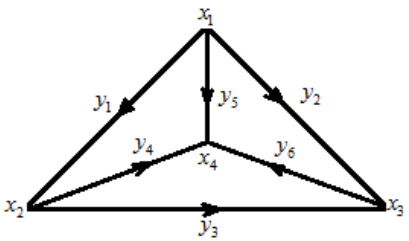
Step-1

Using the nodes to be the column heads and edges to be the row heads, we have 4 nodes and 6 edges which result in the incidence matrix A of order 6×4



$$A = \begin{array}{c} \\ y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \end{array} \begin{array}{c} \begin{array}{cccc} x_1 & x_2 & x_3 & x_4 \end{array} \\ \begin{bmatrix} -1 & 1 & 0 & 0 \\ -1 & 0 & 1 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & -1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & -1 & 1 \end{bmatrix} \end{array}$$

Step-2

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

$$A^T A = \begin{bmatrix} 3 & -1 & -1 & -1 \\ -1 & 3 & -1 & -1 \\ -1 & -1 & 3 & -1 \\ -1 & -1 & -1 & 3 \end{bmatrix}$$

Step-3

$$C = \begin{bmatrix} c_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & c_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & c_3 & 0 & 0 & 0 \\ 0 & 0 & 0 & c_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & c_5 & 0 \\ 0 & 0 & 0 & 0 & 0 & c_6 \end{bmatrix}$$

$$A^T CA = \begin{bmatrix} C_1 + C_2 + C_5 & -C_1 & -C_2 & -C_5 \\ -C_1 & C_1 + C_2 + C_4 & -C_3 & -C_4 \\ -C_2 & -C_3 & C_2 + C_3 + C_6 & -C_6 \\ -C_5 & -C_4 & -C_6 & C_4 + C_5 + C_6 \end{bmatrix}$$

Therefore the graph where the Câ€™s will appear on the main diagonal of $A^T CA$.