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# Computer Lab 2 – Circuits
# Dylan Zwick
# Maple Code for Solving Main Problem
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A := <<-1,-1,0,0,0,0,0,0,0,0>|<1,0,-1,-1,0,0,0,0,0,0>|<0,1,0,0,-1,-1,0,0,0,0>|<0,0,0,
1,1,0,-1,-1,0,0>|<0,0,1,0,0,0,1,0,-1,0>|<0,0,0,0,0,1,0,1,0,-1>|<0,0,0,0,0,0,0,0,1,
1>);
```

$$\begin{bmatrix} -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 \end{bmatrix} \quad (1)$$

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with(LinearAlgebra) :
T := Transpose(A);
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$$\begin{bmatrix} -1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & -1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & -1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix} \quad (2)$$

```
C := <<1,0,0,0,0,0,0,0,0,0>|<0,1/5,0,0,0,0,0,0,0,0>|<0,0,1,0,0,0,0,0,0,0>|<0,0,0,1,0,
0,0,0,0,0>|<0,0,0,0,1,0,0,0,0,0>|<0,0,0,0,1,0,0,0,0,0>|<0,0,0,0,0,1,0,0,0,0>|<0,0,
0,0,0,0,1,0,0,0>|<0,0,0,0,0,0,1/5,0>|<0,0,0,0,0,0,0,0,1,1>);
```

$$\begin{bmatrix}
 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & \frac{1}{5} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \frac{1}{5} & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
 \end{bmatrix} \tag{3}$$

$B := T.C.A;$

$$\begin{bmatrix}
 \frac{6}{5} & -1 & -\frac{1}{5} & 0 & 0 & 0 & 0 \\
 -1 & 3 & 0 & -1 & -1 & 0 & 0 \\
 -\frac{1}{5} & 0 & \frac{11}{5} & -1 & 0 & -1 & 0 \\
 0 & -1 & -1 & 4 & -1 & -1 & 0 \\
 0 & -1 & 0 & -1 & \frac{11}{5} & 0 & -\frac{1}{5} \\
 0 & 0 & -1 & -1 & 0 & 3 & -1 \\
 0 & 0 & 0 & 0 & -\frac{1}{5} & -1 & \frac{6}{5}
 \end{bmatrix} \tag{4}$$

$$eqn1 := \left(\frac{6}{5}\right) \cdot v1 - v2 - \left(\frac{1}{5}\right) \cdot v3 = 12;$$

$$\frac{6}{5} v1 - v2 - \frac{1}{5} v3 = 12 \tag{5}$$

$$eqn2 := -v1 + 3 \cdot v2 - v4 - v5 = 0;$$

$$-v1 + 3 v2 - v4 - v5 = 0 \tag{6}$$

$$eqn3 := -\left(\frac{1}{5}\right)v1 + \left(\frac{11}{5}\right)v3 - v4 - v6 = 0;$$

$$-\frac{1}{5} v1 + \frac{11}{5} v3 - v4 - v6 = 0 \tag{7}$$

$$eqn4 := -v2 - v3 + 4 \cdot v4 - v5 - v6 = 0;$$

$$-v2 - v3 + 4 v4 - v5 - v6 = 0 \tag{8}$$

$$eqn5 := -v2 - v4 + \left(\frac{11}{5}\right) \cdot v5 - \left(\frac{1}{5}\right) \cdot v7 = 0;$$

$$-v_2 - v_4 + \frac{11}{5} v_5 - \frac{1}{5} v_7 = 0 \quad (9)$$

$$\text{eqn6} := -v_3 - v_4 + 3 \cdot v_6 - v_7 = 0; \quad -v_3 - v_4 + 3 v_6 - v_7 = 0 \quad (10)$$

$$\text{eqn7} := -\left(\frac{1}{5}\right) \cdot v_5 - v_6 + \left(\frac{6}{5}\right) \cdot v_7 = -12; \quad -\frac{1}{5} v_5 - v_6 + \frac{6}{5} v_7 = -12 \quad (11)$$

$$\text{eqn8} := v_7 = 0; \quad v_7 = 0 \quad (12)$$

$$\text{solve}(\{\text{eqn1}, \text{eqn2}, \text{eqn3}, \text{eqn4}, \text{eqn5}, \text{eqn6}, \text{eqn7}, \text{eqn8}\}, \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}); \quad \{v_1 = 28, v_2 = 19, v_3 = 13, v_4 = 14, v_5 = 15, v_6 = 9, v_7 = 0\} \quad (13)$$

$$v := \langle 28, 19, 13, 14, 15, 9, 0 \rangle;$$

$$\begin{bmatrix} 28 \\ 19 \\ 13 \\ 14 \\ 15 \\ 9 \\ 0 \end{bmatrix} \quad (14)$$

C.A.v;

$$\begin{bmatrix} -9 \\ -3 \\ -4 \\ -5 \\ 1 \\ -4 \\ 1 \\ -5 \\ -3 \\ -9 \end{bmatrix} \quad (15)$$

