BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.Sc **SEMESTER : II**
BRANCH: BIOTECHNOLOGY **SESSION : SP/2025**

SUBJECT: BT416 ENZYME & BIOPROCESS TECHNOLOGY

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	What do you mean by growth of microbes? Design a method to estimate microbial biomass present in a 10000L bioreactor.	[5]	1	6
Q.1(b)	Calculate specific growth rate (μ) of *Escherichia* coli for its growth in batch bioreactor. Data from batch culture is provided below:	[5]	1	4

Time of sample collection (h)	0	2	4	6	8	10	12
Produced Biomass (g/L)	0.006	0.018	0.126	0.542	1.148	2.868	3.152
Residual sugar (g/L)	10.000	9.650	8.310	7.743	5.267	2.434	0.032

Q.2(a) Calculate V_{max} and K_m for an enzyme catalyzed reaction. Given $[E_o]$= 0.025 g/l. [5] 2 4

V_o (g/l-min)	0.18	0.48	0.66	0.78	0.93	0.98	1.32	1.56
S_o (g/l)	1.0	2.0	3.0	5.0	8.0	12	20	30

Q.2(b)	What do you mean by enzyme immobilization? Fungal derived α - amylase is purified from the culture broth. Elaborate encapsulation method in detail for its immobilization. Describe its merit, demerits and detailed methodology.	[5]	2	3
Q.3(a)	What do mean by sterilization of medium in fermentation industry? Derive an expression to show the death kinetics in batch autoclave.	[5]	3	3
Q.3(b)	Draw a schematic diagram for a system used for continuous sterilization by using two heat exchangers. Also, relate it with its methodology of sterilization.	[5]	3	3
Q.4(a)	Design a system for aeration and agitation for a tank bioreactor, level the diagram and explain the process of aseptic aeration and agitation.	[5]	3	3
Q.4(b)	What is volumetric oxygen transfer coefficient? Describe the dynamic method to calculate it.	[5]	3	3
Q.5(a)	Draw the structure of a chemostat, level it and describe its working.	[5]	3	2
Q.5(b)	Derive the expression to show that 'for production of primary metabolites, continuous culture is better'.	[5]	3	3

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