



**NAVVRACHANA  
UNIVERSITY**

a UGC recognized University

**School:** School of Engineering and Technology  
**Program/s:** BSc ( Data Science )  
**Year:** 3<sup>rd</sup> **Semester:** V  
**Examination:** End Semester Examination  
**Examination year:** December - 2021

**Course Code:** DS303 **Course Name:** Soft Computing  
**Date:** 6/12/2021  
**Time:** 11:30 am to 1:30 pm

**Total Marks:** 40  
**Total Pages:** 2

**Instructions:**

- Write each answer on a new page.
- Use of a calculator is permitted.
- Draw all relevant waveforms in answer sheet only.
- \*COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping

Q. No.	Details	Marks	COs*	BTL#
Q.1(a)	<p><b>Answer in short:</b></p> <p>(i) Every crisp set can be regarded as a fuzzy set. ( True / False )</p> <p>(ii) Universal set is a ____ set. ( fuzzy / crisp )</p> <p>(iii) Give one real example of conditional and unqualified fuzzy proposition. Justify.</p> <p>(iv) Modus Ponens is a _____. ( tautology / contradiction )</p> <p>(v) Fuzzy quantifier "almost all" is a fuzzy set defined on [0,1]. ( True / False )</p>	5	CO1	BT1, BT2
Q.1(b)	<p><b>Attempt Any Three:</b></p> <p>(i) Define the terms: Fuzzy sets, Height of fuzzy sets , Normal fuzzy sets</p> <p>(ii) Consider two fuzzy subsets of the set <math>X, X = \{a, b, c, d, e\}</math> referred to as <math>A</math> and <math>B</math>,  <math>A = \{1/a, 0.3/b, 0.2/c, 0.8/d, 0/e\}</math> and <math>B = \{0.6/a, 0.9/b, 0.1/c, 0.3/d, 0.2/e\}</math>. Find height of fuzzy sets <math>A</math> and <math>B</math>. Check whether <math>A</math> and <math>B</math> are normal fuzzy sets or not.</p> <p>(iii) Explain in detail the different kinds of Fuzzy quantifiers given in Fuzzy logic.</p> <p>(iv) Find fuzzy union, intersection and complement of following two fuzzy sets. Draw membership function of each concept.  <math>A(x) = (x + 1) / 3</math>, for <math>-1 &lt; x &lt; 2</math>  <math>= (5 - x) / 3</math>, for <math>2 \leq x &lt; 5</math>  <math>= 0</math>, for <math>x \leq -1</math> and <math>x \geq 5</math> and</p> $B(x) = (x - 1) / 2$ , for $1 < x < 3$ $= (5 - x) / 2$ , for $3 \leq x < 5$ $= 0$ , for $x \leq 1$ and $x \geq 5$ .	15	CO1, CO2	BT1, BT2, BT5

<b>Q.2(a)</b>	<b>Answer in short:</b> (i) Genetic Algorithm is a non-traditional optimization method. ( True / False ) (ii) In genetic algorithm, data are given in terms of _____. (bit strings / real numbers) (iii) Name one of the method for reproduction operation. (iv) The new mating pool is generated during _____. ( reproduction / crossover ) (v) Which built-in function in Octave can solve the problem using genetic algorithm?	<b>5</b>	CO2	BT1, BT2
<b>Q.2(b)</b>	<b>Attempt Any Three:</b>  (i) Suppose there are five people in a women's figure skating competition. They are Anny, Bonnie, Cathy, Diana, and Eve. Assume that their relative goodness of performance is given by a fuzzy set  $E = 1/Army + .9/Bonnie + .5/Cathy + .9/Diana + .1/Eve.$  Using the fuzzy quantifier "About Half", determine the truth value of the fuzzy proposition, "About half of them have good performance".  (ii) Name and explain three main operators of the genetic algorithm.  (iii) Explain the three forms of Tautologies which are used for making deductive inferences in Fuzzy logic. Consider the fuzzy proposition p : If X is A, then Y is B as a rule , $A = 0.6 / x_1 + 1 / x_2 + 0.9 / x_3$ , $B = 0.6 / y_1 + 1 / y_2$ . Given a fact "X is A' ", where $A' = 0.5 / x_1 + 0.9 / x_2 + 1 / x_3$ . Using the generalized modus ponens derive a conclusion in the form: "Y is B' ". Use fuzzy implication $J(a,b) = \min(1, a - b + 1)$ .  (iv) Consider an air-conditioning fuzzy control system. Using the various steps involved in the fuzzy control system, generate reasonable fuzzy inference rules and find speed of motor if temperature is 63 degree.	<b>15</b>	CO3, CO4	BT2, BT3, BT5

\*\*\*\*\*End of Question Paper\*\*\*\*\*