Integer Programming

Make a **menu driven program** integer programming using Branch & Bound algorithm with the following options (a) initial table (b) table of ith iteration (c) optimal solution (if exists otherwise generate report for infeasibility, unboundedness, alternative optimum etc.) Solve it manually first and check the answers. Solve the same with cutting plane method.

1. Maximize $Z = 5x_1 + 7x_2$, Subject to $-2x_1 + 3x_2 \le 6$, $6x_1 + x_2 \le 30$, $x_1, x_2 \ge 0$ *and integers*.

   (Ans. $x_1 = \dfrac{21}{5}$, $x_2 = \dfrac{24}{5}$, $Z = \dfrac{273}{5}$)

2. Maximize $Z = 2x_1 + 3x_2$, Subject to $6x_1 + 5x_2 \le 25$, $x_1 + 3x_2 \le 10$, $x_1, x_2 \ge 0$ *and integers*

   (Ans. $x_1 = 2$, $x_2 = 2$, $Z = 10$)

3. Maximize $Z = 3x_1 + x_2 + 3x_3$, Subject to $-x_1 + 2x_2 + x_3 \le 4$, $2x_2 - \dfrac{3}{2}x_3 \le 1$, $x_1 - 3x_2 + 2x_3 \le 3$, $x_1, x_2, x_3 \ge 0$ and integers,

   (Ans. $x_1 = 5$, $x_2 = 2$ $x_3 = 2$, $Z = 23$)

4. Maximize $Z = 2x_1 + 20x_2 - 10x_3$, Subject to

$2x_1 + 20x_2 + 4x_3 \leq 15$, $6x_1 + 20x_2 + 4x_3 = 20$ $x_1, x_2, x_3 \geq$

0 *and are integers*

(Ans. $x_1 = 2$, $x_2 = 0$, $x_3 = 2$, $Z = -16$)