Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**
Sub_Code: RCS7D007

7th Semester Regular/Back Examination: 2024-25
SUBJECT: SOFT COMPUTING
BRANCH(S): AEIE, CIVIL, EEE, ELECTRICAL, ECE, ETC, ENV, MECH, METTA, MINING
Time: 3 Hours
Max Marks: 100
Q.Code: R367
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

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

a) What are fuzzy relations? Give an example.
b) What is defuzzification? State its purpose in fuzzy logic.
c) What is the difference between a crisp set and a fuzzy set?
d) Define a single-layer neural network and its basic structure.
e) What is the purpose of weight learning in neural networks?
f) Differentiate between a single-layer and a multi-layer perceptron.
g) What is evolutionary programming? How does it differ from genetic algorithms?
h) What is elitism in genetic algorithms, and why is it important?
i) Define the term "fitness landscape" in the context of evolutionary algorithms.
j) What are the advantages of using genetic algorithms for solving optimization problems?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) What are the basic operations of a fuzzy set? Explain with examples.
b) Describe the process of fuzzy logic control and its application in real-world systems.
c) Discuss Zadeh's compositional rule of inference in fuzzy systems.
d) Explain the concept of fuzzy inference and its role in fuzzy logic systems.
e) Explain the working of the Perceptron algorithm. What are its limitations?
f) Discuss the generalized delta rule and its significance in neural network training.
g) What are Kohonen self-organizing maps (SOMs)? Explain their working and applications.
h) Explain the architecture and working of adaptive neuro-fuzzy inference systems (ANFIS).
i) Discuss the working of the simulated annealing algorithm. Explain its key components, such as temperature control, acceptance probability, and cooling schedule, with an example.

j) Describe the process of acceptance probability in simulated annealing. Explain how the probability function helps avoid local optima and improve the search for global optima.

k) Explain the integration of local search methods with genetic algorithms. How does the inclusion of a local search mechanism help in enhancing the performance of the genetic algorithm?

l) Explain the differences between genetic algorithms and genetic programming. Discuss their respective applications and how they are used to solve different optimization problems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Discuss the Mamdani and Takagi-Sugeno fuzzy inference systems. Compare their structure, working, and applications in detail. **(16)**

Q4 Explain the functioning of Recurrent Neural Networks (RNNs). Give a detailed discussion of their architecture and one specific application of your choice. **(16)**

Q5 Discuss the concept and working of genetic algorithms. Explain the steps of a genetic algorithm (selection, crossover, mutation) with appropriate examples and discuss their applications in optimization problems. **(16)**

Q6 Discuss how combining genetic algorithms with other optimization methods improves performance and solves complex optimization tasks with suitable examples. **(16)**