

**B. Tech. Sem -VIII (E & TC Engg.) (2014 COURSE) (CBCS) :
SUMMER - 2019**

SUBJECT: ELECTIVE-II FUZZY LOGIC AND NEURAL NETWORK

Day: Thursday
Date: 30/05/2019

Time: 02.30 PM TO 05.30 PM
Max. Marks: 60

S-2019-2949

N.B:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.
- 4) Use of non-programmable **CALCULATOR** is allowed.

Q.1 Write short notes on: **(10)**

- a) Applications of soft computing
- b) Hybrid systems
- c) Neuro-fuzzy and soft computing characteristics
- d) Compare and contrast hard and soft computing.
- e) Evolutionary computation

OR

Q.1 a) Define a fuzzy set and explain the concept of a fuzzy number. What is the significance of fuzziness? **(06)**

b) Consider two fuzzy sets A and B. find complement, Union, Intersection, Difference and De Morgan's laws. **(04)**

$$A = \left\{ \frac{0.8}{2}, \frac{0.4}{3}, \frac{0.6}{4}, \frac{0.1}{5}, \frac{0.3}{6} \right\}$$

$$B = \left\{ \frac{0.3}{2}, \frac{0.8}{3}, \frac{0.6}{4}, \frac{0.8}{5}, \frac{0.2}{6} \right\}$$

Q.2 a) Explain any four fuzzy membership functions with their transfer characteristics. **(06)**

b) Given a rule? If x is A, THEN y is B, **(04)**

$$\text{where } A = \left\{ \frac{0.2}{1}, \frac{0.5}{2}, \frac{0.7}{3} \right\} \text{ and } B = \left\{ \frac{0.6}{5}, \frac{0.8}{7}, \frac{0.4}{9} \right\}$$

Infer B' for another rule: If x is A' , THEN y is B' , where $A' = \left\{ \frac{0.5}{1}, \frac{0.9}{2}, \frac{0.3}{3} \right\}$ using Mamdani Implication rule and max-min composition.

OR

Q.2 a) Describe the architecture of a Mamdani type Fuzzy Logic Controller and compare it with a conventional PID controller. **(06)**

b) What are the principal design parameters of a Fuzzy Logic Controller? Explain with a suitable example. **(04)**

Q.3 a) What are the advantages of Fuzzy Logic Controller over that of a conventional controller? **(06)**

b) Explain the Sugeno Fuzzy inference model with a suitable example. **(04)**

P.T.O.

OR

- Q.3 a) Define the following terms with reference to fuzzy inference systems: (06)
- Premise (Antecedent)
 - Conclusion (Consequent)
 - Rule-Base

- b) Given two rules: (04)

Rule 1: If height is "TALL", then speed is "HIGH"

Rule 2: If height is "MEDIUM", then speed is "MODERATE"

The fuzzy sets for height (in feet) and speed (in m/s) are:

$$H_1 = \text{"TALL"} = \left\{ \frac{0.5}{5}, \frac{0.8}{6}, \frac{1}{7} \right\}, S_1 = \text{"HIGH"} = \left\{ \frac{0.4}{5}, \frac{0.7}{6}, \frac{0.9}{7} \right\}$$

$$H_2 = \text{"MEDIUM"} = \left\{ \frac{0.6}{5}, \frac{0.7}{6}, \frac{0.6}{7} \right\}, S_2 = \text{"MODERATE"} = \left\{ \frac{0.6}{5}, \frac{0.8}{7}, \frac{0.7}{9} \right\}$$

$$\text{For a given } H_1 = \text{"ABOVE AVERAGE"} = \left\{ \frac{0.5}{5}, \frac{0.9}{6}, \frac{0.8}{7} \right\}$$

Compute $S' = \text{"ABOVE NORMAL"}$

- Q.4 a) State the various learning rules in neural networks. (06)

- b) Using Mc-Culloch Pitts neuron, implement a bipolar AND function. (04)
Assume initial weights to be [1 1].

OR

- Q.4 a) What is a perceptron network? State the algorithm for perceptron learning. (06)

- b) Train a perceptron network for learning a binary OR gate function. Work out two complete iterations. (04)

- Q.5 a) Explain back-propagation algorithm for MLP with a neat signal flow graph. (06)

- b) Enlist the various activation functions used in neural networks and explain any two in details. (04)

OR

- Q.5 State the applications of artificial neural networks and explain any two in details. (10)

- Q.6 a) Explain unsupervised learning mechanism in contrast with a supervised learning mechanism. (06)

- b) Describe the self Organizing Map architecture and explain the Kohonen model. (04)

OR

- Q.6 Write short notes on (ANY TWO): (10)

- Architecture of ANFIS
- Advantages of ANFIS over FIS
- Use of ANN in process control

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