B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: VII**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 21CS7BSBFE **Max Marks: 100**
Course: Biology for Engineers

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Write the two types of cells based on their organization and differentiate them. **6**

b) What is cell nucleus? Explain the functions of nucleus. **6**

c) How cell membrane is important in a cell? Also explain any four functionalities of the cell membrane. **8**

UNIT - II

2 a) Explain how Evolutionary Algorithms are used for optimization? **8**

b) Write the algorithm for Travelling Sales Person (TSP) using Ant Colony Optimization. **8**

c) Justify how pheromone update is positive and negative reinforcement in Ant Colony Optimization. **4**

OR

3 a) Describe any four decision designs in Ant Colony Optimization algorithms. **8**

b) Explain the different components of Evolutionary Algorithm. **8**

c) Write applications of Ant Colony Optimization. **4**

UNIT - III

4 a) Explain the salient features of Swarm Intelligence based algorithms and also describe the limitations of these algorithms. **6**

b) Give the notation of a cellular automata and explain each component. **6**

c) Illustrate the standard Particle Swarm Optimization Algorithm. **8**

UNIT - IV

5 a) Explain the structure of a gene. **6**

b) With respect to MRI system justify how the genetic algorithms is used for designing the equipment? **8**

c) Let us consider $a_1, a_2, ..., a_n$ to be a permutation of the set $\{1, 2, ..., n\}$ and an inversion vector $b_1, b_2, ..., b_n$ of the permutation $a_1, a_2, ..., a_n$ is defined as bj be the number of elements to the left of j that are greater than j. Generate the permutation given the inversion vector 065500110. **6**
What are the advantages of using inversion vector?

OR

6 a) With a neat diagram explain how the gene expression algorithm is used for optimizing phenotype? **8**

b) Explain the different stages of gene expression. **4**

c) Suppose a genetic algorithm uses chromosomes of the form x = a b c d e f g h with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of an individual x be calculated as: **8**
$f(x) = (a + b) - (c + d) + (e + f) - (g + h)$
Let the initial population consist of four individuals with the following chromosomes:

x_1=6 5 4 1 3 5 3 2
x_2=8 7 1 2 6 6 0 1
x_3=2 3 9 2 1 2 8 5
x_4=4 1 8 5 2 0 9 4

i. Evaluate the fitness of each individual.
ii. Cross the fittest two individuals using one–point crossover at the middle point and write the resulting individual.
iii. By looking at the fitness function and considering that genes can only be digits between 0 and 9 find the chromosome representing the optimal solution (i.e. with the maximum fitness). Find the value of the maximum fitness.

UNIT - V

7 a) Explain the objectives of Bioinformatics. **6**

b) With an example explain the working principle of Biosensor. **8**

c) Explain any three Nano molecules in Biomedical Sciences. **6**

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