

PG CBCS
M.SC. Semester-IV Examination, 2021
(MATHEMATICS)
PAPER: MTM-402
(FUZZY MATHEMATICS WITH APPLICATIONS & SOFT COMPUTING)

Full Marks: 40**Time: 2 Hours****Write the answers of each unit in separate sheets****UNIT- 402.1****(FUZZY MATHEMATICS WITH APPLICATIONS)**

Answer any TWO questions from the following: **2×10=20**

1. (a) Using subtraction rule of fuzzy number to prove that $9-5=4$.
 (b) Define α – cut of the fuzzy number.
 (c) State resolution principle for fuzzy set. 5+2+3
2. (a) Discuss fuzzy sets concept with proper example.
 (b) Prove that $[a_1, b_1, c_1, d_1] + [a_2, b_2, c_2, d_2] = [a_1 + a_2, b_1 + b_2, c_1 + c_2, d_1 + d_2]$, where $[a, b, c, d]$ is a trapezoidal fuzzy number. 3+7
3. (a) Is every fuzzy set is a fuzzy number? Discuss properly.
 (b) In the context of fuzzy sets prove that $[a, b] - [a, b] \neq [0, 0]$.
 (c) Simplify the following fuzzy expressions:
 I. $8[-4, 0, 1, 3] - 5[-3, 1, 7] + 3[-10, 5] - 11$
 II. $[-1, 1, 7] - 4[-1, 5] + 17$ 3+3+4
4. (a) In the context of fuzzy arithmetic prove that $[3, 5] + [4, 6] = [7, 11]$.
 (b) Define symmetric fuzzy linear programming problem.
 (c) Define convex fuzzy set. 5+3+2

UNIT- 402.2**(SOFT COMPUTING)**

Answer any TWO questions from the following: **2×10=20**

5. (a) Write down the features of soft computing.
 (b) Maximize $f(x) = 4 + 10x - x^2$, $1 \leq x \leq 9$ using binary coded GA. Given that population size $N = 5$, initial population $x_1 = 10111, x_2 = 10101, x_3 = 11100, x_4 = 11101, x_5 = 10100$. Random numbers for selection: 0.19, 0.63, 0.97, 0.11, 0.70. Cross-over probability, $P_c = 0.8$ and random numbers for cross-over: 0.60, 0.85, 0.57, 0.37, 0.70.

[P.T.O]

[2]

Mutation probability, $P_m = 0.04$ and random numbers for mutation
 0.21, 0.37, 0.02, 0.52, 0.07, 0.97, 0.14, 0.61, 0.17, 0.09, 0.03, 0.82,
 0.08, 0.21, 0.37, 0.20, 0.25, 0.72, 0.24, 0.16, 0.47, 0.58, 0.49, 0.01,
 0.18. (One iteration only) 2+8

6. (a) Write a short note on Fuzzy logic.
 (b) Perform the selection procedure of the following Binary Coded
 GA:

$$\text{Maximize } f(x) = \sqrt{x}, \quad 0 \leq x \leq 25.$$

Given that population size, $N=5$; Initial population, 11001, 01111,
 01011, 10001, 11001; random numbers for selection, 0.67, 0.11,
 0.83, 0.31, 0.54.

- (c) Write a short note on Hard computing. 3+5+2

7. (a) Mention the ranges of different GA parameters.
 (b) Using the perceptron learning rule, find the weights required to find
 the following classification:

$\{(1, 1, 1), 0\}, \{(-1, 1, 1), 0\}, \{(-1, -1, 1), 1\}, \{(-1, -1, -1), 1\}\}.$

2+8

8. (a) Write down the drawbacks of traditional optimization techniques.
 (b) Write a short note on penalty function method.
 (c) Draw the working cycle of GA. 4+3+3
