

[This question paper contains .. printed pages.]

Sr. No. of Question Paper

:

7416A

Your Roll No.....

Unique Paper Code

:

2362572401

Name of the Paper

:

DSC- Optimization Techniques

Name of Course

:

B.A. (Prog)- NEP-UGCF

Semester

:

IV

Duration

:

3 Hours

Maximum Marks: 90

Instructions for candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any five questions.
3. Use of non-programmable calculator is allowed.

- 1) (a) Find extrema of the given function by gradient search method: (10)

$$F(x_1, x_2) = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$$

The initial point is $x_0 = (1,1)$.

- (b) Discuss the Hessian matrix and second-order tests. Differentiate local and global minima/maxima. (8)

- 2) (a) Define saddle point and how to identify it

$$f(x, y) = x^2 - y^2 \text{ has a saddle at } (0,0). \quad (9)$$

- (b) Describe multi-variable Newton-Raphson method. Two iterations for

$$f(x, y) = x^2 + y^2 + 2x + 4y \quad (9)$$

- 3) (a) Summarize convergence criteria for iterative methods. Check whether the following functions are convex, concave or neither by using Hessian matrix : (9)

$$f(x) = 3x_1^2 + 2x_2^2 + 2x_1 + 4x_2 - 2x_1x_2$$

- (b) Define convexity in single-variable functions. Verify convexity of

$$f(x) = 3x^2 - 2x + 1 \quad (9)$$

- 4) (a) Define convex and concave functions. Prove $f(x)=e^x$ is convex. (9)

- (b) Explain the difference between weighted and pre-emptive goal programming methods. (9)

- 5) (a) Solve the following integer programming problem by graphical method: (10)

$$\text{Min } Z = \{d_1^+, d_2^-, d_3^-, d_4^+\}$$

Subject to constraint

$$X_1 + x_2 + d_1 - d_1^+ = 50$$

$$X_1 + d_2^- = 6$$

$$x_2 + d_3^- = 8$$

$$d_1^+ + d_4^- - d_4^+ = 10$$

$$x_1, x_2, d_1^-, d_1^+, d_2^-, d_2^+, d_3^-, d_3^+, d_4^-, d_4^+ \geq 0$$

(b) Distinguish between Pure ILPP, Mixed ILPP, and 0-1 ILPP. Provide examples. (8)

6) (a) Formulate the following problem as a goal programming problem. (10)

ABC Furniture's produce three products – tables, desks, and chairs. The furniture is produced In the central plant. The production of the desk requires 3 hours in the plant, the table 2 hours And the chair only 1 hour. The regular plant capacity is 40 hours a week. According to the Marketing department, the maximum number of desks, tables and chairs that can be sold Weekly are 10, 10 and 12, respectively. The president of the firm has established the following Goals, according to their importance:

P1: Avoid any underutilization of production capacity.

P2: Meet the order of XYZ Store for seven desks and five chairs.

P3: Avoid overtime operation of the plant beyond 10 hours.

P4: Achieve sales goal of 10 desks, 10 tables, and 12 chairs.

P5: Minimize overtime operation as much as possible.

(b) What is meant by 0-1 Integer linear programming problem? Explain various methods for solving 0-1 Integer linear programming problem. (8)

7) (a) Limitations of integer programming and overcoming them. (9)

(b) Discuss the importance of integer programming in real-life decision-making problems.

Explain the dominance method for solving a two-person zero-sum game and use the same to solve the following two-person zero-sum game. (9)

		V		
2	1	4	3	2
3	2	5	4	3
1	3	2	1	4
4	5	3	2	5

sh