AQ – 2925

First Year M. E. Full Time (Electronics and Telecomm. Engg.) Examination

ARTIFICIAL INTELLIGENT SYSTEM

1 ENTC 5

P. Pages : 3

Time : Three Hours] [Max. Marks : 80

Note : (1) Answer **three** questions from Section A and **three** questions from Section B.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answer wherever necessary with the help neat sketches.

SECTION A

1. (a) Solve the following fuzzy relation equation for the max min composition.

$$\tilde{P} = \begin{bmatrix} 0.5 & 0 & 0.3 & 0 \\ 0.4 & 1 & 0.3 & 0 \\ 0 & 0.1 & 1 & 0.1 \\ 0.4 & 0.3 & 0.3 & 0.5 \end{bmatrix} = \begin{bmatrix} 0.5 & 0.3 & 0.3 & 0.1 \\ 0.5 & 0.4 & 0.4 & 0.2 \end{bmatrix}$$ 8

(b) Prove that properties of symmetry, reflexivity and transitivity are presented under inversion for both crisp and fuzzy relations. 6

OR

2. (a) Compare and contrast the methods employed for defuzzification process on the basis of accuracy and time consumption.. 6

(b) Using your own intuition, develop fuzzy number "approximately 4 or approximately 8" using the following function shapes.

(1) Symmetric triangle (2) Trapezoids (3) Gaussian functions. 8

3. (a) Define fuzzy inference system with a suitable block diagram, explain the construction and working of fuzzy inference system. 6

(b) The formula

$$\frac{1}{u} + \frac{1}{z} = \frac{1}{f}$$

is used in optics. The variables u, z and f are the distance from the lens to the center of the image and the focal length. Define canonical form of rules for this problem. 7

OR

4. (a) Consider we have three fuzzy sets, given by

$$\underset{\sim}{A} = \left\{\frac{1}{3} + \frac{0.8}{7}\right\}, \underset{\sim}{B} = \left\{\frac{0.6}{4} + \frac{1.0}{6}\right\}, \underset{\sim}{C} = \left\{\frac{0.8}{2} + \frac{1}{4} + \frac{0.4}{8}\right\}$$

Make suitable decisions based on fuzzy ordering. 7

(b) What are the characteristics of decision situations in individual decision making ? 6

5. (a) Explain adaptive neurofuzzy inference system. Draw its architecture. How learning is reinforced in ANFIS ? 6

(b) Design a fuzzy logic control for air – conditioner control system. The system comprises a dial to control the flow of warm/hot or cool/cold air and a thermometer to measure the room temperature. Develop fuzzy rule based for air conditioner control system. Assume suitable data for input and output variables. 7

OR

6. (a) What is Inverse Learning in neurofuzzy controller ? What are the drawbacks of it ? How can it be overcome by specialised learning ? 7

(b) Explain Mamdani architecture for fuzzy control with examples. 6

SECTION B

7. (a) Generate AND NOT function with bipolar data using perceptron learning rule with learning rates

(i) $\alpha = 1$ (ii) $\beta = 0.5$

Compare the variations noted. 7

(b) Give a brief note on multilayer perceptrons. 6

OR

8. (a) How boundary region (decision boundry) is determined using linear separability concept ? 6

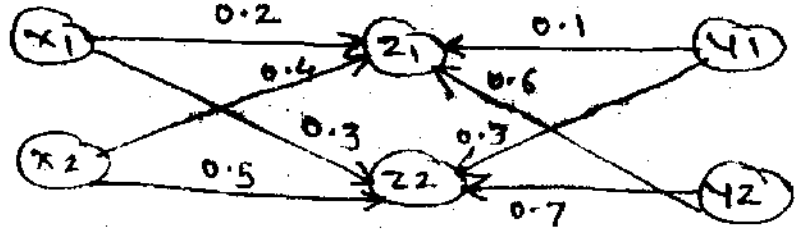
   (b) What are the basic Learning Laws ? Compare LMS, perceptron and delta learning rule. 7

9. (a) Given the exemplar vectors e(1)=(−1 1 −1 1) and e(2)=(1−1−1−1). Use Hamming net to find the exemplar that is closest to each of the bipolar input patterns (1 1 −1 −1),(−1 1 1 −1),(−1 −1 −1 1) and (−1 −1 1 1). 7

   (b) Explain the architecture of Bidirectional Associative Memory (BAM) and its training algorithm. 7

OR

10. (a) Consider the following full CPN (Counter Propagation Network) using input x = (1 , 1) y = (0 , 1). Perform first phase of training (one step only). Find the activation of the cluster layer units and update the weights using learning rates of 0.3.



7

   (b) What is ART network ? Explain ART net algorithm. 7

11. (a) Explain application of neural network for written numeral recognition. 7

   (b) Justify the following statement in the context of nonseparable patterns : "Misclassification implies non separability of patterns, but the converse is not necessarily true". 6

OR

12. (a) Explain the application of neural network in forecasting. 7

   (b) What is Genetic Algorithm ? Specify algorithm in detail. 6