

PARUL UNIVERSITY
FACULTY OF APPLIED SCIENCE
M.Sc., Summer 2022-23 Examination

Semester: 4
Subject Code: 11206258
Subject Name: OPERATIONS RESEARCH

Date: 24-03-2023
Time: 2:00pm to 4:30pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) Answer the following question (08)

Using Kun-Tucker conditions find the optimum value of the objective function

$$\text{Max } Z = 10x_1 - x_1^2 + 10x_2 - x_2^2$$

s.t.

$$x_1 + x_2 \leq 14; \quad -x_1 + x_2 \leq 6;$$

given $x_1, x_2 \geq 0$

Q.1. B) Answer the following questions (Any two) (06)

(a) Solve the following LPP using Gomory's cutting plane method. (06)

$$\text{Max } Z = 3x_1 + 12x_2$$

s.t.

$$2x_1 + 4x_2 \leq 7; \quad 5x_1 + 3x_2 \leq 15;$$

given $x_1, x_2 \geq 0$ are integers

(b) Discuss the change in c_j on the optimality of the optimal basic feasible solution of following LPP after finding solution using Simplex Method. (06)

$$\text{Max } Z = 4x_1 + 6x_2 + 2x_3$$

$$(i) x_1 + x_2 + x_3 \leq 3; \quad (ii) x_1 + 4x_2 + 7x_3 \leq 9;$$

given $x_1, x_2, x_3 \geq 0$

(c) Solve the following LP Problem (06)

$$\text{Maximize } Z = 6x_1 + 4x_2$$

Subject to the constraints

$$(i) x_1 + x_2 \leq 5, (ii) x_2 \geq 8$$

$$x_1, x_2 \geq 0$$

Q.2. A) Answer the following question (08)

Using Big-M Method solve the following LPP

$$\text{Minimize } Z = 2x_1 + 3x_2$$

Subject to the constraints

$$(i) 3x_1 + x_2 \leq 600, (ii) 2x_1 + 4x_2 \geq 480$$

$$x_1, x_2 \geq 0.$$

Q.2. B) Answer the following question (Any one) (06)

(a) Solve the following problem using Lagrangian multiplier method

$$\text{Min } Z = x_1^2 + x_2^2 + x_3^2$$

s.t.

$$x_1 + x_2 + 3x_3 = 2; \quad 5x_1 + 2x_2 + x_3 = 5$$

given $x_1, x_2, x_3 \geq 0$

(b) Using Branch and Bound method solve (06)

$$\text{Maximize } Z = 2x_1 + 3x_2$$

Subject to the constraints

$$(i) 6x_1 + 5x_2 \leq 25, (ii) x_1 + 3x_2 \leq 10$$

$$x_1, x_2 \geq 0 \text{ and integers}$$

Q.3. A) Answer the following question (08)

Solve the following LPP using Daul-Simplex method.

$$\text{Max } Z = -3x_1 - 2x_2$$

s.t.

$$x_1 + x_2 \geq 1; \quad x_1 + x_2 \leq 7; \quad x_1 + 2x_2 \geq 10; \quad x_2 \leq 3$$

$$\text{given } x_1, x_2 \geq 0$$

Q.3. B) Answer the following questions (Any two)

(a) Solve the following problem using Lagrangian multiplier method (05)

$$\text{Optimize } Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$$

s.t.

$$g(x) = x_1 + x_2 + x_3 = 20;$$

$$\text{given } x_1, x_2, x_3 \geq 0$$

(b) Solve the following LPP (05)

$$\text{Max } Z = 3x_1 + 5x_2$$

s.t.

$$x_1 - 2x_2 \leq 6; \quad x_1 \leq 10; \quad x_2 \geq 1;$$

$$\text{given } x_1, x_2 \geq 0$$

(c) Using Kun-Tucker conditions find the optimum value of the objective function

$$\text{Max } Z = 12x_1 + 21x_2 + 2x_1x_2 - 2x_1^2 - 2x_2^2$$

s.t.

$$x_2 \leq 8; \quad x_1 + x_2 \leq 10;$$

$$\text{given } x_1, x_2 \geq 0, \lambda_1 = 0, \lambda_2 \neq 0$$

(05)

Q.4. Answer the following questions

Using Simplex Method solve

$$\text{Maximize } Z = x_1 + 4x_2 + 5x_3$$

Subject to the constraints

$$(i) 3x_1 + 3x_2 \leq 22, (ii) x_1 + 2x_2 + 3x_3 \leq 14$$

$$(iii) 3x_1 + 2x_2 \leq 14$$

$$x_1, x_2, x_3 \geq 0$$

(08)