerobically on arabinose ($\text{C}_5\text{H}_{10}\text{O}_5$) and ammonium hydroxide (NH_4OH) with a respiratory quotient of 1.4. $\text{C}_5\text{H}_{10}\text{O}_5 + a\text{O}_2 + b\text{NH}_4\text{OH} \rightarrow c\text{CH}_{1.66}\text{N}_{0.13}\text{O}_{0.40} + d\text{CO}_2 + e\text{H}_2\text{O}$. Find the stoichiometric coefficient.	10	CO3	BL3																																																																																	
3.	Using Monod model, explain the various ways to find out the maximum specific growth rate and Monod constant.	10	CO3	BL1																																																																																	
4.	The chemical reaction equation for respiration of glucose is $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ <i>Candida utilis</i> cells convert glucose to CO_2 and H_2O during growth. The cell composition is $\text{CH}_{1.84}\text{O}_{0.55}\text{N}_{0.2}$ plus 5% ash. Yield of biomass from substrate is 0.5 g/g. Ammonia is used as nitrogen source. What is the oxygen demand with growth?	10	CO5	BL3																																																																																	
5.	Explain on the classical and statistical way of media optimization.	10	CO5	BL1																																																																																	