Q. P. Code: 27329

(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 labelled diagram whenever necessary
(4) Assume suitable data if necessary

Q.1   Answer any 4 questions from the given questions: 5x4
a.   What is Hebbian learning rule? Describe it with mathematical concept.
b.   What is λ-cut sets? Brief with an example.
c.   Determine λ-cut sets for the given fuzzy sets

$$A=\{\frac{0.1}{x1} + \frac{0.2}{x2} + \frac{0.7}{x3} + \frac{0.5}{x4} + \frac{0.7}{x5}\}$$

$$B=\{\frac{0.9}{x1} + \frac{0.6}{x2} + \frac{0.3}{x3} + \frac{0.2}{x4} + \frac{0.8}{x5}\}$$

(a) $(A \cup B)_{0.6}$ (b) $(A \cup \bar{A})_{0.8}$ (c) $\bar{B}_{0.3}$

d.   Is EX-OR function a linear or non-linear function? Justify your answer.
e.   Explain any four properties of fuzzy sets.

Q.2 (a)   What is meant by learning of neural network? Explain perceptron learning rule.   (10)
(b)   How multi-layer perceptron can be used for face recognition.   (10)

Q.3 (a)   What is the need for defuzzification. Explain any four techniques of   (10)
defuzzification.
(b)   Explain Error Back propagation algorithm with the help of flowchart.   (10)

Q.4 (a)   Explain with the help of block diagram fuzzy inference system.   (10)
(b)   Describe in detail discrete Hopfield network with properties of its weight   (10)
matrix and convergence based on energy.

Q.5 (a)   Explain the application of fuzzy logic for traffic control   (10)
(b)   Explain pattern classification using Radial Basis Function Neural network.   (10)
Compare RBF and MLP.

Q.6(a)   Classify the four vectors into two clusters using Kohenan Self organizing   (10)
Map. (0011); (1000); (0110); (0001).Assume learning rate 0.5. Assume initial
weights to be $[0.2\ 0.4\ 0.6\ 0.8\ ;\ \ 0.9\ 0.7\ 0.5\ 0.3]^T$.
(b)   Design fuzzy controller to determine wash time of a fuzzy washing machine.   (10)
Assume that the two inputs are dirt and grease on the cloths. The design should
be supported by figures wherever possible. Clearly indicate that if the clothes
are soiled to large degree the time required for washing is also more.

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Seat No:-