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

PSCMTH20A - Optional : Operations Research - II

P. Pages : 2 **GUG/S/23/13775**

Time : Three Hours * 2 5 1 1 * Max. Marks : 100

Notes : 1. Solve all the questions.
2. Each question carries equal marks.

UNIT – I

1. a) Use branch & bound method to solve the ILPP: Maximize $z = 2x_1 + x_2$ subject to Constraints: $x_1 \le 3/2, x_2 \le 3/2, x_1, x_2 \ge 0$ & are integers. **10**

b) Solve the ILPP using cutting plane algorithm, Maximize $z = 3x_1 + x_2 + 3x_3$ subject to the constraints: $-x_1 + 2x_2 + x_3 \le 4,\ 4x_2 - 3x_3 \le 2, x_1 - 3x_2 + 2x_3 \le 3, x_1, x_2, x_3$ are non zero integers. **10**

OR

c) Solve the mixed integer programming problem: Maximize $z = 4x_1 + 6x_2 + 2x_3$ subject to the constraints: $4x_1 - 4x_2 \le 5, -x_1 + 6x_2 \le 5, -x_1 + x_2 + x_3 \le 5, x_1, x_2, x_3 \ge 0, x_1, x_3$ are integers. **10**

d) Solve the LPP: Maximize $z = 11x_1 + 4x_2$ subject to constraints: $-x_1 + 2x_2 \le 4,$ $5x_1 + 2x_2 \le 16, 2x_1 - x_2 \le 4, x_1, x_2$ are nonzero integers. **10**

UNIT – II

2. a) Solve the LPP: Maximize $z = \dfrac{-6x_1 - 5x_2}{2x_1 + 7}$ subject to constraints, $x_1 + 2x_2 \le 3,$ $3x_1 + 2x_2 \le 6, x_1, x_2 \ge 0$. **10**

b) Solve the goal programming problem by simplex method: **10**
Minimize $z = p_1 d_1^- + p_2 d_2^- + 2p_2 d_3^- + p_3 d_1^+$
Subject to constraints: $10x_1 + 10x_2 + d_1^- - d_1^+ = 400,\ x_1 + d_2^- = 40, x_2 + d_3^- = 30, x_1, x_2,$
$d_1^+, d_1^-, d_2^-, d_3^- \ge 0$

OR

c) By revised simplex method to solve the LPP: Maximize $z = 3x_1 + 5x_2$ subject to constraints: $x_1 \le 4, x_2 \le 6, 3x_1 + 2x_2 \le 18$ & $x_1, x_2 x_3 \ge 0$ **10**

d) Solve the LPP: Maximize $(5x_1 + 3x_2)/(5x_1 + 2x_2 + 1)$ Subject to constraints: $3x_1 + 5x_2 \le 15, 5x_1 + 2x_2 \le 10, x_1, x_2 \ge 0$ **10**

UNIT – III

3. a) Discuss the operating characteristics of a queuing system. **10**

b) Explain the optimum sequence algorithm for processing n jobs through two machines. **10**

OR

c) Describe the probability distribution in queueing system. **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 done first. Also find the total time elapsed to complete both jobs: **10**

Job 1						
	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) Obtain the set of necessary conditions for NLPP: Maximize $z = x_1^2 + 3x_2^2 + 5x_3^2$ subject to constraints: $x_1 + x_2 + 3x_3 = 2, 5x_2 + 2x_2 + x_3 = 5, x_1, x_2, x_3 \geq 0$ **10**

b) Explain the general nonlinear programming problem. **10**

OR

c) Solve graphically the NLPP: **10**
Maximize $z = 2x_1 + 3x_2$ subject to constraints: $x_1 x_2 \leq 8, x_1^2 + x_2^2 \leq 20, x_1, x_2 \geq 0$

d) Use Wolfe's method to solve the QPP: **10**
Maximize $z = 2x_1 + 3x_2 - 2x_1^2$ subject to constraints $x_1 + 4x_2 \leq 4,\ x_1 + x_2 \leq 2,\ x_1, x_2 \geq 0$

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

b) State the steps of graphical goal attainment method. **5**

c) What are the basic terms used in sequencing. **5**

d) Define: **5**

i) Saddle point of a payoff matrix.

ii) Saddle value problem.

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