

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES  
(AUTONOMOUS)

M.Tech II-Semester Regular Examinations, May 2016

**Intelligent Systems and Control**

(Control Systems Engineering)

Date:

Time: 3 hours

Max Marks: 60

Answer ONE Question from each unit

All questions carry equal marks

All parts of the question must be answered at one place only

**UNIT-I**

1. a) Define ANN? Explain the various types of neuron network architectures. 6  
b) Derive the continuous perceptron training rule (delta training rule) and obtain a formula for  $w(k+1)$ . Assume the unipolar activation function of the neuron 6

$$f(net) = \frac{1}{1 + \exp(-net)}$$

(OR)

2. Describe the architecture and derive the algorithm for a back propagation neural network. 12

**UNIT-II**

3. Design Model reference control based on MIT rule for given system. 12  
reference plant is  $\frac{b_m}{s + a_m}$  and actual plant is  $\frac{b}{s + a}$

(OR)

4. Explain designing of ANN based Internal model control for a plant. 12

**UNIT-III**

5. a) Define Fuzzy sets and Crisp set. Write the properties of fuzzy sets. 6  
b) Consider fuzzy relationships for X and Y defined by fuzzy relation  $Y \times Z$  by S and  $X \times Z$  by T where X, Y and Z are three different universes, whose elements are  $X = \{x_1, x_2\}$ ,  $Y = \{y_1, y_2\}$  and  $Z = \{z_1, z_2, z_3\}$ . Let the fuzzy relations are given by

$$\tilde{R} = \begin{matrix} & y_1 & y_2 \\ x_1 & \begin{bmatrix} 0.7 & 0.5 \end{bmatrix} \\ x_2 & \begin{bmatrix} 0.8 & 0.4 \end{bmatrix} \end{matrix} \text{ and } \tilde{S} = \begin{matrix} & z_1 & z_2 & z_3 \\ y_1 & \begin{bmatrix} 0.9 & 0.6 & 0.7 \end{bmatrix} \\ y_2 & \begin{bmatrix} 0.1 & 0.7 & 0.1 \end{bmatrix} \end{matrix}$$

Find  $\tilde{T}$ , which relates elements of universe X to elements of universe Z.

(OR)

6. a) Discuss the different methods of defuzzification with the examples. 6  
b) Explain Fuzzy inference system of Mamadani and Sugeno methods. 6

**UNIT-IV**

7. a) With a neat block diagram, explain basic architecture and operation of Fuzzy controller. 6  
b) Explain about analysis of static and dynamic properties of fuzzy controller. 6

(OR)

8. Explain Adaptive Fuzzy Controller of a Servo Mechanic System 12

**UNIT-V**

9. a) What are the different types of hybrid systems? Explain them schematically. 6

b) Explain the use of Fuzzy logic in neural networks to improve the learning algorithm. 6

(OR)

10. Describe Adaptive neuro-fuzzy inference system. 12

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