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**B. TECH
(SEM-V) THEORY EXAMINATION 2021-22
NEURAL NETWORKS AND FUZZY SYSTEM**

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt all questions in brief.** **2 x 10 = 20**
- a. Compare and contrast biological and artificial neural network.
 - b. What is Rosenblatt's Perceptron?
 - c. What do you understand by the term 'training of neural network'?
 - d. Define Gradient Descent learning.
 - e. Let A and B be two fuzzy sets given by: $A = \{(x_1, 0.2), (x_2, 0.5), (x_3, 0.6)\}$; $B = \{(x_1, 0.1), (x_2, 0.4), (x_3, 0.5)\}$. Find the membership value of x_2 in $(A-B)$.
 - f. Define linguistic variables.
 - g. What is FLC?
 - h. Write GMP fuzzy inference rule.
 - i. Briefly explain fuzzy neuron architecture of fuzzy BP model.
 - j. How weights are adjusted in fuzzy backpropagation?

SECTION B

2. **Attempt any three of the following.** **10 x 3 = 30**
- a. What is the Activation function in ANN? Explain different types of activation functions used in ANN.
 - b. Let Job = {job₁, job₂, job₃, job₄} and Compensation = {c₁, c₂, c₃, c₄} are set of four different jobs and four categories of compensation respectively. The fuzzy sets Risky-job and High-Compensation are defined on the universes, Job and Compensation respectively as given below.
 $Risky-Job = \{(job_1, 0.3), (job_2, 0.8), (job_3, 0.7), (job_4, 0.9)\}$
 $High-Compensation = \{(c_1, 0.2), (c_2, 0.4), (c_3, 0.6), (c_4, 0.8)\}$
 Figure out the implication relation: If 'job is risky' Then 'compensation is high'.
 - c. Find whether the following rule is a Tautology $(a \rightarrow b) \rightarrow ((a \rightarrow b') \rightarrow a')$. Show with truth table.
 - d. Discuss fuzzy BP model for Earthquake damage evaluation.
 - e. Describe XOR problem in neural network also implement Neural Network to solve XOR problem.

SECTION C

3. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) What are the various artificial neural network structures available? Explain with complete mathematical model.
 - (b) What is the meaning of learning in artificial neural networks. Describe the different learning methods available in artificial neural networks.
4. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Illustrate different steps of the Back-propagation algorithm.



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- (b) What are various tuning parameters in back propagation network and how these parameters affect the BPN?

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Consider the fuzzy sets A and B defined on the interval X: [0, 5] of real numbers, by the membership grade functions.

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

Determine the mathematical formulae and graphs of the membership grade function of each of the following sets:

- (i) $A \cap B$
(ii) $(A \cup B)^c$
- (b) With the help of example, explain fuzzy relation. Let $A = \{(x_1, 0.2), (x_2, 0.7), (x_3, 0.4)\}$ and $B = \{(y_1, 0.5), (y_2, 0.6)\}$ be two fuzzy sets defined on the universe of discourse $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2\}$ respectively. Interpret the fuzzy relation between two sets A and B.

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Define the defuzzification. What are the different methods of defuzzification process? Discuss one method in detail.
(b) Explain Greg Viot's Fuzzy Cruise Controller.

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Illustrate the different steps of the Fuzzy-Backpropagation training.
(b) Define LR-type fuzzy numbers, and explain various operations on LR type Fuzzy numbers.

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