

B. Tech-3rd (EEE)

Optimization and Soft Computing

Full Marks : 50

Time : $2\frac{1}{2}$ hours

Answer all questions

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer all questions : 2 × 5

(a) What is the primary goal of soft computing techniques ?

(b) What are linguistic variables in fuzzy logic ? Provide an example.

(c) What is a perceptron in an artificial neural network ?

(d) What is a genetic algorithm ?

(Turn Over)

(e) What is a particle in particle swarm optimization?

2. (a) Describe any two solution approaches for solving optimization problems. 4

(b) Explain the role of constraints in an optimization problem with an example. 4

Or

(a) Briefly discuss two popular soft computing techniques and their applications. 4

(b) Give an example of a problem where soft computing techniques outperform hard computing approaches. Justify. 4

3. (a) Describe the various set-theoretic operations for fuzzy sets. Give example. 4

(b) What is defuzzification? Explain two defuzzification methods. 4

Or

(a) Compare and contrast fuzzy relations and crisp relations with examples. 4

(b) Briefly describe the Mamdani fuzzy model. 4

4. (a) Explain the working of a biological neuron and how it is mimicked in artificial neurons. 4

(b) Discuss the various types of artificial neural network architectures. 4

Or

(a) Explain backpropagation process in artificial neural networks. 4

(b) Describe the use of the perceptron as a linear classifier. 4

5. (a) Explain the working principles of a genetic algorithm with a basic flow diagram. 4

- (b) Discuss the process of crossover and its importance in genetic algorithms. 4

Or

- (a) What is the significance of the fitness function in genetic algorithms and how is it formulated ? 4
- (b) What is meant by 'initial population' in genetic algorithms ? Describe the process of initializing a population in genetic algorithms. 4
6. (a) Explain the process of updating particle positions and velocities in particle swarm optimization with relevant mathematical expressions. 4
- (b) Describe the process by which ants find the optimal path in ant colony optimization. 4

Or

- (a) What is meant by metaheuristic optimization ? Explain the main goals of metaheuristic optimizations techniques. 4
- (b) Mention the similarities and differences between PSO and ACO. 4