

B.E. COMPUTER SCIENCE AND ENGINEERING FOURTH YEAR SECOND SEMESTER -2018

Subject : SOFT COMPUTING

Time: 3 hours

Full marks:100

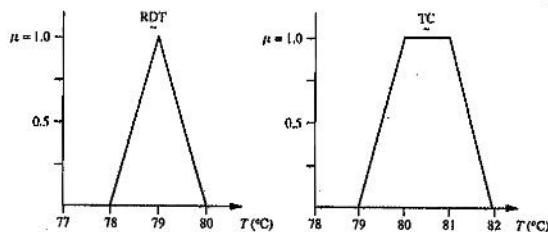
Answer all questions

1. a. What do you mean by Fuzzy Inference system? 4
- b. Using your own intuition, develop fuzzy membership functions on the real line for the fuzzy number "approximately 6 to approximately 8" using the following function shapes: 6
- (a) symmetric triangles
(b) trapezoids
(c) Gaussian functions.
- c. i. The results of a price survey for 30 automobiles is presented here: 10
- | Class | Automobile prices (in units of \$1000) |
|---------|--|
| Economy | 5.5, 5.8, 7.5, 7.9, 8.2, 8.5, 9.2, 10.4, 11.2, 13.5 |
| Midsize | 11.9, 12.5, 13.2, 14.9, 15.6, 17.8, 18.2, 19.5, 20.5, 24.0 |
| Luxury | 22.0, 23.5, 25.0, 26.0, 27.5, 29.0, 32.0, 37.0, 43.0, 47.5 |

Consider the automobile prices as a variable and the classes as economy, midsize, and luxury. Develop three membership function envelopes for car prices using the method of inductive reasoning.

OR

ii. Often, in chemical processing plants, there will be more than one types of instruments measuring the same variable at the same instant during the process. Owing to the nature of measurements, they are almost never exact, and hence can be represented as a fuzzy set. Owing to the differences in instruments, the measurements will usually not be the same. Take, for example, two types of temperature sensors, namely, a thermocouple (TC) and a resistance temperature detector (RTD) measuring the same stream temperature. The membership function of the two types of temperature sensors may look as in following Figure.



When an operator who prefers one measuring device ends his or her shift, and then is replaced by another operator with a different preference in measuring device, there may be a problem in determining the actual value of a variable. To avoid this problem, it was decided to plot the membership functions of the two types of sensors, take their union, and employ defuzzification to select one temperature irrespective of the measuring device. To find this temperature, calculate the defuzzified value, z^* using centroid, center of sums and weighted average method.

2. a. Can GA assures the optimum solution?—give your opinion with proper justification 5
- b. What are the pros and cons of truncation selection scheme? Describe with appropriate algorithm. 5
- c. How do you use Genetic algorithm or Simulated annealing for selection of optimum features from a set of feature? Describe any one with appropriate example. 10
3. a. What is the difference between Incremental mode and Batch mode gradient descent search? 4
- b. How do you solve EX-NOR problem using Multilayer perceptron? 6
- c. What are the advantages of a sigmoid function as the activation function over a hard limiting function? 2
- d. What is the utility of back-propagation algorithm? Derive the necessary formula for back-propagation algorithm in multilayer perceptron? 8
4. a. What do you mean by Rough Membership Function? What is the significance of it? 4
- b. What are the advantages and disadvantages of rough set based approach? 3
- c. What do you mean by deterministic and non-deterministic rules? 3
- d. i. What is Indiscernibility in rough set? What is Discernibility matrix? Develop the Discernibility matrix from the following decision table? 4+

	<i>Diploma</i>	<i>Experience</i>	<i>French</i>	<i>Reference</i>	<i>Decision</i>
x_1	MBA	Medium	Yes	Excellent	Accept
x_4	MSc	High	Yes	Neutral	Accept
x_6	MSc	High	Yes	Excellent	Accept
x_7	MBA	High	No	Good	Accept
x_2	MBA	Low	Yes	Neutral	Reject
x_3	MCE	Low	Yes	Good	Reject
x_5	MSc	Medium	Yes	Neutral	Reject
x_8	MCE	Low	No	Excellent	Reject

OR

- ii. What do you mean by approximate inference? Explain with proper example. 5+
- What is Bayesian network? Develop a Bayesian network with appropriate example. 5

5. a. How is soft partitioning related to fuzzy membership value? 3
- b. What are the fundamental differences between Mamdani and Sugeno fuzzy inference system? Explain with proper example. 7
- c. i. A radar image of a vehicle is a mapping of the bright (most reflective) parts of it. Suppose we have a radar image that we know contains two vehicles parked close together. The threshold on the instrument has been set such that the image contains seven bright dots. We wish to classify the dots as belonging to one or the other vehicle with a fuzzy membership before we conduct a recognition of the vehicle type. The seven bright dots are arranged in a matrix X, and we seek to find an optimum membership matrix U^* . The features defining each of the seven dots are given here: 10

2	9	9	5	8	5	6
7	3	4	6	8	11	1

Start the calculation with the following initial 2-partition:

$$U^0 = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Find the converged optimal 2-partition. (Use $m = 2.0$ and $\epsilon \leq 0.01$.)

OR

- ii. Develop a model for object recognition system using Fuzzy, Neural network and Hill climbing approach. Mention every steps clearly for that.