(3 hours)   **Total Marks: 80**

Please check whether you have got the right question paper.

N.B. 1. Question No. **1** is **compulsory**
2. Attempt any **Three** out of remaining
3. Assume suitable data if **necessary** and **justify** the assumptions
4. Figures to the **right** indicate full marks

Q1. [A] Explain McCulloch-Pitts model using example.   **05**

[B] Describe crossover points with example.   **05**

[C] Describe with example support, core, normality, crossover points, & α-cut for   **05**
a fuzzy set.

[D] A neuron with 4 inputs has the weight vector w = [1 2 3 4]^t. The activation   **05**
function is linear, that is, the activation function is given by f(net) = 2 * net. If
the input vector is X = [4 2 3 1]^t, then find the output of the neuron.

Q2 [A] Describe Hebbian Learning rule with an example.   **10**

[B] Describe any five defuzzification methods with example.   **10**

Q3 [A] Describe with example linearly separable and non-linearly separable pattern   **10**
classification.

[B] Prove the following   **10**
i)   For unipolar continuous activation function
$$f'(net) = O(1 - O)$$
ii)   For bipolar continuous activation function
$$f'(net) = \frac{(1 - O^2)}{2}$$ where O is output.

Q4 [A] Explain with example max-min composition and max-product   **10**
composition.

[B] Describe Binary SVM in brief   **10**

Q5 [A] Describe in brief Single Solution Particle Swarm Optimization.   **10**

[B] What is Elitism? Explain the steps in Genetic Algorithm with a suitable   **10**
Example.

Q6   Describe the methods (**any two**)   **20**
a. Artificial Immune Models
b. Character Recognition
c. Natural Immune System.

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