JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2024

M.Tech-II Semester (BT)

COURSE CODE (CREDITS): **14M11BT215 (3)** MAX. MARKS: **25**

COURSE NAME: **Metabolic Engineering**

COURSE INSTRUCTOR: **Dr. Jitendraa Vashistt** MAX. TIME: **1 Hour 30 Minutes**

Note: (a)All questions are compulsory. (b)Marks are indicated against each question in square brackets. (c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q1. Explain the biological significance of Shikimate pathway in plants and Does Shikimic acid pathway exist in humans? Explain the consequences of absence/presence of this pathway in humans. **(4 marks)**

Q2. Enzymes are not counted in terms of microgram or milligram. However, their units are different. Explain the unit of enzyme quantity in terms of substrate conversion. **(4 marks)**

Q3. Calculate the substrate concentration at which the velocity of the enzymatic reaction reaches at 1/4 of the V_{max} using Michaelis-menten equation. The enzyme has K_M value of 0.5mM and Velocity maximum (V_{max}) = 200mmol/second. **(4 marks)**

Q4. Design a metabolic strategy for production of an essential amino acid (for humans) using the bacteria. Also define the property of auxotrophy for the process and troubleshoot the process to overcome auxotrophy. **(4 marks)**

Q5.a Which of the molecule provides more energy in terms of ATP generation; one molecule of glucose or one molecule of triacylglycerol? Justify your answer by calculating ATP after complete oxidation of each molecule. **(2 marks)**

b. Which molecule is required for the generation of Palmitic acid in humans and how many molecules are required for this biosynthetic process? **(2 marks)**

Q6. Design an experimental method for determining the relation of velocity of the enzymatic reaction and substrate concentration. Explain the relationship a) initial reaction b) middle reaction c) at substrate saturation. **(5 marks)**