NOVEMBER/DECEMBER 2018

MMA33 — OPERATIONS RESEARCH

Time : Three hours Maximum : 75 marks

SECTION A — (5 × 6 = 30 marks)

Answer ALL questions.

1. (a) Solve the following linear integer programming problem by cutting plane method.

Maximize $Z = 14x_1 + 16x_2$

Subject to $4x_1 + 3x_2 \leq 12$

$6x_1 + 8x_2 \leq 24$

and $x_1, x_2 \geq 0$

Or

(b) Write down the procedure for Gomory's mixed-integer programming algorithm.

2. (a) Determine the value of u_1, u_2 and u_3

Maximize $Z = u_1 \cdot u_2 \cdot u_3$

Subject to $u_1 + u_2 + u_3 = 10$

and $u_1, u_2, u_3 \geq 0$

Or

(b) Using dynamic programming to solve the following problem.

Minimize $Z = y_1^2 + y_2^2 + y_3^2$

Subject to $y_1 + y_2 + y_3 = 10$

$y_1, y_2, y_3 \geq 0$

3. (a) A firm has a total revenue function $R = 20x - 2x^2$ and a total cost function, $c = x^2 - 4x + 20$ where x represents the quantity. Find the revenue maximizing output level and the corresponding value of profit, price and total revenue.

Or

(b) Solve the following problem by using the method of Lagrangian multipliers.

Minimize $Z = x_1^2 + x_2^2 + x_3^2$

Subject to $x_1 + x_2 + 3x_3 = 2$

$5x_1 + 2x_2 + x_3 = 5$

and $x_1, x_2 \geq 0$

4. (a) Write down the simplex algorithm for bounded variable LPP.

Or

(b) Solve the following LPP.

Maximize $Z = 3x_1 + 5x_2 + 2x_3$

Subject to $x_1 + 2x_2 + 2x_3 \leq 14$

$2x_1 + 4x_2 + 3x_3 \leq 23$

$0 \leq x_1 \leq 4$

$2 \leq x_2 \leq 5$

$0 \leq x_3 \leq 3$

5. (a) Explain the criteria for decision making under uncertainty.

Or

(b) The probability of demand for hiring cars on any day in a given city is follows.

No. of cars demand :	0	1	2	3	4
Probability :	0.1	0.2	0.3	0.2	0.2

Cars have a fixed cost of Rs. 90 each day to keep the daily hire charges (variable cost of running) Rs. 200. If the car-hire company owns 4 cars, what is its daily expectation? If the company is about to go into business and currently has no car, how many cars should it buy?

SECTION B — (3 × 15 = 45 marks)

Answer any THREE questions.

6. Solve the following mixed integer programming problem by Gomory's algorithm.

Maximize $Z = x_1 + x_2$

Subject to the constraints

$3x_1 + 2x_2 \leq 5$

$x_2 \leq 2$

$x_1, x_2 \geq 0$, x_1 non – negative integer.

7. Solve the following LPP by dynamic programming approach.

Maximize $Z = 8x_1 + 7x_2$

Subject to $2x_1 + x_2 \leq 8$

$5x_1 + 2x_2 \leq 15$

and $x_1, x_2 \geq 0$

8. Find the optimum value of the objective function when separately subject to the following three sets of constraints.

Maximize $Z = 10x_1 - x_1^2 + 10x_2 - x_2$

Subject to

(a) $x_1 + x_2 \leq 14$

$-x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$

(b) $x_1 + x_2 \leq 8$

$-x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

(c) $x_1 + x_2 \leq 9$

$x_1 - x_2 \geq 6$

$x_1, x_2 \geq 0$

9. Use the revised simplex method to solve the following LPP.

Maximize $Z = 2x_1 + x_2$

Subject to $3x_1 + 4x_2 \leq 6$,

$6x_1 + x_2 \leq 3$,

and $x_1, x_2 \geq 0$

10. Write down the steps of decision making process.