GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2022

BOECT7011 / 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)**

		[CO#]	[PO#]

Q.1. Answer **ALL** questions

a. A perceptron is   CO3 PO1

    (i) a single-layer feed-forward neural network with pre-processing   (ii) an auto-associative neural network

    (iii) a double-layer auto-associative neural network   (iv) a neural network that contains feedback view answer

b. What was the name of the first model which can perform a weighted sum of inputs?   CO3 PO1

    (i) McCulloch-Pitts neuron model   (ii) Marvin Minsky neuron model

    (iii) Hopfield model of neuron   (iv) none of the these

c. What is the mathematical expression of α-cut set?   CO2 PO2

    (i) $\{x|\mu_A(x) \geq \alpha$ (ii) $\{x|\mu_A(x) > \alpha$

    (iii) $\{x|\mu_A(x) < \alpha$ (iv) $\{x|\mu_A(x) \leq \alpha$

d. In an unsupervised learning   CO3 PO1

    (i) Specific output values are given   (ii) Specific output values are not given

    (iii) No specific Inputs are given   (iv) Both inputs and outputs are given

e. Fuzzy logic is usually represented as   CO2 PO1

    (i) IF-THEN-ELSE rules   (ii) IF-THEN rules

    (iii) Both (i) & (ii)   (iv) None of the mentioned

f. 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

g. A fuzzy pair contains   CO2 PO1

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

    (iii) Two membership values   (iv) None

h. Which of the following neural networks uses supervised learning?   CO3 PO1

    (i) Multilayer-perceptron   (ii) Self-organizing-feature-map

    (iii) Hopfield network   (iv) None

i. For what purpose Feedback neural networks are primarily used?   CO3 PO1

    (i) Classification   (ii) Feature mapping

    (iii) Pattern mapping   (iv) None of the mentioned

j. ANFIS refers to   CO3 PO1

    (i) Adaptive neuro-fuzzy inference system   (ii) Artificial neural and fuzzy inference system

    (iii) Aggregation neural fuzzy inferencing system   (iv) Association of neural fuzzy interconnected system

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

Q.2. Answer *ALL* questions

|		[CO#]	[PO#]
a.	What is a fuzzy inference system?	CO2	PO2
b.	State and explain fuzzy rule base.	CO2	PO1
c.	Explain the core, support, and boundary of a fuzzy set.	CO2	PO1
d.	What is the role of bias in neural networks?	CO3	PO1
e.	What is feedback neural network architecture? Draw the single-layer recurrent network and multi-layer recurrent network.	CO3	PO2
f.	What is radial basis function in neural network?	CO3	PO2
g.	How does gradient descent learning minimize the error?	CO3	PO2
h.	Compare supervised and unsupervised learning and give one example for each.	CO3	PO1
i.	What is the membership function in Fuzzy Logic System?	CO2	PO1
j.	Write the mathematical form of Hebb's rule.	CO3	PO2

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

Answer *ALL* questions

		Marks	[CO#]	[PO#]

3. a. State and prove D'Morgan's Laws for the following fuzzy se — **5** CO2 PO2

$$A = \{(x_1, 0.2), (x_2, 0.3), (x_3, 0.7)\}$$
$$B = \{(x_1, 0.3), (x_2, 0.9), (x_3, 0.5)\}$$

b. Consider two fuzzy sets   A= — **5** CO2 PO2

$$A = \left\{ \frac{0.3}{1} + \frac{0.3}{2} + \frac{0.4}{3} + \frac{0.5}{4} \right\}$$

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.

(OR)

c. Two fuzzy relations R1 and R2 are given in the following two tables — **6** CO2 PO2

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

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

d. Explain different defuzzification methods. — **4** CO2 PO2

4.a. What is the role of the Learning coefficient and momentum factor in Back-propagation algorithm? — **3** CO3 PO1

4. b. 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.   7   CO3   PO4
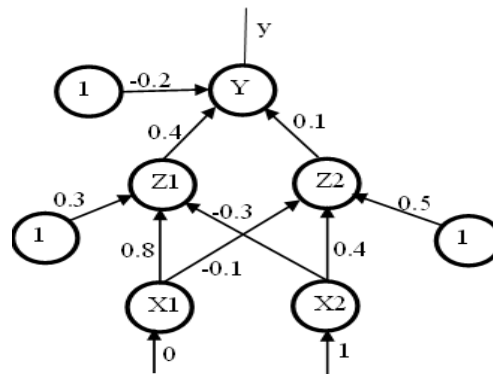
(OR)

c. Draw a table of input and output for the network and identify the logic gate   10   CO3   PO3
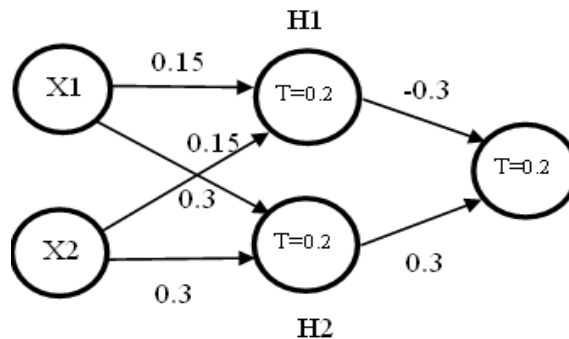
5. a. Construct the Kohonen's Self Organizing Map (KSOM) to cluster the 4-given vectors [1 0 0], [1 1 0], [0 0 1] and [0 1 1]. The number of clusters to be formed are two. Assume initial learning rate 0.2.   10   CO3   PO3

(OR)

b. Construct a LVQ net with five vectors assigned to 2-classes.   10   CO3   PO3

	Class lebels
[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

6. a. The set of input training vectors are as follows   10   CO3   PO4

$X1 = [1 - 2\ 0 - 1]^T$, $X2 = [0\ 1.5 - 0.5 - 1]^T$ and $X3 = [-1\ 1\ 0.5 - 1]^T$ and initial weight $w = [1 - 1\ 0\ 0.5]^T$. The learning rate is 0.1. It has Bipolar activation function. Desired responses are d1= -1, d2= 1and d3= 1 respectively. Find the new weights for six steps according to perceptron learning rule.

(OR)

b. Write the step by step implementation procedure for GA.   6   CO4   PO3

c. Mention four applications of Genetic algorithm.   4   CO4   PO1

--- End of Paper ---