Q3. $\min z = -2x_1 - x_2$ $\quad \therefore \max z' = 2x_1 + x_2$

s.t. $\quad x_1 + x_2 + x_3 = 5$ $\qquad$ and x_3, x_4, x_5

$\qquad -x_1 + x_2 + x_4 = 0$ $\qquad$ could be slack variables.

$\qquad 6x_1 + 2x_2 + x_5 = 21$

$\qquad x_1, x_2, x_3, x_4, x_5 \geq 0$

$\qquad x_1$ to $x_5 \Rightarrow$ integers

Optimal tableau of LP relaxation:

Row	z	x_1	x_2	x_3	x_4	x_5	RHS
0	1	0	0	-0.5	0	-0.25	-7.75
1	0	1	0	-0.5	0	0.25	2.75
2	0	0	1	1.5	0	-0.25	2.25
3	0	0	0	-2	1	0.5	0.5

using row 2 to generate a cut:

$$x_2 + 1.5x_3 - 0.25x_5 = 2.25$$

$$\therefore x_2 + (1 + 0.5)x_3 + (-1 + 0.75)x_5 = 2 + 0.25$$

$$\therefore x_2 + x_3 - x_5 - 2 = 0.25 - 0.5x_3 - 0.75x_5$$

$$\therefore \boxed{0.25 - 0.5x_3 - 0.75x_5 \leq 0} \quad —①$$

using row 3 to generate a cut:

$$-2x_3 + x_4 + 0.5x_5 = 0.5$$

$$\therefore -2x_3 + x_4 + (0 + 0.5)x_5 = 0 + 0.5$$

$$\therefore -2x_3 + x_4 = 0.5 - 0.5x_5$$

$$\therefore \boxed{0.5 - 0.5x_5 \leq 0} \quad —②$$

Ans. $\therefore$ eqn ① & ② are the required cut eqns.

Ans. → also we can prepare the tableaus using the cut in following way:

based on eqⁿ ① : $-0.5x_3 - 0.75x_5 + S_1 = (-0.25)$

∴ New tableau: →

Z	x_1	x_2	x_3	x_4	x_5	S_1	RHS
1	0	0	−0.5	0	−0.25	0	−7.75
0	1	0	−0.5	0	0.25	0	2.75
0	0	1	1.5	0	−0.25	0	2.25
0	0	0	−2	1	0.5	0	0.5
cut → 0	0	0	−0.5	0	−0.75	1	−0.25

and based on eqⁿ ② : $-0.5x_5 + S_1 = (-0.5)$

Z	x_1	x_2	x_3	x_4	x_5	S_1	RHS
1	0	0	−0.5	0	−0.25	0	−7.75
0	1	0	−0.5	0	0.25	0	2.75
0	0	1	1.5	0	0.25	0	2.25
0	0	0	−2	1	0.5	0	0.5
cut → 0	0	0	0	0	−0.5	1	−0.5