**Roll No** .....

# MCIT-204

## M.E./M.Tech., II Semester Examination, June 2020

## Soft Computing

***Time : Three Hours***

***Maximum Marks : 70***

***Note :*** i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Explain Hill Climbing algorithm. 5
   b) Discuss A* algorithm with an example. 5
   c) Discuss the knowledge representation using predicate logic. 4

2. a) Explain the biological neural system in detail. 4
   b) Discuss all the three Artificial Neural Network Architectures and what is the role of hidden layers in the multilayer feed forward network. 6
   c) Show that the sigmoidal function is strictly monotonic. 4

3. a) Write a short note on the following applications of Fuzzy logic: 5
      i) Medicine
      ii) Economics
   b) Differentiate the Classic and Fuzzy sets. Explain with suitable example. Also explain the concept of Fuzzy Number with respect to Membership function. 5
   c) If A and B are two Fuzzy events of a sample space S. Prove that P(A/B) + P(A$^c$/B) = 1. 4

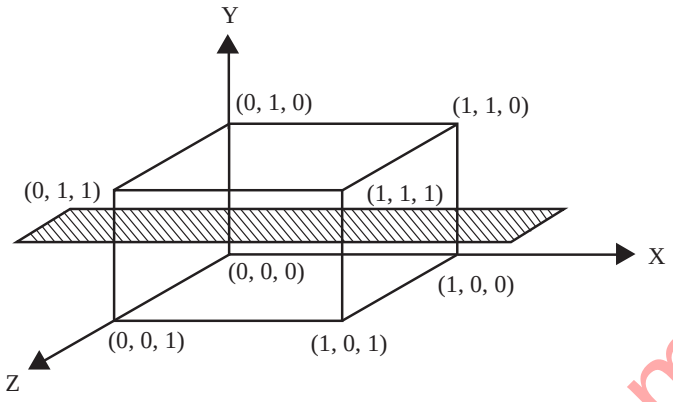
4. a) Explain crossover and mutation genetic operators with example. State the rank-space method. 6
   b) Write the Genetic Algorithm (GA). Solve an optimization problem using GA. 8

5. a) Discuss the following. 8
      i) Rule based structure identification
      ii) Neuro-Fuzzy controls
      iii) Evolutionary computation
      iv) Simulated Annealing
   b) Differentiate between classification and regression trees. 6

6. a) Use simple perceptron learning scheme to classify the eight patterns as lying on the ABOVE and BELOW the horizontal shaded plane as shown in the figure underneath. 10

The output $O(x) = \begin{cases} \text{ABOVE if} & g(x) > 0 \\ \text{BELOW if} & g(x) \le 0 \end{cases}$

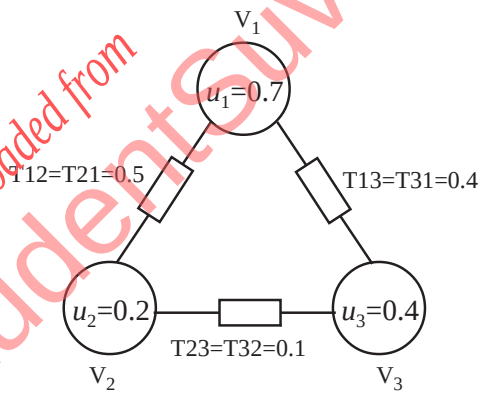
Let the initial weight vector be (0, 1, 1, 1) and $x_0 = 1$.




Draw the truth table for the above problem showing the input and its corresponding desired output. Find the final weight vector when the learning rate $\eta = 1$.

b) What is the role of bias in the neural network? Explain any four activation functions. 4

7. a) Consider the 3-node Hopfield net with the initial weights and thresholds as indicated in figure below. 7




Train the above network such that the pattern 110 becomes stable. Draw the transition diagram corresponding to the trained Hopfield net indicating energy of each node.

b) Solve the traveling salesman problem using genetic algorithm where the distance matrix for six cities is given as: 7

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A | 0 | 12 | 32 | 27 | 14 | 5 |
| B | 12 | 0 | 21 | 17 | 30 | 19 |
| C | 32 | 21 | 0 | 9 | 33 | 40 |
| D | 27 | 17 | 9 | 0 | 15 | 18 |
| E | 14 | 30 | 33 | 15 | 0 | 28 |
| F | 5 | 19 | 40 | 18 | 28 | 0 |

Let the initial population consists of 4 individuals : (A B C D E F), (F E D C B A), (A D F B C E and (B A C E D F). For the chromosome (1 1 0 0 1 0) and using uniform based crossover operator generate the offsprings for two iterations.

8. a) Discuss the back propagation algorithm. 8

b) Explain the following with example. 6

i) Fuzzy Union

ii) Fuzzy Intersection

iii) Fuzzy Complement

iv) Fuzzy Cartesian product

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