

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST - 3 EXAMINATION - MAY - 2023

COURSE CODE(CREDITS): 20MSWBT433 (2)

MAX. MARKS: 35

COURSE NAME: 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.

- Q.1. Discuss about the network that is a "complete set of metabolic and physical processes that determine the physiological and biochemical properties of a cell". Write fundamental properties of this network type. [4]
- Q.2. What are Petri nets? Describe about their basic classification based upon time, space, quality and quantity parameters. Demonstrate the basic ingredients of Petri net with their respective role. [1+2+2]
- Q.3. Design a Petri net for an enzymatic reaction where a substrate in association with an enzyme makes an Enzyme-Substrate complex and produces a product at the end of the reaction. Assume that this reaction is modified in next phase where the process of central dogma for a gene was incorporated. Design two separate Petri nets for these two events. [3+3]
- Q.4. What is the recent evolution of XML and discuss how it is used for the modeling of biological systems? Write SBML code for a biochemical reaction where a parameter X is used at time t . Keep a note that the production of X is delayed by a time factor of 0.5 seconds in the next step. [2+5]
- Q.5. Discuss ER model for calculating possible combinations of nodes and their interactions for any general network type. Discuss all the possible parameters and combinations. [3]
- Q.6. Realize the properties of a biological system. Compare these with the crucial network properties to illustrate a comparative computational framework for the analysis of any given network type. Assume required parameters for a case study (biological network type) of your choice. [4]
- Q.7. Explain the following with a suitable example of each: [1.5*4=6]
- (a) E-cell project
 - (b) Signal Transduction Networks
 - (c) PPIs and their role in biological systems
 - (d) TRNs and TFs