JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2023

M.Tech-I Semester [BT]

COURSE CODE (CREDITS): 18M1WBT133 (3) MAX. MARKS: 35

COURSE NAME: Advances in Computational Systems Biology

COURSE INSTRUCTORS: Dr. Tiratha Raj Singh MAX. TIME: 2 Hours

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

Q1. Discuss the role of systems biology in future expansion of science and technologies. Discuss your viewpoint through a real life example where principles of systems biology could be utilized to solve future serious issues in our society, be it a disease or technology development. [5]

Q.2. What is Stoiciometry matrix? Explain its role in metabolic networks. For a given set of 6 reactions, fabricate the Stoiciometry matrix: [5]

R1: $2A + B \rightarrow C + 3D$ **R4: $4B \rightarrow D + A$**

R2: $A + 3B \rightarrow C + E$ **R5: $D + 2B \rightarrow C + 2E$**

R3: $A \rightarrow 2B + D + E$ **R6: $C + 4E \rightarrow 3B + D$**

Q.3. DIscuss in details the phylogenetic profiling method with an example where 7 different species (***assume from your side but from different lineages***) are involved. Plot the study with reference to PPIs and finally conclude with its application in the involved species. [5]

Q.4. Provide a technical discussion on following topics with reference to biological systems. Discuss their respective application parts also. [2.5*4=10]

(a) Petri Nets and modelling of biological systems (b) Metabolic networks

(c) Dynamicity of regulatory networks (d) JAK-STAT pathway and its importance

Q.5. What is E-cell? Discuss its modules, implication and characteristics. Describe how this project was a revolutionary step in the growth of biological systems scenerio? [5]

Q.6. What are PPIs? Realize the significance of PPIs in biological systems. Discuss in brief various experimental and computational methods availabe for the charaterizations and analysis of PPIs. [5]