(b) What are the different types of enzyme reactor? Explain with diagram of any batch enzyme reactor.

(c) Describe the different generation of biosensor. Discuss in detail about the third generation biosensors.

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NBT-403

B. Tech. (IV Sem.) Even Semester

SPL. THEORY EXAMINATION, 2014-15

ENZYME ENGINEERING

Time : 3 Hours]   *[Total Marks : 100*

Note: Attempt all questions. All questions carry equal marks.

1.   Attempt any four parts of the following: 5×4=20

(a) Give evidence to show that enzymes are proteins.

(b) Explain the structure and application of enzyme with suitable example.

(c) Define holoenzyme, apoenzyme, homotropic enzyme & heterotropic enzyme.

(d) What is meant by enzyme specificity? Explain its types with suitable examples.

(e) The following table gives the values of V_{max} of an enzyme- catalyzed reaction at different temperature.

Temperature (°C)	V_{max} (μ moles min^{-1})
25	6.50
30	12.00
35	16.50
40	22.30
45	30.00

Calculate the Q_{10} value between 25° C and 35° C.

(f) Explain mathematically how a value for K_m can be obtained from V vs. [S] graph when $V = 0.5\ V_{max}$.

2. Attempt any <u>two</u> parts of the following: 10×2=20

(a) Explain the different models used for the bisubstrate reaction.

(b) Derive the Eadie-Hofstee equation. Compare the MM plot and EH plot.

(c) What is Briggs-Haldane relation? How will you derive it? What is its significance?

3. Attempt any <u>two</u> parts of the following: 10×2=20

(a) Explain the steps involved in purification process of enzymes. Discuss the use of chromatography techniques in this process.

(b) What do you understand by enzyme assay's? Explain the Enthalpimetry technique used for assay with suitable reaction.

(c) Consider the following data for a kinetic reaction.

Parameter	Value
Substrate Concentration	3×10^{-4}M
Product Concentration	4×10^{-4}M
K_m value for substrate	4×10^{-5}M
V_{max} for forward reaction	$3\,\mu$ moles L^{-1} min^{-1}
V_{max} for reverse reaction	$6\,\mu$ moles L^{-1} min^{-1}
Equilibrium Constant	5

(i) In which direction will the reaction proceed?

(ii) Calculate the K_m value for the product.

4. Attempt any two parts of the following :   10×2=20

(a) What is immobilization? Discuss the advantages and disadvantages of immobilized enzyme over free anzyme.

(b) What are the different parameters to select the carrier matrix used for the immobilization of enzymes?

(c) Discuss the kinetic properties of immobilized enzyme.

5. Attempt any two parts of the following :   10×2=20

(a) What are the components of a biosensor? How do they function? Explain peizo- electric biosensor with its advantages.