BACHELOR OF ENGINEERING IN INFORMATION TECHNOLOGY

3rd YEAR 2nd SEMESTER, SEMESTER EXAMINATION, 2022

SUBJECT NAME: SOFT COMPUTING (IT/PE/H/T/325A)

FULL MARKS=100

CO1 [20]

Q1.

(a) State the difference between fuzzy set and probabilities with a suitable example.

(b) State whether the following statement is true or false with proper justification

"De-Morgan's-law does not apply to fuzzy sets."

(c) Find out the Cartesian product of two fuzzy set A and B are given below.

$$A = \frac{0.6}{x1} + \frac{0.8}{x2} + \frac{0.3}{x3} \quad \text{And} \quad B = \frac{0.6}{x1} + \frac{0.2}{x3}$$

[(3+4+3)=10]

Q2.

Let A be a fuzzy variable of slow speed and B be a fuzzy variable of recording rate.

$$A = \frac{0.9}{\text{slow}} + \frac{0.8}{\text{medium}} + \frac{0.6}{\text{fast}} \qquad B = \frac{1.0}{\text{PRR}} + \frac{0.8}{\text{MRR}} + \frac{0.5}{\text{GRR}}$$

Where PRR-poor recording rate, MRR-medium recording rate and GRR-good recording rate.

(a) Calculate the relation R: If x is A then y is B. i.e (A→B) using Mamdani Implication.

(b) Let another fuzzy variable "very fast" as $A1 = \frac{0.1}{\text{slow}} + \frac{0.5}{\text{medium}} + \frac{1.0}{\text{fast}}$.

Find the new consequent B1=A1∘ R using max-product composition. [(5+5)=10]

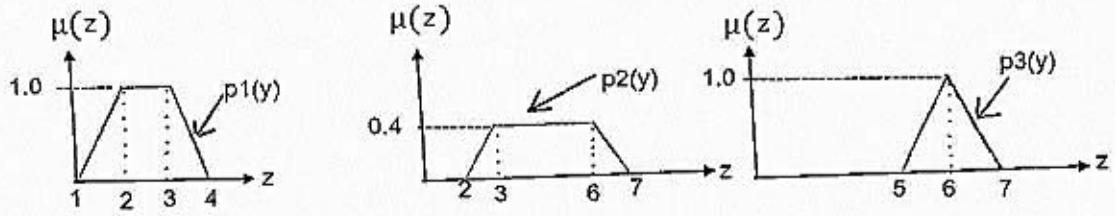
CO2 [20]

Q3. Answer any one either (b) or (c)

(a) State whether the following statements is true or false with proper justification :

"All defuzzification method lead to the same crisp result."

(b) The results of 3 implications process given below. Find the aggregated output and the Defuzzified output using the **center of sums** method.



OR

(c) Suggest a design for a fuzzy control system for selecting a class representative (CR). Explain step by step properly. [(5+15)=20]

CO3 [20]	**Q4.** (a) What two requirements should a problem satisfy in order to be suitable for solving it by a Genetic Algorithms (GA)? (b) Name and describe the main features of Genetic Algorithms (GA). (c) Describe how genetic algorithms differ from other optimization and search algorithms. [(5+8+7)=20]
CO4 [20]	**Q5.** (a) Highlight two major problems that are required to handle in MOEA (Multi-objective evolutionary algorithm). (b) Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between KOLKATA and DELHI is represented by a single gene 'KD'. Let also assume that the direction in which we travel is not important so that KD = DK. (i) How many genes will be used in a chromosome of each individual if the number of cities is 20? (ii) How many genes will be in the alphabet of the algorithm? [(5+7+8)=20]
CO5 [20]	**Q6.** (a) Explain how **ant colony optimization** is implemented for solving any problem? (b) Explain the advantages and disadvantages of a **Fuzzy-evolutionary hybrid** system with a suitable example. [(10+10)=20]

CO1: Explain and **discuss** concepts of fuzzy logic and fuzzy arithmetic. (K2)

CO2: Design and **demonstrate** Fuzzy Logic based Controllers. (A3)

CO3: Interpret and **apply** Genetic Algorithms to Solve Classical problems. (K3)

CO4: Choose and **apply** Evolutionary Algorithms for solving real life problems.(K3)

CO5: Explain uses of Bio- inspired optimization Algorithms and **Contrast** with some hybrid approaches. (K2)