M.Sc. (Mathematics) (New CBCS Pattern) Semester-IV

PSCMTH20A : Operations Research-II

P. Pages : 3 **GUG/W/24/13775**

Time : Three Hours * 5 4 5 2 * Max. Marks : 100

UNIT-I

1. a) Use branch and bound method to solve following LPP: **10**

Maximize $Z = 7x_1 + 9x_2$

Subject to constraints: $-x_1 + 3x_2 \le 6$,

$7x_1 + x_2 \le 35$,

$x_2 \le 7$

$x_1, x_2 \ge 0$ and are integers.

b) Find the optimum integer solution to the all integer programming problem **10**

Maximize $Z = x_1 + x_2$

Subject to constraints: $3x_1 + 2x_2 \le 5$, $x_2 \le 2$,

$x_1 \ge 0, x_2 \ge 0$ and are integers.

OR

c) Find the optimum integer solution to the following LPP: **10**

Maximize $Z = x_1 + 4x_2$

Subject to constraints:

$2x_1 + 4x_2 \le 7$,

$5x_1 + 3x_2 \le 15$;

$x_1, x_2 \ge 0$ and are integer.

d) Solve the following mixed integer programming problem: **10**

Maximize $Z = 4x_1 + 6x_2 + 2x_3$

Subject to the constraints:

$4x_1 - 4x_2 \le 5$,

$-x_1 + 6x_2 \le 5$,

$-x_1 + x_2 + x_3 \le 5$

$x_1, x_2, x_3 \ge 0$; x_1 and x_3 are integers.

UNIT-II

2. a) Solve the goal programming problem by simplex method: **10**

Minimize $Z = P_1 d_1^- + P_2 d_2^- + 2P_2 d_2^- + P_3 d_1^+$

Subject to constraints:

$10x_1 + 10x_2 + d_1^- - d_1^+ = 400$,

$x_1 + d_2^- = 40$,

$x_2 + d_3^- = 30$;

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

b) Solve the following L.P.P.: **10**

Maximize $(5x_1 + 3x_2)/(5x_1 + 2x_2 + 1)$

Subject to the constraints:

$3x_1 + 5x_2 \leq 15$,

$5x_1 + 2x_2 \leq 10$,

$x_1, x_2 \geq 0$

OR

c) A firm products two products, X and Y. Product X sells for a net profit of Rs. 80 per unit, while product Y sells for net profit of Rs. 40 per unit. The goal of the firm is to earn Rs. 900 in next week. Also, the management want to achieve sales volume for the two products close to 17 and 15 respectively. Formulate this problem as goal programming model. **10**

d) Write the simplex method for goal programming problem. **10**

UNIT-III

3. a) Discuss the operating characteristic of queueing system. **10**

b) Using graphical method, calculate the minimum time needed to process job 1 and 2 on five machines A, B, C, D and E, i.e. for each machine find the job which should be done first. Also calculate the total time needed to complete both jobs. **10**

Job1	Sequence :	A	B	C	D	E
	Time(hr) :	6	8	4	12	4

Job 2	Sequence :	B	C	A	D	E
	Time(hr) :	10	8	6	4	12

OR

c) Describe the probability distribution in queueing systems. **10**

d) Use graphical method to minimize the time added to process the following jobs on the machines shown, i.e. for each machine find the job which should be done first. Also, calculate the total time elapsed to both the jobs: **10**

Job1	Sequence :	A	B	C	D	E
	Time :	3	4	2	6	2

Job 2	Sequence :	B	C	A	D	E
	Time :	5	4	3	2	6

UNIT-IV

4. a) Explain the general non-linear programming problem. **10**

b) Obtain the necessary and sufficient condition for the optimum solution of the following NLPP: **10**

Maximize $Z = f(x_1, x_2) = 3e^{2x_1+1} + 2e^{x_2+5}$

Subject to the constraints:

$x_1 + x_2 = 7;\ x_1, x_2 \geq 0$

OR

c) Maximize $Z = 3.6x_1 - 0.4x_1^2 + 1.6x_2 - 0.2x_2^2$ **10**

Subject to the constraints:

$2x_1 + x_2 \leq 10$

$x_1, x_2 \geq 0$

d) Use Wolfe's method to solve the QPP: **10**

Maximize $Z = 2x_1 + 3x_2 - 2x_1^2$

Subject to the constraints:

$x_1 + 4x_2 \leq 4$,

$x_1 + x_2 \leq 4$

$x_1, x_2 \geq 0$

5. a) State the steps of formulation of Linear goal programming problem. **5**

b) State the seven steps of fractional cut method all integer LPP. **5**

c) Write the basic terms used in sequencing. **5**

d) Describe the Wolfe's modified simplex method. **5**

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