GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2023
BOEEL7011/BOEEE7011 – Neural Networks & Fuzzy Logic
(EE & EEE)

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)**

		[CO#]	[PO#]
Q.1. Answer **ALL** questions			
a.	Which of following is not a fuzzy membership function?	CO1	PO1
	(i) Gaussian (ii) Increasing		
	(iii) Signum (iv) Decreasing		
b.	Which of the following is associated with fuzzy logic?	CO1	PO1
	(i) Crisp set logic (ii) Many-valued logic		
	(iii) Two-valued logic (iv) Binary set logic		
c.	Fuzzy Set theory defines fuzzy operators. Which fuzzy operator represents in Fuzzy set theory?	CO1	PO1
	(i) AND (ii) OR		
	(iii) NOT (iv) All of the above		
d.	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}		
e.	Which of the following neural networks uses supervised learning?	CO3	PO1
	(i) Multilayer-perceptron (ii) Self-organizing-feature-map		
	(iii) Hopfield network (iv) none		
f.	The network in which the output of a neuron is fed back into itself as input is	CO3	PO1
	(i) Recurrent network (ii) Back propagation network		
	(iii) Reinforcement (iv) Reverse network		
g.	Artificial neural network used for	CO2	PO1
	(i) Pattern Recognition (ii) Classification		
	(iii) Clustering (iv) All of these		
h.	The amount of output of one unit received by another unit depends on what?	CO1	PO1
	(i) Output unit (ii) Input unit		
	(iii) activation value (iv) weight		
i.	Uncertainty can be represented by _____	CO1	PO1
	(i) Entropy (ii) Fuzzy logic		
	(iii) Probability (iv) All of the above		
j.	Which of the following neural networks uses supervised learning?	CO2	PO1
	(i) Multilayer perceptron (ii) Self organizing feature map		
	(iii) Hopfield network (iv) None of these		

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

|		[CO#]	[PO#]
Q.2. Answer **ALL** questions			
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.	How is centroid method helpful in defuzzification?	CO2	PO2
d.	Find α-cut of the set.(α=0.5) $\dot{A}$={0.1/a, 0.6/b, 0.4/c, 0.8/d, 0.5/e}	CO2	PO2
e.	Draw the single-layer recurrent network and multi-layer recurrent network.	CO3	PO2
f.	What is the role of bias in neural networks?	CO3	PO1

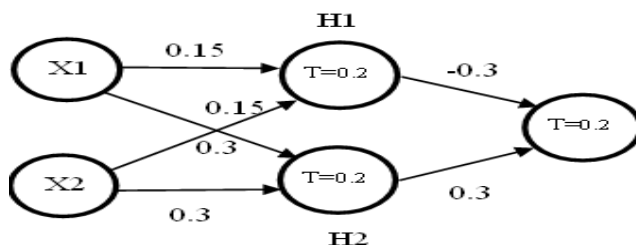|			CO#	PO#
g.	Define binary and bipolar sigmoid activation function.		CO1	PO1
h.	Define perceptron learning rule.		CO4	PO1
i.	What are the applications of fuzzy logic?		CO1	PO1
j.	Mention one advantages and disadvantage of fuzzy logic controllers.		CO2	PO1

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

Answer _ALL_ questions

		Marks	[CO#]	[PO#]
3. a.	What is membership function in Fuzzy Logic System? State and draw various membership functions.	5	CO2	PO2
b.	Two fuzzy sets are given as $\dfrac{\begin{matrix}x_1 & x_2 & x_3 & x_4 & x_4\end{matrix}}{\begin{matrix}A\mid 0.1 & 0.2 & 0.3 & 0.6 & 0 \\ B\mid 0.3 & 0.4 & 0.5 & 0.7 & 0.8\end{matrix}}$ Find (i) $(A \cap B)_{0.6}$ (ii) $(B \cup \bar{A})_{0.6}$	5	CO1	PO3

(OR)

		Marks	[CO#]	[PO#]
c.	Two fuzzy relations R1 and R2 are given in the following two tables	5	CO2	PO3

$$R_1 = \dfrac{\begin{matrix}y_1 & y_2 & y_3\end{matrix}}{\begin{matrix}x_1\mid 0.1 & 0.3 & 0.4 \\ x_2\mid 0.2 & 0.1 & 0.5\end{matrix}} \qquad R_2 = \dfrac{\begin{matrix}y_1 & y_2\end{matrix}}{\begin{matrix}x_1\mid 0.5 & 0.2 \\ x_2\mid 0.7 & 0.1 \\ x_3\mid 0.2 & 0.6\end{matrix}}$$

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

		Marks	[CO#]	[PO#]
d.	Explain the different types of membership function used in fuzzification process.	5	CO2	PO2
4. 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	PO2
b.	Explain Mamdani and Suzzeno fuzzy FIS with example.	5	CO2	PO2

(OR)

		Marks	[CO#]	[PO#]
c.	Explain with suitable membership function and rule base of the fuzzy inference system for Automatic Washing Machine.	10	CO2	PO3
5. a.	Using Back Propagation Algorithm, train the following network with a target of 1 and learning rate 0.2 for inputs of 0 and 1.	10	CO3	PO4

(OR)
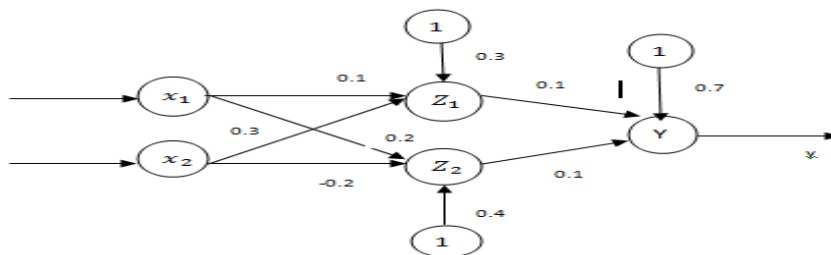
		Marks	[CO#]	[PO#]
b.	Draw a table of input and output for the network and identify the logic gate	10	CO3	PO4

		Marks	[CO#]	[PO#]
6. a.	Consider the initial weight matrix $w = [1 -1\ 0\ 0.5]^T$, the learning rate =1, training set having the input patterns are $X1 = [1 - 2\ 1.5\ 0]^T$ $X2 = [1 - 0.5 - 2 - 1.5]^T$ $X3 = [0\ 1 - 1\ 1.5]^T$. It has bipolar signum neurons. Perform two iterations of training using Hebbian's Learing Rule.	10	CO3	PO3

(OR)

		Marks	[CO#]	[PO#]
b.	Design a bipolar AND gate function using perceptron network.	10	CO2	PO4

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