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**Roll No. ....**

## **TBC-505 (3)**

**B. C. A. (FIFTH SEMESTER)**

**END SEMESTER**

**EXAMINATION, Dec., 2023**

**SOFT COMPUTING**

**Time : Three Hours**

**Maximum Marks : 100**

**Note :** (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among  
(a), (b) and (c) in each main question.

(iii) Total marks in each main question are  
**twenty.**

(iv) Each sub-question carries 10 marks.

1. (a) Discuss the concept of Soft Computing and its significance in solving real-world problems. Provide a comprehensive

**P. T. O.**

(2)

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overview of various soft computing techniques, their applications, and the advantages they offer in handling complex and uncertain data and situations. (CO1)

(b) (i) How is the Training algorithm performed in a back propagation neural network? (CO1)

(ii) With graphical representation, explain the activation functions used in ANN.

(c) Design a Hebb network to realize logical OR function. (CO1)

2. (a) Discuss SOM in brief. Construct SOM to cluster four given vectors

$[0 \ 0 \ 1 \ 1]$ ,  $[1 \ 0 \ 0 \ 0]$ ,  $[0 \ 1 \ 1 \ 0]$ ,  $[0 \ 0 \ 0 \ 1]$ .

Number of clusters to be formed is 2.

Assume initial learning rate = 0.5.

(CO2/CO3)

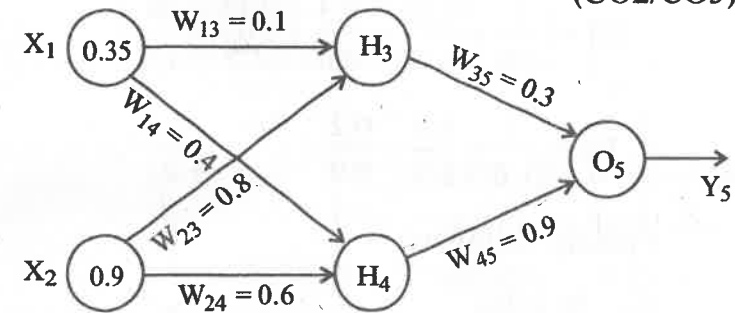
(b) Consider learning in Multi-layer Perceptron. The given MLP consists of an input layer, one hidden layer, and an output layer. The input layer has 2

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neurons, the hidden layer has 2 neurons, and the out layer has a single neuron. Assume that neurons have a sigmoid activation function. Perform a forward pass and backward pass on the network for weight adjustment. Assume that the actual output is 0.5 and the learning rate is 1.

(CO2/CO3)



(c) Explain the following in brief:

(CO2/CO3)

(i) Architecture of Hopfield networks

(ii) Concept of Bidirectional Associative Memory (BAM).

3. (a) Define classical sets and fuzzy sets. State the importance of fuzzy sets. Discuss in detail the operations of fuzzy sets. (CO4)

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(4)

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(b) Write short notes on the following. :

(CO4)

- (i) Cardinality of a set
- (ii) Operations of fuzzy relations
- (iii) Fuzzy Relation

(c) Discuss the properties of fuzzy sets. Give the two fuzzy sets : (CO4)

$$B1 = \left\{ \frac{1}{1.0} + \frac{0.75}{1.5} + \frac{0.3}{2.0} + \frac{0.15}{2.5} + \frac{0}{3.0} \right\}$$

$$B2 = \left\{ \frac{1}{1.0} + \frac{0.6}{1.5} + \frac{0.2}{2.0} + \frac{0.1}{2.5} + \frac{0}{3.0} \right\}$$

Find the following :

- (i)  $B1 \cup B2$
- (ii)  $B1 \cap B2$
- (iii)  $B1|B2$
- (iv)  $B1 \cup B2$
- (v)  $B1 \cup \bar{B}2$

4. (a) What is a Fuzzy Inference System (FIS) ?  
With the suitable block diagram, explain the working principle of an FIS. (CO4)

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- (b) Define the Membership function and state its importance in fuzzy logic. Discuss the Features of membership functions. (CO4)
- (c) Define Linguistic variable in a fuzzy set. Explain the types of membership functions. (CO4)

5. (a) What is meant by a genetic algorithm ? Compare and contrast traditional algorithms and genetic algorithms.

(CO1/CO5)

(b) What are various types of crossover and mutation ? With a neat flow chart, discuss the general genetic algorithm. (CO1/CO5)

(c) Write short notes on the following :

(CO1/CO5)

- (i) Basic terminologies of genetic algorithm
- (ii) Applications of GA

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