**A–0833**

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# MCS-E2

# INTRODUCTION TO SOFT COMPUTING

**(MCA)**

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

***Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

## Section–A

**Long Answer Type Questions** 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Describe the principles of Fuzzy Logic. How does Fuzzy Logic handle uncertainty and imprecision ? Provide practical examples of Fuzzy Logic in real-life systems.

2. What is the significance of fuzzy relations in decision-making and multi-criteria decision analysis (MCDA) ? Discuss how fuzzy relations can be applied in MCDA models, including examples.

3. Explain the process of Selection in Genetic Algorithms. Describe different selection methods, focusing on the "Roulette Wheel Selection" and "Tournament Selection" techniques. Discuss the advantages and disadvantages of each method.

4. Discuss the Pareto-based approaches in Multi-Objective Evolutionary Algorithms (MOEA). Explain how Pareto-based methods work and the concept of Pareto optimality. Compare their advantages and disadvantages to Non-Pareto-based methods.

5. Discuss the role of optimization algorithms in training an Artificial Neural Network (ANN). Explain the working of Gradient Descent, Stochastic Gradient Descent (SGD), and Adam, highlighting their advantages and disadvantages.

## Section–B

**Short Answer Type Questions** 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Define Soft Computing. List the key components of Soft Computing and briefly describe the role of each.

2. Explain the concept of fuzziness in Soft Computing and how it is handled by Fuzzy Logic.

3. What is a fuzzy logic controller (FLC), and how does it differ from a traditional control system ?

4. Explain the concept of union and intersection in fuzzy sets. How are they defined ?

5. Describe the concept of Crossover-I in Genetic Algorithms. What is the role of crossover in GA, and how does one-point crossover work ? Explain with an example.

6. Explain the different types of mutation operators and their effects on the GA process. Discuss the advantages and disadvantages of mutation.

7. Provide an introduction to Evolutionary Computation II (EC-II). Explain its applications in real-world optimization problems.

8. Discuss the basic concepts of Artificial Neural Networks (ANN). Explain the key challenges involved in training an ANN.

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