National Institute of Technology, Delhi

Name of Examination: M. Tech./Ph.D.

End-Sem Examination (Autumn, 2019)

Branch   : EEE   Semester   : III

Title of the Course : AI Techniques & Applications   Course Code : EEL612

Time: 3 Hours   Maximum Marks: 50

Note : Please Read Question Paper Carefully.

Section A:

#### Answer All the Questions   1x 10 = 10

1. Definition of De-fuzzification & its applications.

2. Can a fuzzy membership be true and false at the same time?

3. If A and B are two fuzzy sets with membership functions:

   $\mu a\ (\chi) = \{0.2, 0.5., 0.6, 0.1, 0.9\}$, $\mu b\ (\chi) = \{0.1, 0.5, 0.2, 0.7, 0.8\}$ then the value of $\mu a \cap \mu b$ will be

4. What is cross-over parameter ?

5. What is radial basis function (RBF) ?

6. What is the role of back propagation networks in genetic algorithms ?

7. What is max-product composition ?

8. What is single layer feed-forward network ?

9. What is recurrent network ?

10. Define matrix representation of fuzzy logic.

Section B:

Answer Any FOUR Questions   5 x 4 = 20

11. Solve the following tree using Alpha Beta pruning algorithm.

MAX

MIN

MAX

4   3   6   2   2   1   9   5   3   1   5   4   7   5
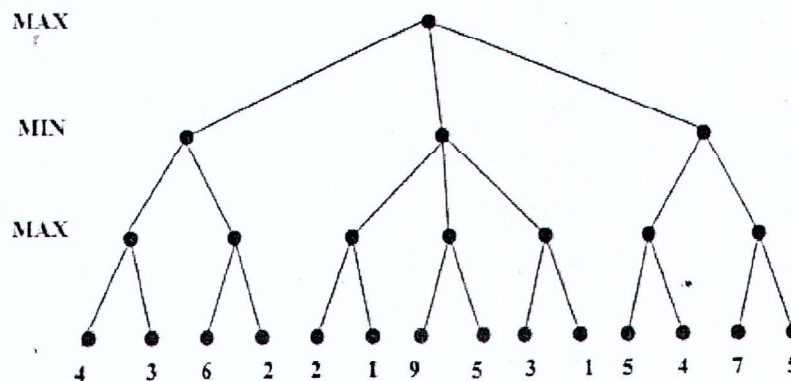
P.T.O

12. Let R and S be two fuzzy relations defined as follows. Then, the resulting relation, T, which relates elements of universe x to the elements of universe z using max-min composition is given by:

$$R = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} y_1 \quad y_2 \\ \begin{bmatrix} 0.6 & 0.4 \\ 0.7 & 0.3 \end{bmatrix} \end{array} \text{ and } S = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{c} z_1 \quad z_2 \quad z_3 \\ \begin{bmatrix} 0.8 & 0.5 & 0.1 \\ 0.0 & 0.6 & 0.4 \end{bmatrix} \end{array}$$

13. Define usefulness of Mamdani approach/technique in fuzzy rule based systems.

14. Design basic structure of genetic algorithm. And explain the following three terms.
(i) Binary representation
(ii) Real valued presentation
(iii) Integer representation

15. What do you understand by the evolutionary programming ? Explain it with necessary block diagram

Section C:

Answer Any TWO Questions   10 x 2 = 20

16. Draw & Explain block diagram of following three hybrid systems.
 (i) Neuro-Fuzzy hybrid systems
(ii) Neuro-Genetic hybrid systems
(iii) Fuzzy-Genetic hybrid systems

17. Define Particle Swarm Algorithm with suitable example and block diagram. And

$$\text{Minimize } f(x,y) = (x^2 + y - 11)^2 + (x + y^2 - 7)^2$$

18. Explain the following De-fuzzification methods with suitable example.
(i) Last of maxima (LoM) (ii) Centre of area (CoA) method (iii) Mean of maxima (MoM) method (iv) Centre of gravity (CoG) method