

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO/2022)**

**CLASS: M.TECH / PRE-PHD
BRANCH: BIOTECHNOLOGY**

**SEMESTER : I / NA
SESSION : MO/2022**

**SUBJECT: BE501 ADVANCED BIOPROCESS ENGINEERING
TIME: 03 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. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

- Q.1(a) What is enzyme? How does it catalyze reaction? L2CO1PO6 [2]
 Q.1(b) Design a method for measuring enzyme activity catalyzed by salivary amylase to starch. L6CO1PO4 [3]
 Q.1(c) Propose a model for enzymatic catalysis of single substrate. Also give suitable assumptions undertaken for this catalysis. L3CO1PO6 [5]
- Q.2(a) What is bacterial growth rate? How it differs from specific growth rate? L4CO2PO6 [2]
 Q.2(b) Design a method for measurement of dry biomass from sample taken from a CSTR inoculated with *Saccharomyces cerevisiae*. For this use following information. $Y = 0.567X$. L6CO2PO4 [3]
 Q.2(c) Use following data for production of Acetic acid by a bacterial isolate. Design the steps for optimization of Carbon and Nitrogen components of medium by monofactorial search. L6CO2PO4 [5]

Name of Components of medium	Glucose	NaNO ₃	Malt Extract	FeSO ₄ .7H ₂ O	K ₂ HPO ₄
Components of medium (g/l)	5	1.1	0.2	0.004	0.02

- Q.3(a) Draw the self-explanatory schematic diagram of a chemostat. L3CO2PO4 [2]
 Q.3(b) Describe the time-temperature regime as a tool to design the sterilization process for medium in a CSTR. L2CO2PO4 [3]
 Q.3(c) Propose a method for continuous sterilization of medium. Support your answer with suitable schematic diagram of the proposed system and describe it. L6CO2PO4 [5]
- Q.4(a) What is scaleup of bioreactor? List the typical parameters used for it. L1CO3PO6 [2]
 Q.4(b) Discuss the method of constant P/V for scaleup of a bioreactor. L2CO3PO3 [3]
 Q.4(c) How do K_a have been used to scaleup of bioreactor. Describe detailed method. L2CO3PO3 [5]
- Q.5(a) Discuss the factors which involved in conceptualization of setting of a fermentation plant. Describe briefly. L2CO4PO5 [2]
 Q.5(b) Propose a method to compute the selling price of a unit product produced from a newly set bioprocess plant. L6CO4PO5 [3]
 Q.5(c) Discuss the method involved in fund management for a newly set bioprocess plant. L2CO4PO5 [5]

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