Que- Using simplex method to solve

$\text{Max } z = 4x_1 + 10x_2$

s.t. $2x_1 + x_2 \le 50$

$2x_1 + 5x_2 \le 100$

$2x_1 + 3x_2 \le 90$

$x_1, x_2 \ge 0$

$2x_1 + x_2 + x_3 = 50$

$2x_1 + 5x_2 + x_4 = 100$

$2x_1 + 3x_2 + x_5 = 90$

$x_1, x_2, x_3, x_4, x_5 \ge 0$

$\text{Max } z = 4x_1 + 10x_2 + 0x_3 + 0x_4 + 0x_5$

Initial simplex table

		c_j	4	10	0	0	0	
B	C_B	x_B	y_1	y_2	y_3	y_4	y_5	Min Ratio
y_3	0	50	2	1	1	0	0	50
y_4	0	100	2	5*	0	$\boxed{1}$	0	20 →
y_5	0	90	2	3	0	0	1	30
		$z = C_B x_B$, $z = 0$	-4	-10 ↑ incoming	0	0	0	

Net evaluation $z_j - c_j$

B	C_B	x_B	y_1	y_2	y_3	y_4	y_5	MR
y_3	0	50	2	1	1	0	0	50
y_2	10	20	2/5	1	0	1/5	0	20
y_5	0	90	2	3	0	0	1	90

							M.R
y_3	0	30	8/5*	0	1	-1/5	0	30×5/8 →
y_2	10	20	2/5	1	0	1/5	0	20×5/2
y_5	0	30	4/5	0	0	-3/5	0	
		z=200	0	0	0	2	0	

Net eval. $z_j - c_j$ (No negative)

$x_2 = 20$, $x_1 = 0$ (nonbasic)

$Z = c_1 x_1$
$z = 0$
$Z = c_2 x_2$
$= 10 \times 20$
max $\boxed{Z = 200}$

Since net evaluation corresponding to nonbasic variable x_1 is zero therefore an alternative basic soln exist.

y_3	0	~~150/8~~ 20	1	0	5/8	-1/8	0
	10		2/5	1	0	1/5	0
	0	30	4/5	0	0	-3/5	0

B	C_B	X_B	y_1	y_2	y_3	y_4	y_5	M.R
y_1	4	150/8	1	0	5/8	-1/8	0	
y_2	10	25/2	0	1	-1/4	1/8	0	
y_5	0	15	0	0	-1/2	-1/2	1	
		$Z = 200$	0	0	0	2	0	

Net evaluation

$x_1 = \frac{150}{8}$ $x_2 = 25/2$

Convex set - $x, y \in S$
$\lambda x + (1-\lambda) y \in S \ \forall \lambda \in [0\ 1]$

C. Combination - $\begin{bmatrix} 0 \\ 20 \\ 30 \\ 0 \\ 30 \end{bmatrix}, \begin{bmatrix} 150/8 \\ 25/2 \\ 0 \\ 0 \\ 15 \end{bmatrix}$

$$x^* = \begin{bmatrix} (1-\lambda)150/8 \\ (25+15\lambda)/2 \\ 30\lambda \\ 0 \\ 15+15\lambda \end{bmatrix}$$

$\lambda \in [0\ 1]$ finitely many alternative soln.

If two basic (optimal) feasible solns are there, then the infinite number of basic (optimum) feasible solution can be obtained.