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

# GIET UNIVERSITY, GUNUPUR – 765022

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

## BOECS7011 / BOECT7011 - Soft Computing

(CSE,CST)

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. The process of converting a crisp value into a fuzzy value is called_____. CO1 PO1

(i) Fuzzification. (ii) Defuzzyfication

(iii) Optimization (iv) Linearization

b. A fuzzy pair contains CO1 PO1

(i) Member, Membership value (ii) Two members

(iii) Two membership values (iv) None

c. The truth values of traditional set theory is _____ and that of fuzzy set is _____ CO1 PO1

(i) Either 0 or 1, between 0 & 1 (ii) Between 0 & 1, either 0 or 1

(iii) Between 0 & 1, between 0 & 1 (iv) Either 0 or 1, either 0 or 1

d. A fuzzy set whose membership function has at least one element x in the universe whose membership value is unity is called CO1 PO1

(i) Sub-normal fuzzy sets (ii) Normal fuzzy set

(iii) Convex fuzzy set (iv) Concave fuzzy set

e. The process of adjusting the weight is known as: CO3 PO1

(i) activation (ii) learning

(iii) synchronization (iv) none

f. A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. The output will be: CO3 PO2

(i) 238 (ii) 76

(iii) 119 (iv) 223

g. LVQ is a powerful method for classifying patterns that are not _____separable. CO3 PO1

(i) Linearly (ii) Non-linearly

(iii) Both Linearly & Non-linearly (iv) none

h. In GA, the strategy to ensure that the best chromosomes are not lost in the search process through generations is CO4 PO1

(i) Elitism (ii) Tabu search

(iii) Selection (iv) Convergence

i. Uncertainty can be represented by _____ CO1 PO1

(i) Entropy (ii) Fuzzy logic

(iii) Probability (iv) All of the above

j. If A and B are two fuzzy sets with membership functions $\mu A(x) = \{0.6, 0.5, 0.1, 0.7, 0.8\}$ $\mu B(x) = \{0.9, 0.2, 0.6, 0.8, 0.5\}$, Then the value of $\mu(A \cup B)(x)$ will be CO2 PO2

(i) {0.9, 0.5, 0.6, 0.8, 0.8} (ii) {0.6, 0.2, 0.1, 0.7, 0.5}

(iii) {0.1, 0.5, 0.4, 0.2, 0.2} (iv) {0.1, 0.5, 0.4, 0.2, 0.3}

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

| Q.2. Answer ***ALL*** questions | [CO#] | [PO#] |
|---|---|---|
| a. What is the membership function in Fuzzy Logic System? | CO1 | PO1 |
| b. Explain the core, support, and boundary of a fuzzy set. | CO1 | PO1 |
| c. What are the applications of fuzzy logic? | CO1 | PO1 |
| d. State the fuzzy rule base in the Sugeno Fuzzy Inference System. | CO1 | PO2 |
| e. Find α-cut of the set.(α=0.5) Ȧ={0.1/a, 0.6/b, 0.4/c, 0.8/d, 0.5/e}. | CO2 | PO2 |
| f. What is radial basis function in neural network? | CO3 | PO1 |
| g. What is Activation Function and write its importance. | CO3 | PO1 |
| h. What is the output of a>>2 operation if a=1010 0110? | CO4 | PO2 |
| i. What do you mean the term population in Genetic algorithm? | CO4 | PO1 |
| j. State commutative and associative laws in fuzzy sets. | CO2 | PO1 |

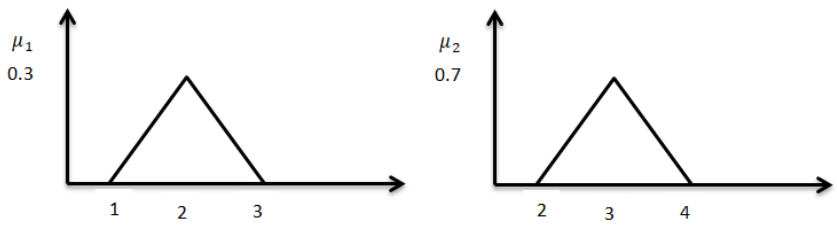
**PART – C: (Long Answer Questions)** **(10 x 4 = 40 Marks)**

| Answer ***ALL*** questions | Marks | [CO#] | [PO#] |
|---|---|---|---|
| 3. a. Consider two fuzzy sets $A=\left\{\frac{0.3}{1}+\frac{0.3}{2}+\frac{0.4}{3}+\frac{0.5}{4}\right\}$ and $B=\left\{\frac{0.1}{1}+\frac{0.2}{2}+\frac{0.2}{3}+\frac{1}{4}\right\}$ Find the bounded sum and bounded difference of the given fuzzy sets. | 5 | CO2 | PO3 |
| b. What is membership function in Fuzzy Logic System? State and draw various membership functions. | 5 | CO2 | PO2 |
| (OR) | | | |
| c. Two fuzzy relations R1 and R2 are given in the following two tables | 5 | CO2 | PO3 |

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

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

| | | | | |
|---|---|---|---|---|
| d. Explain the different types of membership function used in fuzzification process? | 5 | CO2 | PO2 |
| 4. a. Two fuzzy membership functions are represented by: | 10 | CO2 | PO4 |



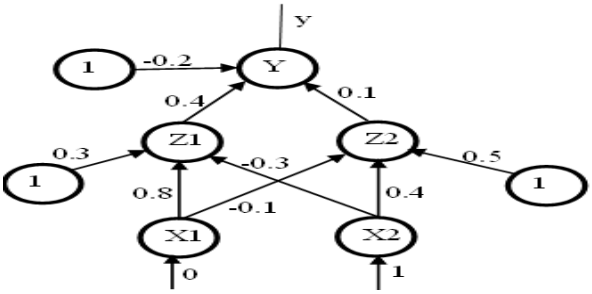

Find the defuzzified output using

(i) Maximum membership principle
(ii) Weighted average method
(iii) Mean of Max method

(OR)

| | | | |
|---|---|---|---|
| b. What is Defuzzification process in FIS? | 3 | CO2 | PO2 |
| c. Explain Mamdani and Suzzeno fuzzy FIS with example. | 7 | CO2 | PO2 |

| | | | | |
|---|---|---|---|---|
| 5. a. | Using back-propagation algorithm find the new weights for the net shown. It is represented with the input pattern [0 1] and the target output is 1. Use a learning rate α is equal to 0.25, and binary sigmoidal activation function. | 10 | CO3 | PO4 |




(OR)

| | | | | |
|---|---|---|---|---|
| b. | Construct the Kohonen's Self Organizing Map (KSOM) to cluster the 4-given vectors [1 0 0], [1 1 0], [0 0 1] and [0 1 1]. The number of clusters to be formed are two. Assume initial learning rate 0.2. | 8 | CO3 | PO4 |
| c. | What is the role of the Learning coefficient and momentum factor in Back-propagation algorithm? | 2 | CO3 | PO1 |
| 6. a. | Write the step by step implementation procedure for GA. | 10 | CO4 | PO3 |

(OR)

| | | | | |
|---|---|---|---|---|
| b. | What is the significance of hybrid system in soft computing? Explain Neuro Fuzzy Hybrid systems with advantages and disadvantages. | 10 | CO4 | PO3 |

--- End of Paper ---