GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021

Subject Code:3160619   **Date:30/11/2021**
Subject Name:Soft Computing Techniques
Time:10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Q.1	**(a)**	What is soft computing? How Soft computing differ from the Hard Computing?	**03**
	(b)	Describe the importance of fuzzy sets and its application in civil engineering sector.	**04**
	(c)	With respect to ANN discuss the various types of learning.	**07**
Q.2	**(a)**	With suitable example show the operations on fuzzy sets – Union, Intersection and Subtraction.	**03**
	(b)	What is membership function? Draw the various membership functions of fuzzy sets with a suitable mathematical formula.	**04**
	(c)	For the two given fuzzy sets $\tilde{A}$ and $\tilde{B}$ as follows:	**07**

$$\tilde{A} = \left\{\frac{0.2}{x1} + \frac{0.3}{x2} + \frac{1}{x3} + \frac{0.1}{x4} + \frac{0.5}{x5}\right\} \text{ and } \tilde{B} = \left\{\frac{0.1}{x1} + \frac{0.25}{x2} + \frac{0.9}{x3} + \frac{1}{x4} + \frac{0.5}{x5}\right\}$$

Find (i) $\bar{\tilde{A}}$ (ii) $\tilde{A} \cap \tilde{B}$ (iii) $\overline{\tilde{A} \cup \tilde{B}}$ (iv) $\tilde{A}/\tilde{B}$ (v) $\tilde{A} + \tilde{B}$ (vi) $\tilde{A} \bullet \tilde{B}$ (vii) $\tilde{A} \oplus \tilde{B}$

OR

	(c)	For an aircraft simulator data the determination of certain changes in its operating conditions is made on the basis of hard break points in the match region. Let fuzzy set $\tilde{A}$ and fuzzy set $\tilde{B}$ represent as:	**07**

$$\tilde{A} = near\ match\ 0.65 = \left\{\frac{0}{0.64} + \frac{0.75}{0.645} + \frac{1}{0.65} + \frac{0.5}{0.655} + \frac{0}{0.66}\right\} \text{ and}$$

$$\tilde{B} = in\ the\ region\ of\ match\ 0.65 = \left\{\frac{0}{0.64} + \frac{0.25}{0.645} + \frac{0.75}{0.65} + \frac{1}{0.655} + \frac{0.5}{0.66}\right\}.$$

Find (i) $\bar{\tilde{A}}$ (ii) $\tilde{A} \cap \tilde{B}$ (iii) $\overline{\tilde{A} \cup \tilde{B}}$ (iv) $\tilde{A}/\tilde{B}$ (v) $\tilde{A} + \tilde{B}$ (vi) $\tilde{A} \bullet \tilde{B}$ (vii) $\tilde{A} \oplus \tilde{B}$

Q.3	**(a)**	Compare the classical relation versus fuzzy relation.	**03**
	(b)	With suitable example, explain how membership function assignment is performed using intution.	**04**
	(c)	Consider two fuzzy relations R1 and R2 on $X \times Y$ and $Y \times Z$ respectively, where $X = \{a, b, c\}$, $Y = \{1,2,3,4\}$ and $Z = \{\alpha, \beta\}$. Assume R1 and R2 can be expressed as the following relation	**07**

$$\tilde{R}_1 = \begin{bmatrix} 0.2 & 0.6 & 0.8 & 0.9 \\ 0.5 & 0.1 & 0.6 & 0.4 \\ 0.7 & 0.3 & 0.2 & 0.7 \end{bmatrix} \text{ and } \tilde{R}_2 = \begin{bmatrix} 0.6 & 0.2 \\ 0.3 & 0.7 \\ 0.4 & 0.9 \\ 0.8 & 0.5 \end{bmatrix}$$

Calculate the fuzzy *max-min*, and *max- prod* composition between two fuzzy relations.

OR

Q.3 **(a)** What is defuzzification? List out various methods of defuzzification. Explain any one method of defuzzification in details. **03**

(b) Write a short note on Mamdani FIS for the formation of inference rules. **04**

(c) For the logical union of the membership functions shown below Figure (a) and (b), find the defuzzified value x^* using centroid method. **07**
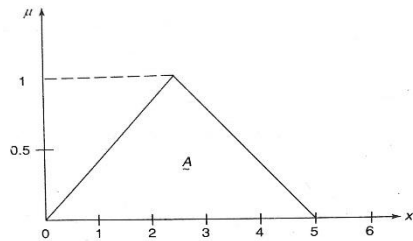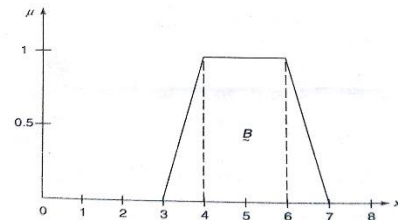

Figure (a)   Figure (b)

Q.4 **(a)** List out and explain the different types of activation functions used in ANN's. **03**

(b) Write short note on biological neuron. **04**

(c) Realize the Mc-Culloch-Pitts neuron model for AND gate (take binary data). **07**

OR

Q.4 **(a)** Classify the biological and the artificial neuron. **03**

(b) With the flow chart explain the training process of Perceptron network. **04**

(c) Realize AND function using perceptron network for bipolar inputs and targets. **07**

Q.5 **(a)** State the importance of Genetic algorithm. **03**

(b) Define: Crossover and Mutation **04**

(c) How are data represented in genetic programming? **07**

OR

Q.5 **(a)** What is hybrid systems? List the various types of hybrid systems. **03**

(b) Write a short note on fuzzy neural system. **04**

(c) With the help of block diagram and flow chart, explain the one application of neural network in civil engineering. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3160619   **Date:06/06/2022**
Subject Name:Soft Computing Techniques
Time:10:30 AM TO 01:00 PM   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Differentiate "Soft" computing versus "Hard" computing.	03
	(b)	What is fuzzy set and membership function?.	04
	(c)	Describe characteristics of soft computing and give any two example of soft computing in civil engineering.	07
Q.2	**(a)**	Define support, core and normality terminology.	03
	(b)	Explain union and intersection operation with example.	04
	(c)	Explain application of fuzzy logic in civil engineering and day to day practice.	07

OR

	(c)	Give crisp set A ={1,2,3,4} find the relation matrix for the relation R= {(a,b)/b=a+1, a,b ∈ A } and S= {(a,b)/b=a+2, a,b ∈ A } and also find R U S , R∩S , compliment of R.	07
Q.3	**(a)**	Define genetic algorithm and its application.	03
	(b)	What is defuzzification and enlist different defuzzification Techniques?	04
	(c)	Derive R·S (max. min. composition) for x and y = {1,3,5} and relation matrix R={(x,y)/ y=(x+2)}, S={(x,y)/ x<y} here R and S is x $\times$ y.	07

OR

Q.3	**(a)**	Explain basic GA. Framework.	03
	(b)	Enlist simple genetic algorithm parameter and its features.	04
	(c)	Determine a fitness value of a function $f(x,y) = (x-6)^2 + (y-3)^2$ for a string 110010,000100,100001 having string length of first 3 bits for X and remaining 3 bits are for Y.	07
Q.4	**(a)**	Differentiate artificial neural network and biological neural network.	03
	(b)	Describe biological and it's working.	04
	(c)	Explain crossover and mutation in detail	07

OR

Q.4	**(a)**	Explain chromosomes ,gene, and allele in brief.	03
	(b)	Enlist the step for solving problem using GA in MATLAB.	04
	(c)	Explain different ANN architectures.	07
Q.5	**(a)**	Explain ANN and enlist the element of neural network.	03
	(b)	What are the advantages of hybrid systems?	04
	(c)	Explain genetic neural system in detail.	07

OR

Q.5	**(a)**	What do you mean by hybrid system in Soft computing	03
	(b)	Give the advantages of ANN.	04
	(c)	Describe fuzzy neural system with its working flow advantages and disadvantages.	07

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