15281

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(CSE)-AIML-2022
Course Name – Optimization Techniques
Course Code - PEC-CSM601B
(Semester VI)

Full Marks : 60
Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)
1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the main goal of optimization in engineering

    a) Maximizing resources
    b) Finding the best possible solution
    c) Minimizing complexity
    d) Reducing labor

(ii) Identify the focus of early optimization techniques

    a) Resource allocation
    b) Complex algorithms
    c) Artificial intelligence
    d) Cost reduction

(iii) An optimization problem related to

    a) Objective function
    b) Constraints
    c) Decision variables
    d) All of these

(iv) Problems with no constraints are classified as

    a) Linear optimization
    b) Unconstrained optimization
    c) Constrained optimization
    d) Nonlinear optimization

(v) A function $f(x) = 3x^3 - 2x^2 + 4$ is classified as

    a) Linear function
    b) Quadratic function
    c) Cubic function
    d) Exponential function

(vi) Select the matrix equation that represents a system of linear equations in a linear programming problem

    a) $Ax=b$
    b) $c^Tx=z$
    c) $x \geq 0$
    d) none of these

(vii) Choose the correct option from below: A function is unimodal if it

    a) has multiple minima
    b) has a single maximum or minimum
    c) is always increasing
    d) has no derivative

(viii) Choose the correct from below: Dichotomous Search eliminates

    a) One-third of the search space
    b) Half of the search space

c) One-fourth of the search space

d) Random points

(ix) Choose the correct one from the following: The cubic interpolation method differs from quadratic interpolation by

a) Using one more function value

b) Being slower

c) Ignoring derivative values

d) Avoiding iteration

(x) The shortest route problem determines

a) Minimum cost path

b) Maximum cost path

c) Minimum spanning tree

d) Maximum network flow

(xi) The Hungarian method solves

a) Maximum flow problem

b) Minimal spanning tree problem

c) Assignment problem

d) Shortest route problem

(xii) The traveling salesman problem is classified as

a) NP-hard

b) Linear programming

c) Polynomial time solvable

d) Network flow problem

(xiii) Identify the correct option from below: The most efficient spanning tree algorithm for dense graphs is

a) Kruskal's algorithm

b) Prim's algorithm

c) Hungarian method

d) Dijkstra's algorithm

(xiv) Identify the correct option from below: The ideal method for drawing complex networks is

a) Linear programming

b) Graph theory visualization

c) Maximum spanning tree

d) Traveling salesman method

(xv) Identify the correct option from below: The reliability problem focuses on

a) Maximizing system reliability

b) Minimizing maintenance cost

c) Reducing the number of components

d) Shortening the supply chain

Group-B
(Short Answer Type Questions)

3 x 5=15

2. Consider the LP problem: (3)

Maximize $5X_1 + 6X_2$

subject to

$X_1 + 2X_2 \leq 7$

$3X_1 + 5X_2 \leq 13$

$X_1, X_2 \geq 0$

Write this into standard form.

3. Write the dual of the following L. P. P: (3)

Max $z = 2x_1 - 3x_2$

subject to: $x_1 + 5x_2 \leq 20$

$4x_1 + 9x_2 = 30$

$2x_1 - 5x_2 \geq 40$ and $x_1, x_2 \geq 0$.

4. Define the transshipment problem in transportation models and give an example. (3)

5. Explain the concept of global and local optima with examples.

6. Write the minimum of the function $f(x) = x^3 - 6x^2 + 9x + 15$ using the first and second derivative tests. (3)

OR

There is a series system with 3 components, and the reliability of each component is given as follows: (3)

Component	Reliability
1	0.9
2	0.8
3	0.95

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Explain the general structure of an optimization problem, including the formulation of objective functions and constraints, with an example. (5)

8. Write the role of Fibonacci numbers in the Fibonacci Search Method for optimization. (5)

9. Compute the optimal point for $f(x) = x^3 - 6x^2 + 9x + 5$ using the Unrestricted Search Method with step size $\Delta x = 1$. (5)

10. Differentiate between interpolation and direct root methods in nonlinear programming. (5)

11. Compare the results of Fibonacci and Golden Section methods for minimizing $f(x) = (x - 2)^2 + 3$ in $[0, 5]$. (5)

12. Solve a transportation problem where three factories supply four warehouses with the following cost matrix. Use the Northwest Corner Method to find the initial feasible solution. (5)

	W1	W2	W3	W4	Supply
F1	4	3	5	6	20
F2	6	1	8	4	30
F3	3	4	2	7	50
Demand	30	30	20	20	

OR

Construct the optimize design of a parallel-series system to meet minimum reliability requirements at minimum cost.

(5)

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