Q3

$$\min z = x_1 + x_2$$
s.t.
$$x_1 + 2x_2 = 3$$
$$x_1 - 2x_2 \leq -5$$
$$x_1 + 5x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

∴ removing (−ve) from RHS and adding slack, surplus and artificial variables wherever required to convert it into standard L.P. format:

$$\therefore \min z = x_1 \pm x_2 - ma_1 \quad - ma_2 \quad = 0$$
$$x_1 + 2x_2 + a_1 \quad = 3$$
$$-x_1 + 2x_2 \quad - e_2 + a_2 \quad = 5$$
$$x_1 + 5x_2 \quad + s_3 = 2$$
where, $x_1, x_2, a_1, a_2, e_2, s_3 \geq 0$.

∴ Creating tableau based on it for simplex LP:

	Z	x_1	x_2	a_1	e_2	a_2	S_3	RHS	BV	Ratio
R0	1	-1	-1	$-m$	0	$-m$	0	0	Z	
R1	0	1	2	1	0	0	0	3	a_1	
R2	0	-1	2	0	-1	1	0	5	a_2	
R3	0	1	5	0	0	0	1	2	S_3	

→ Removing $(-m)$ from (R0) to have $(a_1), (a_2)$ coefficient as (0).

		↓								
$mR_1 + mR_2 + R_0 = R0$	1	-1	$-1+4m$	0	$-m$	0	0	$8m$	Z	
R1	0	1	2	1	0	0	0	3	a_1	$3/2$
R2	0	-1	2	0	-1	1	0	5	a_2	$5/2$
← R3	0	1	$\boxed{5}$	0	0	0	1	2	S_3	$2/5$

→ Now, ~~remov~~ x_2 is entering variable based on its highest coefficient value in (R0).
∴ With min. ratio test, we get S_3 as leaving variable.
∴ making x_2 column identity column, we get following table:

$-\frac{4m+1}{5}R_3 + R_0 \to R0$	1	$-1+\left(\frac{1+4m}{5}\right)$	0	0	$-m$	0	$-4m/5$	$8m - \frac{8m}{5} + \frac{3+2}{5}$	Z	
$-\frac{1}{5}R_3 + R_1 \to R1$	0	$1-2/5$	0	1	0	0	$-2/5$	$11/5$	a_1	$a_1 = 11/5$
$-\frac{2}{5}R_3 + R_2 \to R2$	0	$-7/5$	0	0	-1	1	$-2/5$	$21/5$	a_2	$a_2 = 21/5$
$\frac{R_3}{5} \Rightarrow R3$	0	$1/5$	1	0	0	0	$1/5$	$2/5$	x_2	

∴ So, we don't have any feasible solution as we have a_1, a_2 still in solution and no further iteration.