Reg. No. : | | | | | | | | | | |

Question Paper Code: 49032

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Sixth Semester

Electrical and Electronics Engineering

14UEE911- FUZZY LOGIC AND NEURAL NETWORK

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The cardinality of fuzzy sets on any universe is

(a) 0 (b) +1 (c) ∞ (d) -1

2. The support of membership function is defined as

(a) $\mu_A(x)=1$ (b) $\mu_A(x)<0$ (c) $\mu_A(x)>0$ (d) $0<\mu_A(x)<1$

3. What are the following sequence of steps taken in designing a fuzzy logic machine?

(a) Fuzzification----->Rule evaluation----->Defuzzification

(b) Rule evaluation----->Fuzzification----->Defuzzification

(c) Fuzzy Sets----->Defuzzification----->Rule evaluation

(d) Defuzzification----->Rule evaluation----->Fuzzification

4. Fuzzy logic controllers are used in many applications because

(a) Can use multiple input and output sources (b) Much simpler

(c) Very quick and cheaper to implement (d) All of the above

5. The equivalent terminology of dendrites in artificial neuron is

(a) Neuron (b) Weights (c) Net input (d) Output

6. The range of learning rate is

(a) Less than (b) 0 to 1 (c) 1 to 5 (d) 0 to ∞

7. An auto-associative network is:

(a) A neural network that contains no loops

(b) A neural network that contains feedback

(c) A neural network that has only one loop

(d) A single layer feed-forward neural network with pre-processing

8. The storage capacity of a discrete Hopfield network is approximated as

(a) $C \approx 0.15n^2$ (b) $C \approx 0.15n$ (c) $C \approx 2n$ (d) $C \approx n^2$

9. In a power system fault detection problem, the best neural network architecture that can be implemented is

(a) Multilayer Perceptron (b) Back Propagation Network

(c) Hopfield Network (d) Kohonen Self-organizing map

10. Goal of the inverted pendulum is

(a) A sequence of right and left forces of fixed magnitude such that the pendulum is balanced, and the cart does not hit the edge of the track.

(b) A sequence of right and left forces of fixed magnitude such that the pendulum is unbalanced, and the cart does not hit the edge of the track.

(c) A sequence of right and left forces of fixed magnitude such that the pendulum is balanced, and the cart does hit the edge of the track.

(d) A sequence of right and left forces of fixed magnitude such that the pendulum isun balanced, and the cart does hit the edge of the track.

PART - B (5 x 2 = 10 Marks)

11. Differentiate crisp set and fuzzy set

12. Give at least four reliable statements of your own using IF-THEN rules.

13. Define perceptron learning rule.

14. What are recurrent networks?

15. Give any two applications in power system using fuzzy logic.

PART - C (5 x 16 = 80 Marks)

16. (a) For the given two fuzzy sets

$$B_1 = \left\{\frac{1}{1.0}+\frac{0.45}{1.5}+\frac{0.3}{2.0}+\frac{0.15}{2.5}+\frac{0}{3.0}\right\}$$

$$B_2 = \left\{\frac{0.9}{1.0}+\frac{0.6}{1.5}+\frac{0.5}{2.0}+\frac{0.2}{2.5}+\frac{0.1}{3.0}\right\}$$

Find the following.

(i) $B_1 \cup B_2$ (*ii*) $B_1 \cap B_2$ (*iii*) $\overline{B_1}$ (*iv*) $\overline{B_1 \cup B_2}$ (*v*) $B_1 \cup \overline{B_1}$ (*vi*) B_1 / B_2

(*vii*) B_2 / B_1 (*viii*) $\overline{B_2}$ (16)

Or

(b) Two fuzzy relations are given by (16)

$$\mathcal{R}_1 = \begin{bmatrix} 0.1 & 0.3 & 0.5 & 0.7 \\ 0.4 & 0.2 & 0.8 & 0.9 \\ 0.6 & 0.8 & 0.3 & 0.2 \end{bmatrix}, \mathcal{R}_2 = \begin{bmatrix} 0.9 & 0.1 \\ 0.2 & 0.3 \\ 0.5 & 0.6 \\ 0.7 & 0.2 \end{bmatrix}$$

Obtain fuzzy relation T as a composition between two fuzzy relations using

(i) Max-Min composition (ii) Max- Product composition

17. (a) Draw the block diagram of a fuzzy logic controller and discuss the various design steps of fuzzy logic controller. (16)

Or

(b) (i) What are fuzzy modifiers and linguistic variables? Explain with examples. (8)

(ii) What is defuzzification? Explain the various defuzzification methods. (8)

18. (a) (i) Explain the structure of biological neuron and hence obtain the mathematical model of ANN. (8)

(ii) What are the different types of learning methods? Explain each method with an example. (8)

Or

(b) Draw and explain the architecture of back propagation network. Also derive the updation of hidden layer weights. (16)

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19. (a) Draw the architecture of Kohonen's self organizing map and explain its training algorithm. (16)

Or

(b) Explain the discrete Hopfield net with its architecture and state the application algorithm. (16)

20. (a) Design and analyze the application of neural networks for an inverted pendulum. (16)

Or

(b) Design and analyze a fuzzy controller for a washing machine. (16)

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