

# CBCS SCHEME

15EE661

## Sixth Semester B.E. Degree Examination, Jan./Feb. 2021 Artificial Neural Networks and Fuzzy Logic

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Bring out the concept of neurons of human being to realize the artificial neural networks. (07 Marks)
- b. Explain the basic architecture of neural network. (06 Marks)
- c. Explain the different learning methods used in back propagation network. (07 Marks)

OR

- 2 a. What are the different types of threshold functions used in neural networks? (08 Marks)
- b. Explain the Rosenblatt's perceptron neural network architecture. (06 Marks)
- c. Explain the back propagation learning algorithms used in bpn. (06 Marks)

### Module-2

- 3 a. Explain the effect of tuning parameter of the back propagation network. (06 Marks)
- b. Differentiate between autocorrelators and heterocorrelators used in Bidirection Associative Memory (BAM) (04 Marks)
- c. A three patterns are specified as  $A_1 = \{-1, 1, -1, 1\}$ ;  $A_2 = \{1, 1, 1, -1\}$ ;  $A_3 = \{-1, -1, -1, 1\}$ . Which are to be stored as an autocorrelators. Retrieve the pattern  $A_2$ . (10 Marks)

OR

- 4 a. Explain the process of selection of various parameters used in Back Propagation Network (BPN). (06 Marks)
- b. Explain the Wang et al.'s multiple training encoding strategy algorithms. (08 Marks)
- c. Explain the simplified bidirectional associative memory algorithm to retrieve the specified pattern. (06 Marks)

### Module-3

- 5 a. Define adaptive resonance theory, and explain the method of clustering data using vector quantization. (04 Marks)
- b. With a neat diagram, explain the architecture of ART1. (08 Marks)
- c. Explain the algorithm of ART1. (08 Marks)

OR

- 6 a. With a neat diagram, explain the architecture of ART2. (08 Marks)
- b. Explain the algorithm of ART2. (08 Marks)
- c. Explain the effect and its sensitiveness while ordering the data during clustering. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-4**

- 7 a. What are the different crisp set operation? List out the properties of crisp set. (06 Marks)  
 b. Consider the fuzzy sets  $\tilde{A}$  and  $\tilde{B}$  defined on the interval  $X = \{0, 5\}$  of real numbers, by the membership grade functions:

$$\mu_{\tilde{A}}(x) = \frac{x}{x+1} ; \mu_{\tilde{B}}(x) = 2^{-x}$$

Determine the mathematical formulae and graph of the membership grade functions of each of the following sets:

- i)  $\tilde{A}^c, \tilde{B}^c$     ii)  $\tilde{A} \cup \tilde{B}$     iii)  $\tilde{A} \cap \tilde{B}$     iv)  $(\tilde{A} \cup \tilde{B})^c$  (10 Marks)

- c. Two crisp defined as

$$R = \begin{matrix} & 1 & 3 & 5 \\ \begin{matrix} 1 \\ 3 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \end{matrix} \quad S = \begin{matrix} & 1 & 3 & 5 \\ \begin{matrix} 1 \\ 3 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

Find the Cartesian product relation  $T = RoS$ . (04 Marks)

**OR**

- 8 a. Define fuzzy sets. What are the fuzzy sets operations? (04 Marks)  
 b. List out the properties of fuzzy sets. (04 Marks)  
 c. A set of three fuzzy sets are given in Fig.Q.8(c)(i), (ii) and (iii). Draw the aggregate of the three fuzzy sets. Determine the defuzzification value using centroid method. (12 Marks)

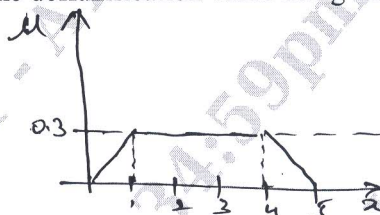


Fig.Q.8(c)(i)

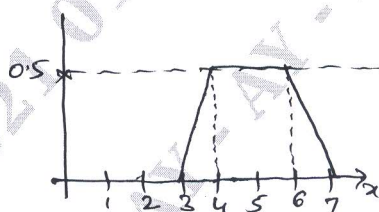


Fig.Q.8(c)(ii)

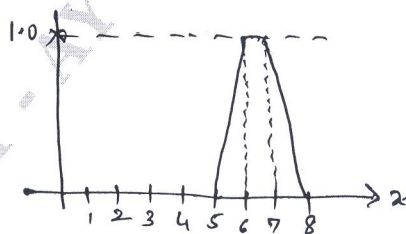


Fig.Q.8(c)(iii)

Module-5

- 9 a. Obtain the truth table for the formula
- $(P \vee B) \Rightarrow (\sim P)$  Is it tautology?
  - $(P \Rightarrow Q) \wedge (Q \Rightarrow P) = (P = Q)$  Is it tautology?

(08 Marks)

- b. Let  $X = \{a, b, c, d\}$   $Y = \{1, 2, 3, 4\}$
- $$\tilde{A} = \{(a, 0), (b, 0.8), (c, 0.6), (d, 1)\}$$
- $$\tilde{B} = \{(1, 0.2), (2, 1), (3, 0.8), (4, 0.0)\}$$
- $$\tilde{C} = \{(1, 0.2), (2, 0.4), (3, 1), (4, 0.8)\}$$

Determine the implication relation

- If  $x$  is  $\tilde{A}$  then  $y$  is  $\tilde{B}$
- If  $x$  is  $\tilde{A}$  then  $y$  is  $\tilde{B}$  ELSE  $y$  is  $\tilde{C}$

(12 Marks)

OR

- 10 a. Verify the De-Morgan's laws
- $\sim (P \vee Q) = (\sim P \wedge \sim Q)$
  - $\sim (P \wedge Q) = (\sim P \vee \sim Q)$
- b. Explain the different operation can perform on type-2 fuzzy sets.
- c. Explain how interval type-2 fuzzy sets are represented.

(06 Marks)

(07 Marks)

(07 Marks)

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