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

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 any two Fuzzy membership functions.   05

     [B]   Show Mc-culloh Pit Model to implement OR gate.   05

     [C]   Explain with diagram different activation functions used in Neural Network.   05

     [D]   Explain with an example Union and Intersection of two fuzzy sets.   05

Q2   [A]   What is learning? Explain the different types of learning with example. Compare   10
           the different learning rules.

     [B]   Let X be the Universe of well-known objects such as   10

           X = {car, boat, house, bike, tree, Mountain}

           Let Y be the Universe of simple geometrical shapes such as

           Y={square, octagon, triangle, circle, ellipse}

           Following are the fuzzy sets of objects such as "car", "square" and "corner"

           A = car = {1.0/car + 0.7/boat + 0.3/house + 0.2/bike + 0.4/tree + 0.0/Mountain}

           B = square = {1.0/square + 0.5/octagon + 0.6/triangle + 0.0/circle + 0.1/ellipse}

           C = corner = {0.6/square + 0.8/octagon + 0.5/triangle + 0.0/circle + 0.2/ellipse}

             i.   Find the relation R between "car" and "square".

             ii.   Find the relation S between "square" and "corner".

             iii.   Find the relation T between "car" and "corner" using Max-Min
                 composition.

Q3   [A]   Determine the weights after one iteration for Hebbian learning of a single   10
           neuron network starting with initial weight vector w = [1, 0, -1, 0.5] and inputs
           as

           $X_1 = [1, -2, 0.5, -1]$,

           $X_2 = [1, -1.5, -2, -0.5]$,

           $X_3 = [1, 0, -1, 1.5]$ and c=1.

           Use bipolar binary activation function.

     [B]   Explain with example Centre of largest area and weighted average method of   10
           Defuzzification.

Q4 [A] Describe in brief Single Solution Particle Swarm Optimization method.   10

[B] Explain the steps in Genetic Algorithm with a suitable Example.   10

Q5 [A] Explain with examples Binary SVM.   10

[B] With the help of a flow chart explain the working of Learning Vector   10
Quantization.

Q6   Describe the methods (**any two**)   20

    a. Natural Immune System

    b. TSP, Best path finding using Ant algorithm

    c. Color Recipe prediction - Single MLP approach