Reg. No.



## VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2022

## SOFT COMPUTING TECHNIQUES [ELE 4062]

**REVISED CREDIT SYSTEM** 

Time: 3	Hours Date: 28 November 2022 Max. Marks:	Max. Marks: 50	
Instructio	ons to Candidates:		
*	Answer <b>ALL</b> the questions.		
*	Missing data may be suitably assumed.		
1.0	Design McCullach Ditts neural network model for VOD function		
1A.	considering binary data. Assume initial weights and bias to be zero. (04	I)	
1B.	Design a Hebb net to implement the logical AND function. Assume initial		

- weights and bias to be zero. Determine the final weights and bias values. Assume bipolar inputs and targets. Draw the decision boundary lines for each training pair.
- **1C.** Analyze the model and obtain the output of the neuron Y for the network shown using bipolar sigmoidal function.



(02)

(04)

**2A.** Construct the MADALINE network by performing 1 epoch of training. Function and initial weights are given below.

x1	x2	bias(1)	t
1	1	1	-1
1	-1	1	1
-1	1	1	1
-1	-1	1	-1

(04)

**2B.** Develop the hetero associative memory network using the outer products rule to store input row vectors s=(s1,s2,s3,s4) to the output row vectors t=(t1,t2). Use the vector pairs shown below.

	/					
	s1	s2	s3	s4	t1	t2
1	1	0	1	0	1	0
2	1	0	0	1	1	0
3	1	1	0	0	0	1
4	0	0	1	1	0	1

- **2C.** The elements in two sets A and B are given as  $A=\{2,4\}$  and  $B=\{a,b,c\}$ . Evaluate A \* B, B \* A, A<sup>2</sup>, B<sup>2</sup>. (02)
- **3A.** Many products such as tar (A), petroleum jelly (B), and petroleum (C) are extracted from crude oil. In a newly drilled oil well, these samples are taken and tested for their viscosity. The results are as shown. For the given membership function, evaluate the defuzzified output value by the Centroid method.



**3B.** 1000 people responded to a questionnaire about their pairwise preferences among five car brands, X={Hyundai, Suzuki, Ford, Honda, Skoda}, and the data is given in the table below. Analyze the data and estimate the best car brand.

	Kia	Toyota	Ford	Honda	Skoda
Kia	-	192	246	592	621
Toyota	403	-	621	540	391
Ford	616	534	-	797	746
Honda	523	364	417	-	608
Skoda	235	336	492	726	-

- **3C.** Using your own intuition plot the fuzzy membership for the age of people in the range o to 80 years. Use a traingualr membership function with 5 descriptors.
- **4A.** Design a suitable Adaline network. Initially assume all the weights and links to be 0.1 and the learning rate to be 0.1. For all the input combinations perform one epoch to calculate the new weights, bias and hence error.

x1	x2	bias(1)	t
1	1	1	-1
1	-1	1	1
-1	1	1	1
-1	-1	1	1

(05)

(04)

(02)

**4B.** Design a Fuzzy Logic Controller to determine the *wash time* of a domestic washing machine.

Assume the inputs are *dirt* and *grease* on clothes. Use 3 descriptors (*small, medium, Large*) for input variables and 5 descriptors (*very small, small, medium, large, very large*) for output variables. Assume maximum wash time is 60 minutes. Determine wash time for 30% dirt and 20% grease using the designed model.

**4C.** Design a computer software to do image processing to locate objects within a scene of images in an overhead reconnaissance photograph. Two fuzzy sets are given below representing car and a truck image.

	0.1	0.5	0.65	0.95	0.3	0.7)
$car = {$	truck +	cycle +	boat <sup>+</sup>	car +	house 1	cart}
truck -	<u> </u>	0.45	0.6	0.2	0.5	(0.3)
<i>li uck –</i>	truck	<sup>+</sup> cycle	<sup>+</sup> boat	$\overline{car}$	<sup>+</sup> house	<sup>+</sup> cart∫

Using Zadeh's notation Evaluate  $\lambda$ -cut sets for the following expressions: (car U truck), (car  $\cap$  truck), car', truck'; Assume  $\lambda$ =0.4

5A.	Using genetic algorithm, find the maximum value of the given function $y=e^{-(x-3)^2}$ where $1 < x < 5$ using 5 bit binary string. The initial population given are $[1 \ 0 \ 0 \ 0 \ 1]$ , $[0 \ 0 \ 1 \ 1 \ 0]$ ,	
	[1 0 1 0 0],[0 1 0 1 1]. Perform two iterations.	(05)
5B.	Compare traditional algorithms and genetic algorithms with the help of a real-time example.	(03)
5C.	List the limitations of neural networks and fuzzy systems when operated individually.	(02)

(05)

(02)