Reg. No.



VII SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, DECEMBER 2023

SOFT COMPUTING TECHNIQUES [ELE 4062]

REVISED CREDIT SYSTEM

| Time: 3 Hours | | | | | | Max. Marks: 50 | | | |
|---------------|--|-------|---------|----------|--------|--|-------|--|--|
| Instruc | tions | to C | andida | ates: | | | | | |
| | ✤ Answer ALL the questions. | | | | | | | | |
| | ✤ M | issin | g data | may be | e suit | ably assumed. | | | |
| | | | | | | | | | |
| 1A. | Why do Neural Networks need activation functions? Discuss with suitable examples. (02) | | | | | | | | |
| 1B. | Construct and test a bidirectional associative network to associate letters E and F with simple bipolar input–output vectors. The target output for E is (–1, 1) and for F is (1, 1). The display matrix size is as shown. | | | | | | | | |
| | * | * | * | * | * | * | | | |
| | * | • | • | * | * | * | | | |
| | * | * | * | * | • | • | | | |
| | * | • | • | * | • | • | | | |
| | * | * | * | * | • | • | | | |
| | "E" | | "F" | | | (05) | | | |
| 10 | Δli | nguig | tic var | iahle Δ(| SF de | scribed in a universe of discourse [1:70] has linguistic v | alues | | |

- **1C.** A linguistic variable AGE described in a universe of discourse [1:70] has linguistic values child, young, middle age, and old. Obtain suitable triangular membership function for each linguistic value. Develop expressions for the same. According to this, determine the category in which you fall and what is the corresponding membership value.
- **2A.** Develop multiple adaptive neural network model for the given network. Inputs and target as given below. Perform one epoch. Assume $\alpha = 0.5$.

| X ₁ | X ₂ | 1 | t |
|-----------------------|----------------|---|----|
| 1 | 1 | 1 | -1 |
| 1 | -1 | 1 | 1 |
| -1 | 1 | 1 | 1 |
| -1 | -1 | 1 | -1 |

The activation function is bipolar and is as given below.



(03)

2B. What is the effect of bias on output in Artificial neural networks? Introduce the bias input and vary the bias weight from 0 to 1 and plot the variation of output against bias weight.



(02)

2C. Determine the output of the neuron Y for the network shown using activation functions as: (i) binary sigmoidal and (ii) bipolar sigmoidal.



(03)

(02)

3A. It is required to recognize English alphabetic characters (F, E, X, Y, I, T) in an image processing system. The two Fuzzy sets are A={(F,0.4),(E,0.3),(X,0.1),(Y,0.1),(I,0.9),(T,0.8)}; B={(F,0.99),(E,0.8),(X,0.1),(Y,0.2),(I,0.5),(T,0.5)}

Determine the following.

i) AUB ii) A-B iii)A' iv)A Π B

v) Verify DeMorgan's law

3B. In metallurgy, materials are made with mixtures of various metals and other elements to achieve certain desirable properties. In a particular preparation of steel, three elements, namely iron, manganese, and carbon, are mixed in two different proportions. The samples obtained from these two different proportions are placed on a normalized scale, as shown below and are represented as fuzzy sets A₁ and A₂. Determine the defuzzified value, *z* using centroid method to obtain the average steel proportion.



3C Develop membership function and rule base to generate the function y=cosx using fuzzy logic. (03)

- 4A. Consider a set of 4 variables of Jasmine plants, P={(j1,0.2),(j2,0.7),(j3,0.4),(j4,0.6)}; set of 4 diseases affecting the plants
 D={(d1,0.5),(d2,0.6),(d3,0.8),(d4,0.2)} and set of common symptoms of the diseases S={(s1,0.2),(s2,0.7),(s3,0.4),(s4,0.6)}. Formulate the relation between plants and disease, diseases and symptoms. Also, obtain the association of the plants with the different symptoms of the diseases using max-min composition.
- **4B** Consider the design of a fuzzy controller to decide the tip to be given to the hotel server based on the food quality and service quality. Use 3 descriptors for the inputs and output variables. Create a set of rules for controller action and get the defuzzified values. The descriptors are

Food quality: rancid, average, delicious Service quality: poor, good, excellent Tips to be given: low (0-15%), average (10-20%), good (15-30%) [of the bill amount] Determine the tip to be given if the food is delicious and service is poor.

(05)

(03)

| Focal elements | m(.) |
|-------------------|------|
| Р | 0.02 |
| В | 0.02 |
| E | 0.02 |
| PUB | 0.2 |
| PUE | 0.2 |
| BUE | 0.2 |
| PUBUE | 0.6 |

4C. Using the data given determine the fuzzy belief measure bel (P U B U E)

- Discuss the following terms with respect to soft computing. 5A. (03) i) alpha cut ii) fitness ii) winner take all Using the Genetic Algorithm find the maximum value of the given function $y=e^{-(x-3)^{n/2}}$ 5B. 5-bit The where1<x<5 using binary string. initial population:[10001],[00110],[10100][01011]. Perform cross-over after 2nd and 4th bits. The mutation chromosome is [00100]. Determine the average fitness after two iterations. (05)
- 5C. How can genetic algorithms be used in real-world problems such as engineering, finance, or healthcare? (02)

(02)