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

PSCMTH20A - Optional : Operations Research-II

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

Time : Three Hours * 7 3 6 1 * Max. Marks : 100

Notes : 1. Solve all the **five** questions.
2. Each question carry equal marks.

UNIT – I

1. a) Solve the ILPP using the cutting plane algorithm: **10**

Maximize $z = 3x_1 + x_2 + 3x_3$ subject to the constraints:

$x_1 + 2x_2 + x_3 \le 4,\ 4x_2 - 3x_3 \le 2,\ x_1 - 3x_2 + 2x_3 \le 3,\ x_1, x_2 \& x_3$ all are non zero integers.

b) Solve the mixed ILPP: **10**

Maximize $z = 4x_2 + 6x_2 + 2x_3$ 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.

OR

c) Solve the mixed IPP using Gomory's cutting plane method: **10**

Maximize $z = x_1 + x_2$ subject to

Constraints : $3x_1 + 2x_2 \le 5,\ x_2 \le 2,\ \ x_1, x_2 \ge 0$ and are integers.

d) Use branch & bound method to solve the ILPP: **10**

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.

UNIT – II

2. a) Use simplex method to solve the goal programming problem: **10**

Minimize $z = p_1 d_1^- + p_2 d_2^- + 2p_2 d_3^- + p_3 d_1^+$

Subject to constraints:

$10x_1 + 10x_2 + d_1^- - d_1^+ = 400,\ x_1 + d_2^- = 40,$

$x_2 + d_3^- = 30,\ x_1, x_2,\ d_1^+,\ d_1^-,\ d_2^-, d_3^- \ge 0.$

b) Use revised simplex method to solve the **10**

LPP : maximize $z = 3x_1 + 2x_2 + 5x_3$ subject to the constraints :

$x_1 + 2x_2 + x_3 \le 430,\ 3x_1 + 2x_2 \le 460,\ x_1 + 4x_2 \le 420,\ x_1, x_2, x_3 \ge 0$

OR

c) Use revised simplex method to solve the **10**

LPP : maximize $z = 3x_1 + 5x_2$ subject to the constraints :

$x_1 \le 4,\ x_2 = 6,\ 3x_1 + 2x_2 \le 18,\ \&\ x_1 \ge 0,\ x_2 \ge 0,\ x_3 \ge 0$.

d) **10**

Solve the LPP : Minimize $z = \dfrac{-6x_1 - 5x_2}{2x_1 + 7}$

Subject to constraints $x_1 + 2x_2 \le 3,\ 3x_1 + 2x_2 \le 6,\ x_1,\ x_2 \ge 0$

UNIT – III

3. a) Explain how the optimal sequence is obtained in processing 2 Jobs through k machines. **10**

b) 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 the 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

OR

c) A petrol pump station has two pumps. The service times follows the exponential distribution with a mean of 4 minutes & cars arrive for service in a Poisson process at the rate of 10 cars per hour. Find the probability that a customer has to wait for service. What proportion of time the pumps remain idle? **10**

d) Explain the probability distributions in queueing systems. **10**

UNIT – IV

4. a) Obtain the set of necessary conditions for the NLPP: minimize $z = kx^{-1}y^{-2}$ subject to constraints : $x^2 + y^2 - a^2 = 0$ with $x \geq 0,\ y \geq 0$ & hence find the minimum value of z. **10**

b) Obtain the necessary & sufficient conditions for the optimum solution of the NLPP: **10**

$$\text{minimize } z = f(x_1, x_2)$$

$$= 3e^{2x_1} + 1 + 2e^{x_3+5}$$

subject to constraints $x_1 + x_2, = 7,\ x_1, x_2 \geq 0$

OR

c) Solve graphically the NLPP: **10**

Maximize z = $2x_1 + 3x_2$ subject to the 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: maximize $z = 2x_1 + 3x_2 - 2x_1^2$ subject to the constraints : $x_1 + 4x_2 \leq 4,\ x_1 + x_2 \leq 2,\ x_1, x_2 \geq 0$ **10**

5. a) State the 7 steps of fractional cut method – All integer LPP. **5**

b) Explain the formulation of linear goal programming problem. **5**

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

d) Explain the necessary conditions for a general NLPP. **5**

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