

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-2022

M.Tech-I Semester (BT)

COURSE CODE (CREDITS): 18M1WBT133 (3)

MAX. MARKS: 25

COURSE NAME: Advances in Computational Systems Biology

COURSE INSTRUCTORS: Dr. Tiratha Raj Singh

MAX. TIME: 1 Hour 30 Min

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Simple calculator is permitted.

Q1. "Robustness of any living system is achieved for its survival". Justify this statement through the detailed discussion of system level parameters and their intricate associations. [4]

Q2. Suggest the significance of motifs in biological networks. Demonstrate the computations for sub-graph concentrations for a motif type where 3 nodes are there and 8 motifs were found in a regulatory network out of 13 for a 3 node type. Assume their respective frequency as per the requirements. [1+3 = 4]

Q3. Describe the classification of network motif families with a special emphasis on feed forward loop (FFL) family with its applications in regulatory pathways. [5]

Q4. For a set of 3 genes, generate state-transition table if Boolean functions are given as follows (assume standard values for G1, G2 and G3 at time t):

$$G1(t+1) = G2(t) \text{ and } G3(t)$$

$$G2(t+1) = G3(t)$$

$$G3(t+1) = \text{not } G1(t)$$

[4]

Q5. What is stoichiometry? How it is related to any biological system? Discuss with an example where 3 reactions and 4 components (2 reactants and 2 products) were given. [1+1+2=4]

Q6. What is Hill function for activator? calculate its value for an activator where concentration of activator is 10 units, and Hill coefficient is 3 and maximal expression level is 2.5 units. [4]