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Total Number of Pages: 02

Course: M.Sc.I
Sub_Code: FBEF911

9th Semester Regular Examination: 2024-25

SUBJECT: SOFT COMPUTING

BRANCH(S): M.SC.I (MC)

Time: 3 Hours

Max Marks: 70

Q.Code: R219

Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: **(2 x 10)**

- a) List the main characteristics of soft computing techniques.
- b) Define soft computing and how it differs from hard computing.
- c) How does the concept of parallelism benefit neural networks?
- d) What is a membership function in fuzzy logic?
- e) Define a fuzzy set and give an example.
- f) List the basic operations on fuzzy sets.
- g) How does fuzzy logic handle uncertainty compare to classical logic?
- h) What is meant by convergence in genetic algorithms?
- i) What is the purpose of the "mutation rate" in genetic algorithms?
- j) How does elitism improve the convergence speed and solution quality of genetic algorithms?

Part-II

Long Answer Type Questions (Answer Any five)

- Q2**
- a) Explain the working of a biological neuron and how it is simulated in artificial neural networks. **(5+5)**
 - b) Discuss the different architectures of artificial neural networks with suitable diagrams.
- Q3**
- a) Describe the training techniques for ANNs and their significance in problem-solving. **(5+5)**
 - b) Explain how ANNs can be applied to solve real-world problems with suitable examples.
- Q4**
- a) Explain fuzzy relations, fuzzy propositions, and their roles in decision-making systems. **(5+5)**
 - b) Describe the process of designing a fuzzy logic controller with an example.

- Q5** Discuss the various defuzzification techniques used in fuzzy systems. How can fuzzy logic be applied to control systems? Explain with a detailed example. **(10)**
- Q6** a) Explain the basic framework of a genetic algorithm and its working with an example. **(5+5)**
b) Describe the role of selection, crossover, and mutation in genetic algorithms.
- Q7** Describe the differences between Pareto-based approaches and non-Pareto approaches to solving multi-objective optimization problems. Give examples of each approach and discuss their advantages and disadvantages. **(10)**
- Q8** Explain the concept of multi-objective optimization problems (MOOPs). Discuss the challenges involved in solving these problems. **(10)**