A. Slack Variable B. Su		Da Callifaci	2
. If the feasible region o	Unbounded	C. Alternative	D. None of the above
X			
A minimization proble	m can be converted into	a maximization problem	by changing the sign of
coefficients in the	Dbjective Functions	C. Both A and B	D. None of the above
			ut violating the constraint
A. Infeasible (	By Unbounded	C. Alternative	D. None of the above
objective function A. +M	B.) -M	C. 0	D. None of the above
Alternative solution ex		ning problem when	
A. one of the constraint is redundant	B. objective function is parallel to one of the constraints		D. all of the above
. Constraints in an LP	model represents		
A. Limitations	B. Requirements	C. balancing limitations and requirements	D. all of above
To convert ≥ inequalit	v constraints into causi		
add a surplus  Variable  B. si	ıbtract an C. subt		add a surplus variable and subtract an artificial variable
. If for a given solution	ı, a slack variable is eqi	ial to zero, then	
A. the solution is optimal	B. the solution is infeasible	C. there exist no solution	D. None of the above
	table a. e. = 0 value	indicates	
A. unbounded solution	B. degenerate	C) alternative solution	D. None of thes
. 5010100	the state of the s	The second secon	at the boundary of the best of the basis of



Question 2. Consider the following problem.

Maximize  $Z = 4 x_1 + 2 x_2 + 3 x_3 + 5 x_4$ subject to

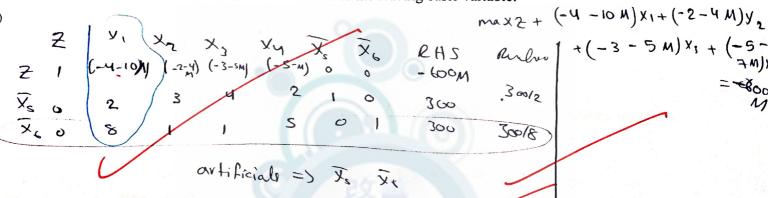
$$2 x_1 + 3 x_2 + 4 x_3 + 2 x_4 = 300$$

$$8 x_1 + x_2 + x_3 + 5 x_4 = 300$$
And  $x_j \ge 0$ , for  $j = 1, 2, 3, 4$ .

max Z - 4x1 = 2x - 3x3 - Sx4 + Mx + Mx = C -M(2x1 + 3x2 + 4x3 + 2x4 + Ax = 300) -M (8 X1 + X2 + X3 + 5 X4+ = 300)

(a) Using the Big M method, construct the complete first simplex tableau for the simplex method and identify the corresponding initial (artificial) BF solution.

(b) Identify the initial entering basic variable and the leaving basic variable.



first leavine variable = 4, first intering variable = 5.

$$\frac{2}{2}$$
  $\frac{1}{2}$   $\frac{1}$ 

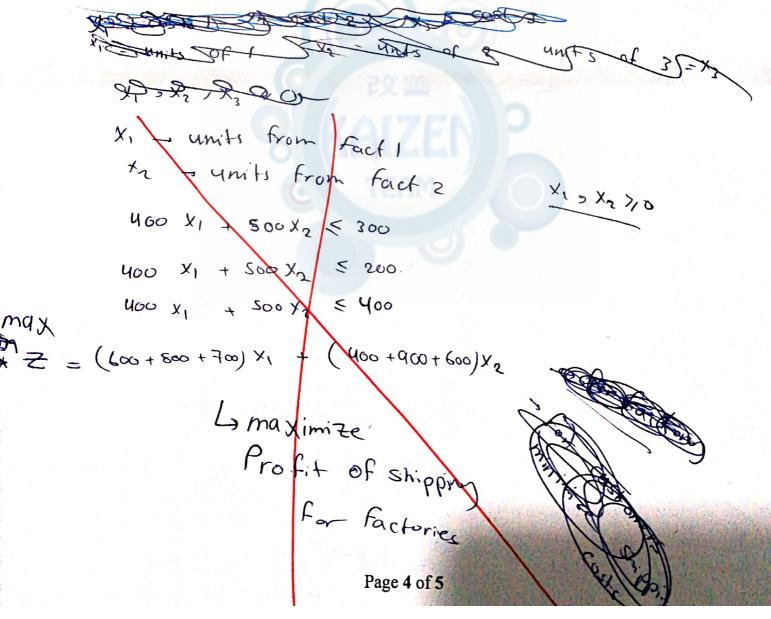


Question 3. A company produces precision medical diagnostic equipment at two factories. Three medical centers have placed orders for this month's production output. The table below shows what the cost would be for shipping each unit from each factory to each of these customers. Also shown are the number of units that will be produced at each factory and the number of units ordered by each customer.

	<b>*</b>			
From	Customer 1	Customer 2	Customer 3	Output
Factory 1	\$600	\$800	\$700	400 units
Factory 2	\$400	\$900	\$600	500 units
Order size	300 units	200 units	400 units	

A decision now needs to be made about the shipping plan for how many units to ship from each factory to each customer.

Formulate a linear programming model for this problem. DO NOT SOLVE



Question 4. Max 
$$Z = 2x_1 + 3x_2 + 4x_3$$
  $= (2 + d_1)$   $x_1 + (3 + d_2) x_2 + (4 + d_3) x_3$ 

$$1 x_1 + 2 x_2 + 3 x_3 \le 11$$

$$2x_1 + 3x_2 + 2x_3 \le 10$$

$$x_1, x_2, x_3 \ge 0$$

Consider the FINAL tableau and answer the following questions

			d, Coefficient of					RHS	
			Z	X1	<i>x</i> <sub>2</sub>	х3	X4	<b>X</b> 5	
1	Z	0	1	0	0.5	0	1	0.5	16
ol,	3	1	0	0	0.25	1	0.5	-0.25	3
λ,	$(x_I)$	2	0	1	1.25	0	-0.5	0.75	2

6,

$$^{2}$$
 2. Calculate the allowable increase and allowable decrease for  $b_{I}$ 

For each scenario (below) follow the sensitivity analysis procedure and comment on your results.

6. Change the right-hand sides 
$$\begin{bmatrix} b_1 \\ b_2 \end{bmatrix} = \begin{bmatrix} 11 \\ 10 \end{bmatrix} \Rightarrow \begin{bmatrix} 15 \\ 15 \end{bmatrix}$$

7. Change the coefficients of 
$$x_2 \begin{bmatrix} c_2 \\ a_{12} \\ a_{13} \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix} \rightarrow \begin{bmatrix} 4 \\ 2 \\ 3 \end{bmatrix}$$

A = 
$$5A = \begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{3} \end{bmatrix}$$
 (8. Introduce a new variable  $x_6$  with coefficients  $x_6 \begin{bmatrix} c_6 \\ a_{16} \\ a_{16} \end{bmatrix} = \begin{bmatrix} 4.5 \\ 3 \\ 3 \end{bmatrix}$ 

7. Change the coefficients of 
$$x_2 \begin{bmatrix} c_2 \\ a_{12} \\ a_{13} \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix} \Rightarrow \begin{bmatrix} 4 \\ 2 \\ 3 \end{bmatrix}$$

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