

1. Formulate the satisfiability of the following Boolean expression as an integer linear program with a suitable objective function. You need not solve the ILP.

$$(x_1 + x_2 + \overline{x_3}) \cdot (\overline{x_1} + x_3) \cdot (x_1 + \overline{x_2}) \cdot (\overline{x_2} + \overline{x_3}) \cdot (x_1 + \overline{x_2} + x_3)$$

2. Show that the following matrix is totally unimodular (Hint: Use Theorem 13.3):

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 \end{bmatrix}$$

3. Exercise 13.9
4. Exercise 14.1 (You may start from tableau (14.17) in Example 14.2)
5. Solve the following ILP:

Maximize $2x_1 + x_2$ subject to

$$2x_1 + 5x_2 \leq 17$$

$$3x_1 + 2x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

$$x_1, x_2 \text{ integer}$$