



বিদ্যাসাগর বিশ্ববিদ্যালয়

**VIDYASAGAR UNIVERSITY**

**M.Sc. Examinations 2020**

**Semester IV**

**Subject: APPLIED MATHEMATICS WITH OCEANOLOGY AND  
COMPUTER PROGRAMMING**

**Paper: MTM 402  
(Theory)**

**Full Marks: 40**

**Time: 2hrs.**

*Candidates are required to give their answers in their  
own words as far as practicable.*

**Unit-01**

**Paper: MTM-402 (Fuzzy Mathematics with Applications)**

*Answer any **One** of the following questions*

- (a) Define different arithmetic operations on Interval numbers.  
(b) Describe the concept of uncertainty with mentioning the sources from these arise.
- (a) Define fuzzy set. Write three real life fuzzy sets and find their  $\alpha$ -cut, where  $\alpha = 0.4$ .  
(b) Prove that distribution law for fuzzy sets is true.
- (a) Using Zadeh's Extension principle, prove that  $[3, 7] - 2 = [1, 5]$ .  
(b) Explain, why multiplication of two triangular fuzzy numbers is not a triangular fuzzy number.
- (a) Show that  $(3, 9, 11, 17) - (1, 3, 5, 7) = (-4, 4, 8, 16)$ .  
(b) Give the examples of two fuzzy sets of which one is convex and other is non-convex.
- (a) Describe different types of fuzzy LPP and write corresponding methods names of solving them.  
(b) Explain Werner's method to convert fuzzy LPP to crisp LPP.



6. (a) Using Zimmermann's method convert the following fuzzy LPP to corresponding crisp LPP

$$\begin{aligned} \widetilde{Max} \quad Z &= x_1 + 2x_2 \\ s. t. \quad -x_1 + 5x_2 &\lesssim 21 \\ 4x_1 + 3x_2 &\lesssim 31 \\ 3x_1 + 2x_2 &\lesssim 41 \\ x_1, x_2 &\geq 0 \end{aligned}$$

Given that the aspiration level  $z_0$  and tolerance levels  $p_i$  as  $z_0 = 21.5, p_0 = 5, p_1 = 3, p_2 = 4, p_3 = 7$ .

(b) Derive the crisp LPP from multi-objective fuzzy LPP with triangular fuzzy parameters.

## Unit-02

### Paper: MTM-402 (Soft Computing)

Answer any **One** of the following questions

7. (a) Describe shortly the scope of applications of soft computing techniques in different fields.

(b) Write Short note on: Hybrid Computing, Biological Neural Network.

8. (a) Write different learning rules with their mathematical expression which are used to update the parameters in ANN.

(b) Realize the function  $F(x_1, x_2) = x_1'x_2 + x_1x_2'$  using McCulloch-Pitts neuron model.

9. (a) Explain with an example the limitation of Hebb training rule for bipolar patterns.

(b) Write the algorithm of perceptron neural network for several output classes.

10. (a) Write shortly the procedure of Real Coded GA.

(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; and random numbers for selection, 0.67, 0.11, 0.83, 0.31, 0.54.

11. (a) Describe the limitations of Binary Coded GA with appropriate examples.

(b) Explain the different structure of decomposition of fuzzy rules.

12. (a) Write different fuzzy inferences with their mathematical formulas.

(b) Describe the Mamdani's fuzzy inference method.