Roll No. | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, April / May 2013

B.Tech IT

VIII Semester

IT9035 Soft Computing

(Regulation ...2008.....)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1 | What is the difference between the classic proposition and fuzzy proposition.

2. | Let A be a fuzzy set defined by: $A=0.5/x_1+0.4/x_2+0.7/x_3+0.8/x_4+1/x_5$. Find α-cuts and strong α-cuts of A

3. | Give an example from daily life of any two fuzzy propositions and express in canonical form.

4. | For the fuzzy representation below, find $M_1 \circ M_2$ and explain the significance in the real world.

$$M_1=\begin{bmatrix} 1 & 0 & 0.7 \\ 0.3 & 0.2 & 0 \\ 0 & 0.5 & 1 \end{bmatrix} \quad M_2=\begin{bmatrix} 0.6 & 0.6 & 0 \\ 0 & 0.6 & 1 \\ 0 & 0.1 & 0 \end{bmatrix}$$

5. | Differentiate supervised and unsupervised network, giving an example for each.

6. | Write the equation for perceptron and explain the significance of this equation.

7. | Write the four activation functions of neurons.

8. | You are given the task of identifying human gestures computationally. Which neuron learning model will you use? Why?

9. | Write any one equation of the kernel function and explain the terms.

10. | Write down atleast one unique application area for each of the following learning process (i) Fuzzy logic (or) fuzzy control process (ii) Neural Network (iii) Genetic Algorithm and (iv) Support Vector machines.

Part – B (5 x 16 = 80 marks)

11. i) Four steps of Hebbian learning of a single-neuron network have been implemented starting with $w^1=[1-1]'$ for learning constant $c=1$ using inputs as follows:

$$x_1=\begin{bmatrix} 1 \\ -2 \end{bmatrix} \quad x_2=\begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad x_1=\begin{bmatrix} 2 \\ 3 \end{bmatrix} \quad x_1=\begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

Draw the neuron model for this problem and find the final weights after four steps for bipolar continuous f(net), $\lambda=1$ (8)

ii) Describe a neural network that could be used to control the steering of a robotic car on a race track. How can it be tracked? (8)

12. a) i) With an application of your choice explain the various stages of Fuzzy Controller. Include the blockdiagram, fuzzy sets, membership functions that are being decided upon, Fuzzy rule base, the type of inference that is being carried out, and the defuzzification process . (10)

ii) With an example of your choice, explain the basis of calculating fuzzy relations and projections. (6)

OR

b) i) Let A, B be two fuzzy numbers whose membership functions are given by
A(x) = (x+2)/2 for -2<x<=0, (2-x)/2 for 0<x<2, 0 otherwise
B(x) = (x-2)/2 for 2<x<4, (6-x)/2 for 0<x<=6, 0 otherwise.
Calculate the fuzzy numbers A+B, A – B, B – A, A*B, A/B, Min(A,B) and Max(A,B). (10)

ii) Let the sets of values of variables X and Y be X = {x1 , x2 , x3 } and Y = {y1 , y2 }, respectively. If A = 0.6/x1 + 1/x2 + 0.9/x3 and A'= 0.5/x1 + 0.9/x2 + 1/x3 , find the conclusion B' by using modus ponens if B = 1/y1 + 0.4/y2 . (6)

13. a) i) With an example, explain the procedure of a single discrete perceptron in classifying a linearly separable problem (6)

ii) With an appropriate diagram, describe the classification of logical AND, OR and XOR (10)

OR

b) i) Illustrate how a linear classifier works geometrically. What difference does it make, when the same problem is applied to a neural network. why? How are non linearly separable patterns handled in neural networks? (6)

ii) Prototype points are given as:

$x_1=[5\ 1]^t, x_2=[7\ 3]^t, x_3=[3\ 2]^t, x_4=[5\ 4]^t : Class\ 1$

$x_5=[0\ 0]^t, x_6=[-1\ -3]^t, x_7=[-2\ 3]^t, x_8=[-3\ 0]^t : Class\ 2$

a) Determine if the two classes of patterns are linearly separable. (2)

b) Determine the center of gravity for patterns of each class, and find and draw the decision surface in pattern space (4)

c) Using the equation from the decision surface, find the weight vectors and design a dichotomizer. How would it recognize the following input patterns:

$x=[4\ \ 2]^t \quad x=[0\ \ 5]^t \quad x=[36/13\ \ 0]^t$ (4)

14. a) i) Why do we need to calculate the gradient in the back propagation algorithm? In a feed forward neural network trained by back propagation, what is back propagated and from where to where? Explain with the help of the diagram mathematically. What role does the steepness function in this learning process? (8)

ii) (a) Are there any relation between the number of neurons and the type of classification? Explain. (4)

(b) What are the advantages and disadvantages of neural network classification schemes? Which type of problems neural network is **NOT** suited for? (4)

OR

b) i) A two layer neural network has two neurons in each layer, three inputs, including an augmentation input and two outputs. With back propogation algorithm, how will you find weights, slopes, error signals, outputs and the updated weight. (8)

ii) How does neurons act as auto associative memory? Explain the functioning with a three neuron model. (8)

15. a) i) Describe the terms, crossover rate, mutation, reproduction, Roulette wheel selection and Fitness function in Genetic Algorithm. (6)

ii) You are given digits 0 to 9, and operators +, -, * and /. Using Genetic algorithm how will you represent the target positive integer. Design the whole optimization process and the type of optimization function used (10)

OR

b) i) Explain the basis of classification in SVM (6)

ii) How does SVM classify non-linearly separable classes? Explain it through the kernel functions. Where will you apply this classification? Explain with an example (10)