**QP Code :789102**

(3 Hours)                                                    Total Marks: 80

N.B. : (1)  Questions No.**1** is **compulsory**.
   (2) Solve any three questions out of remaining **five** questions
   (3) Draw neat labeled diagram whenever necessary
   (4) Assume suitable data if necessary

Q1: Solve any four out of five                                      (5x4)

1 a. Draw and explain neural networks based OR function.

   b. Draw and explain McCulloch Pitts neuron architecture.

   c. Explain with block diagram the unsupervised neural networks with an example.

   d. List the different activation functions used in neural network.

   e. Mention the five properties of Fuzzy Sets.

2 A Explain perceptron learning algorithm and develop perceptron  network to implement two input OR function. Consider inputs and output as unipolar. Assume initial weights and bias value equal to zero. Consider learning rate equal to one.                                      (10)

(b) For  speed control of DC motor the membership functions for series resistance, armature current and speed are:                                      (10)

$$R = \left\{ \frac{0.4}{30} + \frac{0.6}{60} + \frac{1}{100} + \frac{0.1}{120} \right\}$$

$$I = \left\{ \frac{0.2}{20} + \frac{0.3}{40} + \frac{0.6}{60} + \frac{0.8}{80} + \frac{1}{100} + \frac{0.2}{120} \right\}$$

$$N = \left\{ \frac{0.35}{500} + \frac{0.67}{1000} + \frac{0.97}{1500} + \frac{0.25}{1800} \right\}$$

Find the following: Fuzzy Cartesian Product & Fuzzy Composition

**[Turn Over**

$$S = R \times I$$
$$T = I \times N$$
$$P = S \, o \, T (\text{max} - \text{min})$$
$$P = S . T (\text{max} - product)$$

3A. Explain the any five methods of De-fuzzification.                                    (10)

3B. Describe neural network based face recognition with block diagram.      (10)

4A. Describe back propagation algorithm with flow chart.                            (10)

4B. Explain Hopfield network using a suitable example.                              (10)

5A. Describe Handwritten character recognition using Neural Networks.       (10)

5B. What is self organizing map? Explain Kohonen self-organizing map .       (10)

6A Design a fuzzy controller to regulate the temperature of a domestic shower.   (10)
   Assume that:
   a)      Temperature is adjusted by single mixtap.
   b)      The flow of water is constant.
   c)      Use three descriptors for each input and output variable.
   d)      Derive set of rules for control action.
   e)      Verify the design using one example.

6B Design a fuzzy controller to determine wash time of domestic washing machine.   (10)
   Assume that:
   a)      Input is dirt and grease on clothes.
   b)      Output is wash time.
   c)      Use three descriptors for each input variable and five descriptors for output variable.
   d)      Derive set of rules for control action.
   e)      Verify the design using one example.

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