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

CLASS: BE **SEMESTER: V**
BRANCH: BIOTECH **SESSION : MO/2019**

SUBJECT : BT5021 BIOPROCESS ENGINEERING

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Differentiate between growth rate and specific growth rate? Derive an expression for it in presence of limiting nutrient 'S'. [2]

(b) Design a method to quantify the dry biomass of bacterial culture by using UV-Vis data. [3]

Q2 (a) Plan a test you will undertake to differentiate living and dead cell of a bacterial culture. [2]

(b) Production of single cell protein from hexadecane in presence of ammonia was done as follow. [3]

$$C_{16}H_{34}+aO_2+bNH3 \Longrightarrow cCH_{1.66}O_{0.27}N_{0.20}+dCO_2+eH_2O$$

If, RQ=0.43, determine stoichiometric coefficients.

Q3 (a) Draw an illustrated diagram of a chemostat. [2]

(b) Describe material balance on product formation in a continuous culture being operated at dilution (D) containing limiting nutrient (So). Derive expressions for cell biomass. [3]

Q4 (a) Define Degree of reduction for different substrate used in fermentation. [2]

(b) Derive the expression to link the energy with its material balance for biomass production by use of glucose, ammonia and water. [3]

Q5 (a) What do you mean by International Unit of enzyme activity? [2]
Calculate IU from following data:

Substrate concentration (mmol l^{-1})	40.0	20.0	10.0	6.67	5.0
Time (min)	0	1	2	3	4

(b) Derive model equation for single substrate enzyme catalyzed reversible reaction. [3]

Q6 (a) Describe a method for determination of Km and Vmax for single substrate enzyme catalyzed reaction. [2]

(b) The following results were obtained for an enzyme catalysed reaction. [3]

Substrate concentration (mmol l^{-1})	5.0	6.67	10.0	20.0	40.0
Initial velocity (μ mol l^{-1} min^{-1})	147	182	233	323	400

Calculate Km and Vmax.

:::::: 19/09/2019 ::::::E