Set No. 2 **R07** Code No: 07A7EC01 IV B.Tech I Semester Examinations, MAY 2011 NEURAL NETWORKS AND FUZZY LOGIC Common to Aeronautical Engineering, Instrumentation And Control Engineering, Electrical And Electronics Engineering Time: 3 hours Max Marks: 80 Answer any FIVE Questions All Questions carry equal marks \*\*\*\* 1. Explain the role of neural networks in Power System Planning. [16]2. State and prove the perceptron convergence theorem. [16]3. (a) Differentiate single layer and multilayer networks. (b) Generate the output of OR, NOT function using McCulloch-Pitts Neuron. [8+8](a) What is meant by uncertainty? What are various types of uncertainties? 4. Explain the measures of uncertainty. (b) Describe the measures of Fuzziness and dissonance. [8+8]5. (a) Discuss memory based learning in detail. (b) How is boundary region determined using linear seperability concept. |8+8|6. Determine the weights of a network with 4 input and 2 output units using delta learning law with  $f(a) = \frac{1}{1+e^{-a}}$  for the following input-output pairs: Input :  $\begin{bmatrix} 1 & 1 & 0 & 0 \end{bmatrix}^T \begin{bmatrix} 1 & 0 & 0 & 1 \end{bmatrix}^T \begin{bmatrix} 0 & 0 & 1 & 1 \end{bmatrix}^T \begin{bmatrix} 0 & 1 & 1 & 0 \end{bmatrix}^T$ Output : 1 [16] 7. (a) Using Predicate logic solve the following: All men are mortal Confucius is a man Prove : Confucius is mortal (b) Let  $X = \{a, b, c, d\} Y = \{1, 2, 3, 4\}$ and  $A = \{(a,0)(b,0.8)(c,0.6)(d,1)\}$  $\ddot{B} = \{(1,0.2)(2,1)(3,0.8)(4,0)\}$  $C = \{(1,0)(2,0.4)(3,1)(4,0.8)\}\$ Determine the implication relations IF x is  $\hat{A}$  THEN y is  $\hat{B}$ . IF x is  $\tilde{A}$  THEN y is  $\tilde{B}$  ELSE y is  $\tilde{C}$ . [16]8. Write note on the following. (a) Bidirectional Associate memories. (b) Grossberg layer. [8+8]

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## Set No. 4

#### IV B.Tech I Semester Examinations,MAY 2011 NEURAL NETWORKS AND FUZZY LOGIC Common to Aeronautical Engineering, Instrumentation And Control Engineering, Electrical And Electronics Engineering Time: 3 hours Max Marks: 80 Answer any FIVE Questions

### All Questions carry equal marks

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- 1. Define defuzzification. Explain different methods of defuzzification. [16]
- 2. (a) Describe the geometry of fuzzy sets.
  - (b) Describe the FAM system architectures.
- 3. (a) Using MC-Culloch pitts model implement the following logic functions.
  - i. Ex-OR gate.

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- ii. Ex-NOR gate.
- iii. AND gate.
- iv. NAND gate.

(b) Explain the organization of the brain in detail.

- 4. (a) Define "sensor" connected with fuzzy control system.
  - (b) Explain in detail any one application of neuro fuzzy techniques in power systems.

[8+8]

[16]

8 + 8]

- 5. Explain how a simple vowel-speech recognition system is implemented using back propagation algorithm. [16]
- 6. (a) Using suitable diagrams and equations explain the basic Bidirectional Associative
  - (b) With suitable diagrams explain the competitive network. [8+8]
- 7. Class prototype vectors are

$$X_{1} = [-2], X_{2} = \left[-\frac{2}{3}\right], X_{3} = [3] : \text{Class 1} \\ X_{4} = [1], X_{5} = [2], : \text{Class 2}$$

- (a) Design the dichotomizer using a single discrete perceptron and non-linear discriminant function of quadratic type.
- (b) Draw separating lines in the augmented weight space for each pattern.
- (c) Draw patterns in augmented pattern space. [16]
- Using the perceptron learning rule, find the weights required to perform the following classifications. Vectors (1 1 1 1), (-1 1 -1 -1) and (1 -1 -1 1) are members of class (having value -1). Use learning rate of 1 and starting weights of 0. Using each of the training and vectors as input, test the response of the net. [16]

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[8+8]

#### IV B.Tech I Semester Examinations,MAY 2011 NEURAL NETWORKS AND FUZZY LOGIC Common to Aeronautical Engineering, Instrumentation And Control Engineering, Electrical And Electronics Engineering Time: 3 hours Max Marks: 80 Answer any FIVE Questions

## All Questions carry equal marks

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- 1. (a) How is the error back propagated in BPN ?
  - (b) Differentiate between local minima and global minima ?
- 2. (a) Prove the fuzzy DeMorgan law.
  - i.  $A \cap A^C = (A^C \cup B^C)^C$
  - ii.  $A \cup A^C = (A^C \cap B^C)^C$
  - (b) Given an example for the membership function of the fuzzy relation :="considerably smaller than" in RXR. Restrict  $\tilde{R}$  to the first ten natural numbers and define the resulting matrix. [8+8]
- 3. Form a perceptron net for OR function with binary input and output. Compare it with the results using bipolar input and target. [16]
- 4. Draw a single layer network with continuous perceptions and present the delta learning rule. [16]
- 5. (a) Explain the following:
  - i. Generalized Modus Ponens (GMP).
  - ii. Generalized Modus Tollens (GMT).
  - (b) Let H = High, VH = very high, Š = slow and Q (Quite slow) indicate, the associated fuzzy sets as follows. For X={30,40,50,60,70,80,90,100}, the set of temperatures and Y={10,20,30,40,50,60}, the set of rotations per minute. *Ĥ* = {(70, 1) (80, 1) (90, 0.3) } *V* H = {(90, 0.9) (100, 1)} *Q* S = {(10, 1) (20, 0.8)} *Š* = {(30, 0.8) (40, 1) (50, 0.6)} Apply the fuzzy Modus ponens rule to deduce Rotation is quite slow given.
    i. If the temperature is high then rotation is slow.
    ii. The temperature is very high. [16]
- 6. (a) Draw the Block diagram representation of associative memories and explain why they are needed.
  - (b) Prove that in successive iterations, the energy either decreases or remain same but never increases in a discrete Hopfield model. [8+8]

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# Set No. 1

- 7. (a) "Multi-layer network with linear activation function has same experience power as that of single layer network" elaborate and justify the statement.
  - (b) What is the advantage of having hidden layers in an ANN? On what basis is the number of hidden layers and the number of neurons in each hidden layer selected?

[8+8]

8. Explain how neurocomputing circuits can be modeled using digital and analog circuits. [16]



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# Set No. 3

#### IV B.Tech I Semester Examinations,MAY 2011 NEURAL NETWORKS AND FUZZY LOGIC Common to Aeronautical Engineering, Instrumentation And Control Engineering, Electrical And Electronics Engineering Time: 3 hours Max Marks: 80 Answer any FIVE Questions

## All Questions carry equal marks

### \*\*\*\*

- 1. State and explain the generalized delta learning rule applied in back propagation algorithm. [16]
- 2. Write short notes on the following:
  - (a) Knowledge base in fuzzy logic control system.
  - (b) Decision making logic in fuzzy logic control system. [8+8]
- 3. (a) With neat diagrams discuss the two self-organized feature maps.
  - (b) Explain about learning vector quantization. [8+8]
- 4. Consider the fuzzy sets & defined on the interval X=[0,5] of real numbers, by the membership grade functions.

 $\mu(\mathbf{x}) = \frac{X}{X+1}, \ \mu \ \tilde{B}(\mathbf{x}) = 2^{-x}$ 

Determine the mathematical formulae and graphs of the membership grade functions of each of the following sets.

(a)  $A^{c}, B^{c}$ .

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- (b)  $A \cap B$ .
- (c)  $A \cup B$ .
- (d)  $(A \cup B)^c$ .
- 5. (a) What are the rules based format used to represent the fuzzy information.
  - (b) Explain the importance of fuzzi logic control in various fields. [8+8]
- 6. With an example explain how a pattern can be trained and classified using discrete perceptron algorithm. [16]
- 7. (a) How do you justify that brain is a parallel distributed processing system?
  - (b) Explain the following terms with respect to Neural networks.
    - i. Stability.
    - ii. Plasticity.
    - iii. Learning.
    - iv. Architecture.
- 8. (a) What are the stopping conditions used to stop the progress of the training algorithm.

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[8+8]

[16]

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(b) Explain the algorithm used for training the perceptron net. [8+8]

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