

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

**CLASS: B.TECH
BRANCH: BIOTECHNOLOGY**

**SEMESTER : V
SESSION : MO/18**

SUBJECT: BT5021 BIOPROCESS ENGINEERING

TIME: 3.00 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 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.
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- Q.1(a) Analyze the growth patterns of a microorganism in a limited medium. [6]
Q.1(b) Evaluate the different types of microbial products with respect to their kinetics. [6]
- Q.2(a) Analyze the different means of transfer of heat in a bioreactor. [2]
Q.2(b) What do you understand by degree of reduction? Find out degree of reduction of propane? [4]
Q.2(c) Derive an equation for enzyme catalysis for single substrate. Define Michaelis-Menten constant. [6]
- Q.3(a) Explain the role of one factor at a time (OFAT) in medium optimization. [2]
Q.3(b) Calculate the stoichiometric coefficients for following equations. [4]
$$C_6H_{12}O_6 + aO_2 + bNH_3 = c(C_{4.4}H_{7.3}O_{1.2}N_{0.86}) + dH_2O + eCO_2$$

Q.3(c) Mention various physicochemical conditions on enhanced production of microbial enzyme. [6]
- Q.4(a) Evaluate the role of del factor on sterilization process. [2]
Q.4(b) Explain the significance of air filter sterilization. [4]
Q.4(c) Analyze the significance of different types of impeller. [6]
- Q.5(a) Explain the various factors involved in regulation of OTR. [4]
Q.5(b) Describe the dynamic method of K_{La} determination. [4]
Q.5(c) What is relationship between N_p and N_{Re} ? [4]
- Q.6(a) Evaluate the criteria considered for designing a bioreactor. [2]
Q.6(b) Explain the significance air-lift reactor. [4]
Q.6(c) Derive the material balance in batch mode of cultivation system. [6]
- Q.7(a) What is the significance of Damkohler Number? [2]
Q.7(b) Estimate the theoretical growth and product yield for ethanol production as given in the equation- [4]
$$C_6H_{12}O_6 \longrightarrow 2 C_2H_5OH + 2CO_2 + 2ATP$$
 (Given; $Y_{ATP} = 10.5$ gdw/mol ATP).
Q.7(c) Describe the mass balance of biomass accumulation and substrate used in a CSTR. [6]

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