QPC: RN20BTECH691 AR 20 Reg. No | | | | | | | | | | |

# GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2023

## BOEEC7032 - Soft Computing

(ECE)

Time: 3 hrs Maximum: 70 Marks

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions)** **(1 x 10 = 10 Marks)**

| Q.1. Answer ***ALL*** questions | [CO#] | [PO#] |
|---|---|---|
| a. Which of the following represents the values of set membership?<br>(i) Degree of truth (ii) Discrete set<br>(iii) Probabilities (iv) Both a & b | CO1 | PO1 |
| b. Every connection link present in ANN gets linked to the _____ that consists of various statics about an input signal.<br>(i) Activation function (ii) Neurons<br>(iii) Bias (iv) Weights | CO1 | PO1 |
| c. Uncertainty can be represented by _____<br>(i) Entropy (ii) Probability<br>(iii) Fuzzy logic (iv) All of the above | CO1 | PO1 |
| d. Fuzzy Set theory defines fuzzy operators. Choose the fuzzy operators from the following.<br>(i) AND (ii) NOT<br>(iii) OR (iv) All | CO2 | PO2 |
| e. What is Adaline in neural networks?<br>(i) Adaptive line element (ii) Automatic linear element<br>(iii) Adaptive non-linear element (iv) none of the above | CO1 | PO1 |
| f. Which layer type is typically used to capture sequential dependencies in an RNN?<br>(i) Input layer (ii) Output layer<br>(iii) Hidden layer (iv) Activation function | CO1 | PO1 |
| g. Which layer type is commonly used in RNNs for time series prediction tasks?<br>(i) Input layer (ii) Hidden layer<br>(iii) Output layer (iv) Activation layer | CO1 | PO1 |
| h. Which of the following method is useful for escaping from local minima?<br>(i) Updating heuristic estimate (ii) Eliminating heuristic estimate<br>(iii) Reducing heuristic estimate (iv) None of these | CO1 | PO1 |
| i. ----- is a computational model<br>(i) cell (ii) perceptron<br>(iii) neuron (iv) nucleus | CO1 | PO1 |
| j. Fuzzy logic is usually represented by<br>(i) IF-THEN-ELSE rules (ii) IF-THEN rules<br>(iii) IF-THEN-ELSE rules & IF-THEN rules (iv) None | CO1 | PO1 |

**PART – B: (Short Answer Questions)** **(2 x 10 = 20 Marks)**

| Q.2. Answer ***ALL*** questions | [CO#] | [PO#] |
|---|---|---|
| a. What is the difference between threshold function and membership function. | CO1 | PO1 |
| b. What do you mean by linearly separable function and non-linearly separable function. | CO1 | PO1 |
| c. Given a Fuzzy set S= {X1, X2, X3, x4, x5}, and M={0.7,0.3,0.4,0.5,0.1}, find the strong lambda cut where lambda=0.4. | CO2 | PO2 |
| d. If A={(x1,02),(x2,0.3),(x3,0.4)}, find the $A^2$ | CO2 | PO2 |
| e. Show the structure of a typical RBF neural network. | CO1 | PO1 |
| f. Realize NOT function using McCulloch-Pitts neuron model. | CO1 | PO1 |
| g. Mention two applications of LVQ and KSOM. | CO2 | PO2 |
| h. Explain any one selection process of GA. | CO2 | PO1 |
| i. What is a hybrid system in soft computing. | CO2 | PO1 |

j. What is Learning Rate Annealing? CO1 PO1

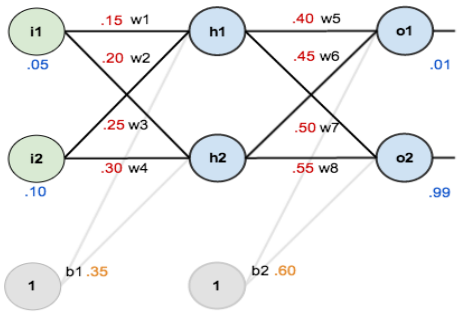
## PART – C: (Long Answer Questions) (10 x 4 = 40 Marks)

| Answer ***ALL*** questions | | Marks | [CO#] | [PO#] |
|---|---|---|---|---|
| 3. a. | What is the difference between hard computing and soft computing. | 5 | CO2 | PO2 |
| b. | Explain the Fuzzy system architecture. | 5 | CO2 | PO1 |
| | (OR) | | | |
| c. | Explain with example how GA is used for optimization. | 5 | CO2 | PO2 |
| d. | What do you mean by optimization? Explain various optimization process. | 5 | CO2 | PO1 |
| 4. a. | Two fuzzy relations R1 and R2 are given in the following two tables | 5 | CO3 | PO2 |

$$R_1 = \begin{array}{c|ccc} & y_1 & y_2 & y_3 \\ x_1 & 0.1 & 0.3 & 0.4 \\ x_2 & 0.2 & 0.1 & 0.5 \end{array} \qquad R_2 = \begin{array}{c|cc} & y_1 & y_2 \\ x_1 & 0.5 & 0.2 \\ x_2 & 0.7 & 0.1 \\ x_3 & 0.2 & 0.6 \end{array}$$

Find MAX-MIN composition (ii) MAX-PROD composition.

| | | | | |
|---|---|---|---|---|
| b. | State and draw various membership functions. | 5 | CO1 | PO1 |
| | (OR) | | | |
| c. | Consider a fuzzy set A defined on the interval x=[0,10] of integers by the membership function. μA(x) = x / x+ 2, if the α cut is α = 0.5. What is the sequence? | 5 | CO2 | PO2 |
| d. | Describe Centre of gravity method of defuzzification. | 5 | CO1 | PO1 |
| 5. a. | | 5 | CO3 | PO2 |




Compute the mean square error in the neural network for the above.

| | | | | |
|---|---|---|---|---|
| b. | Write the difference between Adaline and Madaline neural network. | 5 | CO2 | PO1 |
| | (OR) | | | |
| c. | Explain the Back Propagation neural network with its advantage and Disadvantages. | 5 | CO2 | PO1 |
| d. | Design a bipolar AND gate function using perceptron network. | 5 | CO3 | PO2 |
| 6. a. | Construct the Kohonen's Self Organizing Map (KSOM) to cluster the 4-given vectors [0 0 1 1], [1 0 0 0], [0 1 1 0] and [0 0 1 1]. The number of clusters to be formed is two. Assume an initial learning rate 0.2. wight are [0.4,0.5,02,0.3] and [0.1,0.8,0.5,0.6] | 5 | CO3 | PO3 |
| b. | Explain the Recurrent Neural Network (RNN) | 5 | CO2 | PO1 |
| | (OR) | | | |
| c. | Explain the process of Kohnen Self-Organization Map(KSOM). | 5 | CO2 | PO1 |
| d. | Construct a LVQ net with five vectors assigned to 2-classes. | 5 | CO3 | PO3 |

| | Class labels |
|---|---|
| [0 0 1 1] | 1 |
| [1 0 0 0] | 2 |
| [0 0 0 1] | 2 |
| [1 1 0 0] | 1 |
| [0 1 1 0] | 1 |

*** End of the Paper ***