Roll Number:

School of Mathematics, TIET, PATIALA

Mid Semester Examination, October 05, 2023

B.E.(Sem III)

Course Name: Optimization Techniques **Course Code:** (UMA035/UMA031)

TIME: 2 Hours. MAXIMUM MARKS : 35

Faculty: MKS

NOTE: ALL QUESTIONS ARE COMPULSORY

Q1. A company wishes to schedule the production of a kitchen appliance that require two resources labor and material. The company is considering three different models and its production engineering department has furnished the following data

	Model		
	A	B	C
Labor (hours per unit)	7	3	6
Material (pounds per unit)	4	4	5
Profit ($ per unit)	4	2	3

The supply of raw material is restricted to 200 pounds per day. The daily availability of labor is hours. Formulate (do not solve) the linear programming (LP) model to determine the daily production rate of the various models in order to maximize the total profit.

4

Q2. Find the optimal solution of the following linear programming problem by using the graphical method.

$Maximizez = 5x_1 + 4x_2 \ \ subjectto\ 6x_1 + 4x_2 \leq 24; x_1 + 2x_2 \leq 6; \ -x_1 + x_2 \leq 1; x_2 \leq 2; x_1, x_2 \geq 0$

4.5

Q3(a) Using Simplex methods find the optimal solution of the following LPP.

$Maximizez = 10x_1 + 15x_2 + 20x_3 \ \ subject\ to\ \ 2x_1 + 4x_2 + 6x_3 \leq 24; 3x_1 + 9x_2 + 6x_3 \leq 30; x_1, x_2, x_3 \geq 0$

5

(b) Use two phase method to show that the following LPP is infeasible.

$Maxz = 4x_1 + 3x_2, subject\ to\ \ x_1 + x_2 \leq 8,\ 5x_1 + 6x_2 \geq 60,\ \ x_1, x_2 \geq 0.$

3

Q4(a) Solve the following LPP by a dual simplex method.

$Maxz = -2x_1 - 3x_2 \ \ Subject\ to\ -2x_1 + x_2 \geq 3; 3x_1 + x_2 \leq 5; x_1, x_2 \geq 0$

3.5

(b) Consider the LPP $Max\ z = 5x_1 + 12x_2 + 4x_3$ subject to $x_1 + 2x_2 + x_3 \leq 10,\ 2x_1 - x_2 + 3x_3 = 8,\ \ x_1, x_2, x_3 \geq 0.$ Write the dual of above problem and using complimentary slackness conditions, find the optimal solution of dual, given that x_1, x_2 are strictly positive in the optimal solution of primal.

5

Q5(a) Let following be the simplex table of a LPP (maximization problem) at some iteration

B.V	x_1	x_2	s_1	s_2	Solution
$z_j - c_j$	0	d	0	e	
s_1	0	c	1	1	A
x_1	1	-1	0	2	B

State all possible values of a, b, c, d and e in each of the following so that the given statement is true

(i) the current solution is optimal.

(ii) the given LPP has unbounded solution.

(iii) the current solution is optimal but the LPP has many optimal solution. 3

(b) The optimal table of a LLP in which s_1, s_2 are the slack (starting basic) variables is given below :

B.V	x_1	x_2	s_1	s_2	Solution
$z_j - c_j$	0	0	2	1	26
x_2	0	1	2	-1	6
x_1	1	0	-1	1	2

P.T.O.

(i) Write the original LPP.

(ii) Use the sensitivity Analysis to find the range of the coefficient of x_2 in objective function so that the optimal table remains unaffected.

(iii) Use the sensitivity Analysis to find the optimal solution, If a variable x_3 with coefficient 5 in objective function and corresponding column $[3,4]^T$ in constraints is added to the original LPP.

(3+2+2)