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Question Paper Code	12989
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Artificial Intelligence and Data Science

20AIPW603 – OPTIMIZATION TECHNIQUES FOR PROGRAMMING WITH LABORATORY

Regulation – 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which of the following represents the design vector in optimization problems? (a) Constraints (b) Decision variables (c) Objective function (d) Constraint surface	1	K1	CO1
2. KKT conditions are applicable for which type of optimization problems? (a) Linear unconstrained problems (b) Nonlinear constrained problems (c) Unconstrained single-variable problems (d) Multi-objective problems	1	K1	CO1
3. What is the purpose of the Lagrange's method of multipliers? (a) Solving unconstrained optimization problems (b) Solving constrained optimization problems (c) Solving linear equations (d) Finding roots of equations	1	K1	CO1
4. The Golden Section Method is used in: (a) Linear programming (b) Nonlinear programming (c) Dual simplex problems (d) Convex programming	1	K1	CO2
5. Which method is NOT a part of linear programming techniques? (a) Simplex Method (b) Dual Simplex Method (c) Fibonacci Method (d) Revised Simplex Method	1	K1	CO2
6. KKT conditions include: (a) Primal feasibility and dual feasibility (b) Lagrangian function & stationarity (c) Complementary slackness and feasibility (d) All of the above	1	K1	CO2
7. In the Cauchy (Steepest Descent) Method, the direction of search is determined by: (a) The gradient of the objective function (b) The second derivative of the objective function (c) A random search (d) The constraint surface	1	K2	CO3
8. What is the primary advantage of Sequential Linear Programming? (a) Solves nonlinear problems using linear approximations (b) Faster convergence for unconstrained problems (c) Avoids the need for derivatives (d) Simplifies objective functions	1	K1	CO3
9. Which of the following is a direct search method? (a) Steepest Descent Method (b) Simplex Method (c) Newton's Method (d) Penalty Function Method	1	K1	CO3
10. Simulated Annealing is inspired by: (a) Evolutionary processes (b) Metal cooling and annealing (c) Swarm behavior (d) Neural networks	1	K1	CO4
11. Which operator is NOT part of the Genetic Algorithm? (a) Selection (b) Mutation (c) Annealing (d) Crossover	1	K1	CO4
12. How does the Ant Colony Optimization algorithm solve optimization problems? (a) By using a population of solutions and applying genetic operators (b) By simulating the movement of particles in a swarm (c) By using pheromones to guide the search for the best solution (d) By minimizing energy levels in a system	1	K2	CO4

13. Which algorithm mimics the behavior of social insects? 1 K1 CO5
 (a) Firefly Algorithm (b) Ant Colony Optimization
 (c) TabuSearch (d) Genetic Algorithm
14. In the context of simulation modeling, what does "Monte Carlo Simulation" primarily involve? 1 K2 CO5
 (a) Simulation of deterministic processes (b) Optimization of linear systems
 (c) Random sampling to generate statistical distributions of outcomes
 (d) Solving systems of nonlinear equations
15. The Monte Carlo method is primarily used for: 1 K1 CO5
 (a) Linear optimization (b) Simulation of random processes
 (c) Deterministic modeling (d) Elimination methods
16. What is the purpose of "local search" in Nature-Inspired Algorithms? 1 K1 CO5
 (a) To generate global solutions immediately
 (b) To explore nearby regions for possible improvements in the solution
 (c) To select the best solution from a set of candidates
 (d) To model the behavior of individual agents in the system
17. Which algorithm is inspired by bee foraging behavior? 1 K1 CO6
 (a) Firefly Algorithm (b) Particle Swarm Optimization
 (c) Ant Algorithm (d) Bee Algorithm
18. If you want to optimize the route for a traveling salesman, which nature-inspired algorithm would be the most suitable? 1 K1 CO6
 (a) Particle Swarm Optimization (b) Ant Colony Optimization
 (c) Simulated Annealing (d) Genetic Algorithm
19. When applying the Bat Algorithm, which behavior do bats mimic to solve optimization problems? 1 K2 CO6
 (a) Echolocation for hunting and navigating
 (b) Flying in random patterns for exploration
 (c) Using pheromone trails to find food
 (d) Searching for optimal solutions in groups
20. Which of the following algorithms is commonly used to model the swarm intelligence behavior of birds or fish in optimization problems? 1 K1 CO6
 (a) Firefly Algorithm (b) Particle Swarm Optimization
 (c) Bat Algorithm (d) Cuckoo Search

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. Provide an example of a design constraint in an optimization problem. 2 K1 CO1
22. Mention the different classifications of optimization techniques. 2 K1 CO1
23. Examine the differences between the revised simplex method and the original simplex method. 2 K2 CO2
24. Differentiate between the Simplex and Dual Simplex methods. 2 K2 CO2
25. Outline Steepest Descent method. 2 K2 CO3
26. Mention the basic terminology used in optimization. 2 K1 CO3
27. List three components of the genetic algorithm. 2 K1 CO4
28. Compare and contrast genetic algorithms and neural network-based optimization. 2 K3 CO4
29. Define modeling and describe its various phases. 2 K1 CO5
30. Describe the relationship between the Cuckoo Search algorithm and Levy flight. 2 K3 CO6

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Describe the procedure for applying Lagrange's method of multipliers to solve a constrained optimization problem. 10 K2 CO1

OR

- b) Outline and analyze the classification of optimization problems according to the number of variables and constraints. 10 K2 CO1

32. a) Using Revised simplex method solve the LPP 10 K3 CO2
Max $z = x_1 + 2x_2$ Subject to
 $x_1 + x_2 \leq 3$; $x_1 + 2x_2 \leq 5$; $3x_1 + x_2 \leq 6$; $x_1, x_2 \geq 0$

OR

- b) Analyze the Revised Simplex Method by comparing it with the Simplex Method. 10 K3 CO2

33. a) Outline the Sequential Linear Programming (SLP) method and demonstrate its application in solving engineering optimization problems. 10 K2 CO3

OR

- b) Examine the various direct search methods used in unconstrained optimization. How are these methods applied to find optimal solutions? 10 K2 CO3

34. a) Illustrate the Genetic Algorithm and its key functions in solving optimization problems. 10 K2 CO4

OR

- b) Clarify what fuzzy optimization techniques are and how they are used to solve problems with uncertain or imprecise data? 10 K2 CO4

35. a) Describe the Bee algorithm and how its design is inspired by the behavior of bees in nature? 10 K2 CO5

OR

- b) Analyze the Firefly Algorithm used in Nature-Inspired Optimization, discussing its principles, advantages, and limitations in comparison to other optimization techniques. 10 K2 CO5

36. a) Critically evaluate the butterfly optimization algorithm, illustrating its working with an example and discussing its effectiveness compared to other optimization methods. 10 K4 CO6

OR

- b) Explain the procedure of the Bat algorithm. 10 K4 CO6