

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0935

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION 2010-11

INTRODUCTION TO SOFT COMPUTING

(Neural Networks, Fuzzy Logic and Genetic Algorithm)

Time : 3 Hours

Total Marks : 100

Note : (1) Attempt **all** questions.

(2) Make suitable assumptions wherever necessary.

1. Attempt any **four** parts of the following : **(5×4=20)**

- Define an artificial neural network. State the characteristics of an artificial neural network.
- Briefly discuss the common application domains of an artificial neural network.
- Define learning. Discuss the different learning methods in brief.
- Construct a recurrent network with four input nodes, three hidden nodes and four output nodes that has lateral inhibition structure in the output layer.
- What is the necessity of activation function ? List the commonly used activation functions.
- What is an auto-associative memory network ? Explain.

2. Attempt any **two** parts of the following : **(5×4=20)**
- (a) (i) Explain the major features of single layer perception.
 (ii) How hidden layer computation is done in back propagation learning ? Explain.
- (b) (i) Describe the multilayer perception model.
 (ii) What is the significance of error signal in perceptron network ? Explain.
- (c) (i) Discuss the some application areas of back propagation networks.
 (ii) Discuss the factors affecting the training of back propagation training.

3. Attempt any **two** parts of the following : **(10×2=20)**

- (a) Explain the term fuzzy sets and fuzzy logic. Compare and contrast classical logic and fuzzy logic.
- (b) The task is to recognize English alphabetical characters (F, E, X, Y, I, T) in an image processing system. Two fuzzy sets I and F are defined to represent the identification of characters I and F.

$$I = \{(F, 0.4), (E, 0.3), (X, 0.1), (Y, 0.1), (I, 0.9), (T, 0.8)\}$$

$$F = \{(F, 0.99), (E, 0.8), (X, 0.1), (Y, 0.2), (I, 0.5), (T, 0.5)\}$$

Find the following :

- (i) $I \cup F$ (ii) $(I - F)$ (iii) $F \cup F^c$ (iv) Verify de Morgan's law.
- (c) Write short notes on the following :
- (i) Fuzzy relations (ii) Fuzzy to crisp conversion.

4. Attempt any **two** parts of the following: **(10×2=20)**

- (a) Let $X = \{a, b, c, d\}$ $Y = \{1, 2, 3, 4\}$
 and $A = \{(a, 0), (b, 0.8), (c, 0.6), (d, 1)\}$
 $B = \{(1, 0.2), (2, 1), (3, 0.8), (4, 0)\}$
 $C = \{(1, 0), (2, 0.4), (3, 1), (4, 0.8)\}$

Determine the implication relations :

- (i) IF x is A THEN y is B .
 (ii) IF x is A THEN y is B ELSE y is C .
- (b) Define the membership function. Using your own intuition, plot the fuzzy membership function for the age of people.
- (c) Let sets of values of variables X and Y be $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2\}$, respectively. Assume that a proposition "if X is a , Then Y is B " is given, where $A = .5/x_1 + 1/x_2 + .6/x_3$ and $B = 1/y_1 + .4/y_2$. Then, given a fact expressed by the proposition " x is A' ", where $A' = .6/x_1 + .9/x_2 + .7/x_3$. use the generalized modus ponens to derive a conclusion in the form " Y is B' ".

5. Write short notes on any **four** of the following : **(5×4=20)**

- (a) Procedures of GA.
 (b) Genetic representations.
 (c) Mutation and Mutation rate.
 (d) Generational cycle of GA.
 (e) Applications of GA.