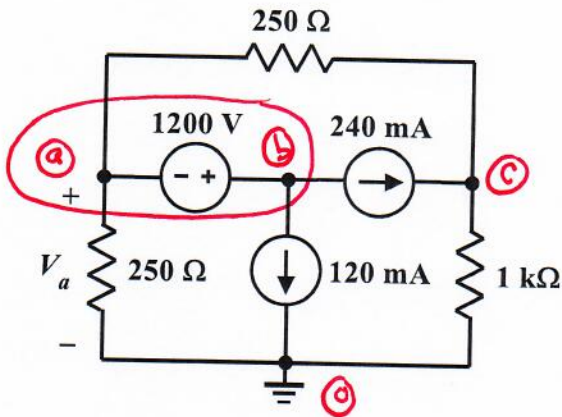


Homework Problem #015

Use the nodal analysis method to write nodal equations and express them in the matrix form discussed in class. Then solve the equations to determine V_a .



$$V_b - V_c = 1200 \quad (\text{constraint})$$

$$\frac{V_a - V_c}{250} + 0.24 + 0.12 + \frac{V_a}{250} = 0 \quad (\text{KCL for the supernode})$$

$$\frac{V_c - V_a}{250} - 0.24 + \frac{V_c}{1000} = 0 \quad (\text{KCL for node c})$$

In matrix form:

$$\begin{bmatrix} -1 & 1 & 0 \\ 1/250 & 0 & -1/250 \\ -1/250 & 0 & 1/2000 \end{bmatrix} \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = \begin{bmatrix} 1200 \\ -0.36 \\ 0.24 \end{bmatrix}$$

Solving yields:

$$V_a = -35 \text{ V}$$