VIT UNIVERSITY
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Term End Examination - November 2014

Course	: **CSE319** - **Soft Computing**		**Slot : F1**
Class NBR	: **5103 / 5105**		
Time	: **Three Hours**		**Max.Marks:100**

PART – A (8 X 5 = 40 Marks)
Answer <u>ALL</u> Questions

1. Implement XOR function using McCulloch Pitts neuron.

2. a) Define and give the use of Lyapunov function. **[2]**

   b) Train the autoassociative network for the pattern [-1 1 1 1] and test the same with one missing entry in 3rd bit. **[3]**

3. Draw the neural network to classify the patterns 'I' and 'O' with bipolar values represented in 3✕3 matrix. Use Hebb rule and give the new weights.

4. Write notes on supplemental units of ART network with its architecture.

5. Find the membership of fuzzy set A, B defined on the universe X = [0, 5] with membership functions defined below. Compute R= A✕B.

   $$\mu_A(x) = \frac{1}{1+5(x-5)^2} \qquad \mu_B(x) = \frac{2x}{x+5}$$

6. Given two fuzzy set

   $$u_T = \left\{ \frac{0.2}{1} + \frac{0.3}{2} + \frac{0.4}{3} + \frac{0.5}{4} \right\}$$

   $$u_R = \left\{ \frac{0.1}{1} + \frac{0.2}{2} + \frac{0.2}{3} + \frac{1}{4} \right\}$$

   Find the following:

   a) Algebraic sum and product **[2.5]**

   b) Bounded sum and difference **[2.5]**

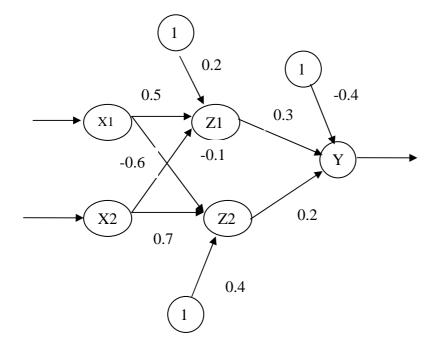7. Check for the following for fuzzy set A defined in universe U={1,2,3,4,5} by

$$\mu_A(x) = \left(\frac{1}{1+5x}\right)^{\frac{1}{2}}$$

    a) Convex fuzzy set with proof **[1]**

    b) Normal fuzzy set **[1]**

    c) Support **[1]**

    d) Intersection of two convex fuzzy set is also convex fuzzy set. Justify. **[1]**

    e) For $\lambda=0.2$ and $\beta=0.4$, check if $A_\beta \subseteq A_\lambda$ **[1]**

8. Write notes on evolutionary algorithms.

PART – B (6 X 10 = 60 Marks)
Answer any <u>SIX</u> Questions

9.   a) Write the advantages of soft computing techniques and its applications. **[5]**

    b) Write notes on characteristics of Neural Network. **[5]**

10. Find the new weights, using back propagation for the given network. The network is presented with the input pattern [1, 0] and the target output 1. Use learning rate $\alpha = 0.3$ and use bipolar sigmoidal activation function.

11. Consider LVQ with two inputs and four target classes c1, c2, c3 and c4. The data in the following table are used as weights for the 4 clusters. The input vectors are [0.25, 0.25], [0.4, 0.35], and their target classes are 1and 1 respectively. The learning rate is 0.25. Determine the new weights of both the patterns from the initial weights.

X2

1.0

0.8	C3	C4	C1	C2
0.6	C1	C2	C3	C4
0.4	C3	C4	C1	C2
0.2	C1	C2	C3	C4
0.0	0.2	0.4	0.6	0.8	1.0 X1

12. a) Explain the various functional units of ART network with its architecture.   **[6]**

  b) List the advantages of Fuzzy techniques over conventional techniques.   **[4]**

13. For a speed control of Dc motor, the membership functions of series resistance, armature current and speed are given as follows:

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

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

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

  a) Compute the relation $X = R \times I$
  b) Compute the relation $Y = I \times N$
  c) Compute the relation T between X and Y using max-min composition

14. a) Explain in details about fuzzy inference system based on linguistic rules using 3 models.   **[5]**

  b) Compare the Mamdani and Sugeno FIS models.   **[5]**

15. a) Write any 5 defuzzification methods with a graph.   **[5]**

    b) The membership values of particle occlusion and lens occlusion is given by Fuzzy   **[5]**
       set A and B defined on the Universe X={x1,x2,x3,x4,x5} and Y={y1,y2,y3,y4,y5}
       respectively. Establish the relationship between particle occlusion and lens occlusion
       in order to track the soil particle movement.

$$A = \left\{ \frac{0.1}{x1} + \frac{0.9}{x2} + \frac{0.0.}{x3} \right\} \qquad B = \left\{ \frac{0}{y1} + \frac{1}{y2} + \frac{0.}{y3} \right\} \qquad C = \left\{ \frac{0.3}{x1} + \frac{1.0}{x2} + \frac{0.0.}{x3} \right\}$$

Let C be a fuzzy set that gives the tracked particle in slightly more occlusion, which is
added to the antecedent A. Find the membership for the image quality.

16. a) Explain about Genetic Algorithm with its procedure   **[3]**

    b) Compare Traditional algorithm over GA   **[3]**

    c) Explain various selection and cross over operator.   **[4]**

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