B.E. CHEMICAL ENGINEERING 4TH YEAR SECOND SEMESTER EXAMINATION 2019

BIOENERGETICS AND BIOPROCESS ENGINEERING

Time: Three hours **Full Marks: 100**

Answer all questions

1. Derive the rate equation for a homogeneous enzyme-catalyzed reaction using the rapid equilibrium assumption. 20

2. The following data have been obtained from an enzyme catalysed reaction using enzyme concentration ($[E_0]$ = 0.00875 g/l).

Substrate concentration, [s](g/l)	20	10	6.7	5.0	4.0
Rate of reaction, γ[g/(l.min)]	0.67	0.51	0.41	0.31	0.29

Estimate using Hanes-Woolf plot 1) Forward reaction velocity (V_m), 2) Michaelis-Menten constant (K_m) and 3) Rate constant (k_2). 20

3. Describe briefly with the help of a neat sketch the various section of cell growth curve. 20

4. In his (Monod) thesis which was published Monod was proposed equation with his name. As experimental support for this equation from his presented results from 4 batch reactor run on the growth of a pure bacteria culture in a lactose solution. One of his runs produced:

Time(hr)	0	0.54	0.90	1.23	1.58	1.95	2.33	2.70
$C_A(mg.L^{-1})$	147	125	104	70	38	18	3	1
$C_C(mg.L^{-1})$	15.5	23	30	38.8	48.5	68.3	61.3	62.5

Fit the Monod equation to this data. 20

5. a) Explain the different methods of enzyme immobilization?
b) Describe the non-mechanical methods of cell disruption. 10+10=20