

Total No. of printed pages = 4

**MCA 18250 E 21**

Roll No. of candidate

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**M.C.A. 5<sup>th</sup> Semester Examination**

**SOFT COMPUTING (Elective - II)**

**(New Syllabus & New Regulation (W.e.f. 2020 - 21))**

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct answer from the following: (10 × 1 = 10)
- (i) Which of the following is not true about a single Perception?
- (a) It can take many inputs
  - (b) Input units have weights
  - (c) It has many output units
  - (d) It uses an activation function
- (ii) In supervised learning
- (a) Inputs are not labelled
  - (b) No inputs are required
  - (c) Inputs are labelled
  - (d) None of the above
- (iii) Which of the following functions is used for activation of the output unit of the *ADALINE* during application?
- (a) Identity
  - (b) Binary
  - (c) Bipolar step
  - (d) Sigmoid
- (iv) A recurrent neural network(RNN) is
- (a) Feed forward type of network
  - (b) Feedback type of network
  - (c) Linear type network
  - (d) None the above

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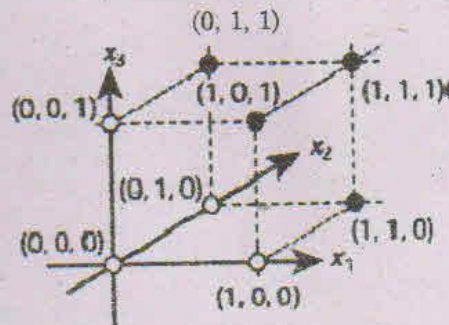


- (v) Genetic Algorithms are inspired by,
- Statistical mechanics
  - Big bang theory
  - Natural evolution
  - None of the above
- (vi) Which of the following is a competitive learning method?
- Winner-takes-all
  - Least-Mean-square
  - Extended delta
  - None the above
- (vii) An output of a fuzzy inference system is a,
- A linguistic variable
  - A crisp value
  - A fuzzy set
  - None of the above
- (viii) What kind of learning is backpropagation?
- Supervised
  - Non-supervised
  - Semi-supervised
  - None of the above
- (ix) Which of the following activation functions is not differentiable?
- Identity function
  - Heaviside function
  - Sigmoid function
  - None of the above
- (x) Which of the following is not a fuzzy linguistic truth value?
- True
  - Almost true
  - Very much true
  - Apple

2. (a) What are the constituents of Soft Computing? (6)
- (b) Let  $U = \{4,5,6,7,8,9\}$ ,  $A = \{(4,0.51), (5,0.7), (6,0.11), (8,0.8)\}$ ,  
 $B = \{(4,0.9), (5,1), (7,0.83), (9,0.6)\}$ . Find (6)
- $A \cup B$
  - $A \cap B$
  - $\bar{A}$
- (c) Find the concentration and dilation for set  $A$  with membership values  
 $\mu_A = \{0.71, 1, 0.45, 0.1, 0\}$  (3)
3. (a) Write the structure of a Rosenblatt perceptron. What are the usages of perceptron? (6)
- (b) Mention four fuzzy membership functions. (4)
- (c) What are Fuzzy quantifiers? Give examples. (3)
- (d) What is n valued logic? (2)



4. (a) Calculate the weight matrix  $W$  and show how the pattern,  $s = [1, -1, -1, 1]$  can be stored and recognized by an auto associative net. (6)
- (b) Consider the 3-input majority function for the classification of 3-bit patterns. Figure below shows the positions of the input patterns in a 3-dimensional space, classified on the basis of the corresponding output values, (7)



- (c) Give example of 2 popular Recurrent Neural Networks. (2)
5. (a) Mention the operations in a Genetic Algorithm. (6)
- (b) What is a fuzzy, predicate? Consider the following syntactic rules. (4)

$S \rightarrow A$   
 $A \rightarrow A \text{ and } B$   
 $A \rightarrow B$   
 $B \rightarrow \text{not } C \mid C$   
 $C \rightarrow \text{very } C \mid D$   
 $D \rightarrow \text{Cold} \mid \text{Warm} \mid \text{Hot}$

Generate the following fuzzy predicates by applying the above rules,

- (i) "more or less Hot"  
 (ii) "almost Hot"  
 (iii) "very Cold and not Hot".
- (c) What are the components of RBFN? How many minimum layers are there in an RBFN? (5)
6. (a) Show with a diagram the architecture of a multilayer feed-forward neural network. (5)
- (b) Mention any two ANN learning algorithms. What is an epoch and learning rate in a learning algorithm? (4)
- (c) What is gradient in the gradient descent learning algorithm? (2)
- (d) Consider a neural network with three input and two output weights are given by  $w_{11} = 0.3, w_{12} = 0.5, w_{21} = 0.7, w_{22} = 0.3, w_{31} = 0.8, w_{32} = 0.1$ . It is given with input of  $[0.2, 0.7, 1.1]$ . Find the output if sigmoid function is used as activation with slope = 1.2. (4)



7. (a) Discuss the back propagation network. Explain how the errors are corrected. (6)
- (b) Give two examples of Neuro-Fuzzy Inference systems. Explain the architecture of a Neuro-Fuzzy Inference system. (5)
- (c) What is the limitation of single layer neural network or single layer perceptron model? An XOR function cannot be realized by one perceptron. Why? (4)

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