Q.P. Code: 34497

[Total Marks: 80]

(3 Hours)

N.B. : 1) Question No.1 is **compulsory.**
2) Attempt any **three** from the remaining questions.
3) Use of calculator is allowed.

1. Attempt the following (20)
   a) Differentiate between Hard Computing & Soft Computing.

   b) Describe Agent and its properties with suitable diagram.

   c) Using Zadeh's notation, determine the following for the given fuzzy sets:
   $A = \left\{\frac{0.3}{x1} + \frac{0.4}{x2} + \frac{0.5}{x3} + \frac{0.7}{x4} + \frac{1}{x5}\right\}$ $B = \left\{\frac{0.7}{x1} + \frac{0.8}{x2} + \frac{0.7}{x3} + \frac{1}{x4} + \frac{0.6}{x5}\right\}$

   1. $A \cap B$ 2. $A \cup B$ 3. $\overline{A \cup B}$ 4. $\overline{A} \cup \overline{B}$ 5. $A \cap \overline{A}$

   d) What is maxnet? Explain it with neat diagram

2. (a) Define state space search for the following problem – (10)
"We are given two water jugs having no measuring marks on these. The capacity of jugs is 3 liters and 5 liters. It is required to fill the bigger jug with exactly 4 liters of water. The water can be filled in a jug from a tap".

   (b) What is Fuzzy Inference system (FIS)? Explain Mamdani FIS in brief along with its advantages. (10)

3. (a) Explain the different types of knowledge representations schemes with the help of suitable example. (10)

   (b) What is Genetic Algorithm? Explain crossover and mutation operation in GA. (10)

4. (a) Describe and define: (10)
   1. Tower of Hanoi problem
   2. Breadth-First Search Technique

   (b) For the following fuzzy sets (10)

$$\underset{\sim}{P} = \left\{\frac{0.1}{2} + \frac{0.3}{4} + \frac{0.7}{6} + \frac{0.4}{8} + \frac{0.2}{10}\right\}$$

$$\underset{\sim}{Q} = \left\{\frac{0.1}{0.1} + \frac{0.3}{0.2} + \frac{0.3}{0.3} + \frac{0.4}{0.4} + \frac{0.5}{0.5} + \frac{0.2}{0.6}\right\}$$

$$\underset{\sim}{T} = \left\{\frac{0.1}{0} + \frac{0.7}{0.5} + \frac{0.3}{1}\right\}$$

The following operations performed over the fuzzy sets

$$R = P \times Q$$
$$S = Q \times T$$
$$M = R \circ S$$
$$M = R \bullet S$$

5. (a) Explain perceptron training algorithm. (10)

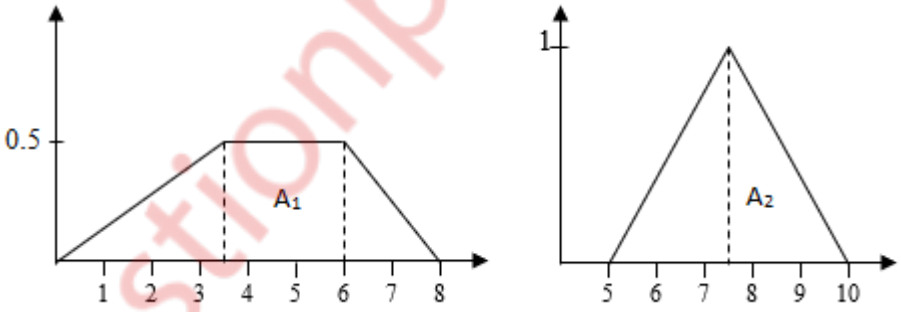
Implement AND function using Perceptron network for bipolar inputs (x_1, x_2) and bipolar targets (t). (Learning rate α=1 , threshold θ= 0)

x_1	x_2	t
1	1	1
1	-1	-1
-1	1	-1
-1	-1	-1

(b) Explain any three Selection methods in Genetic Algorithm. (10)

6. Attempt the following (20)

a) For given A_1, A_2 illustrate centroid defuzzification method:



b) What is membership function? Explain intuition method of membership value assignment in brief.

c) Compare Mamdani and Takagi-Sugeno Fuzzy Inference System.

d) Differentiate between supervised learning network and unsupervised learning network.

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