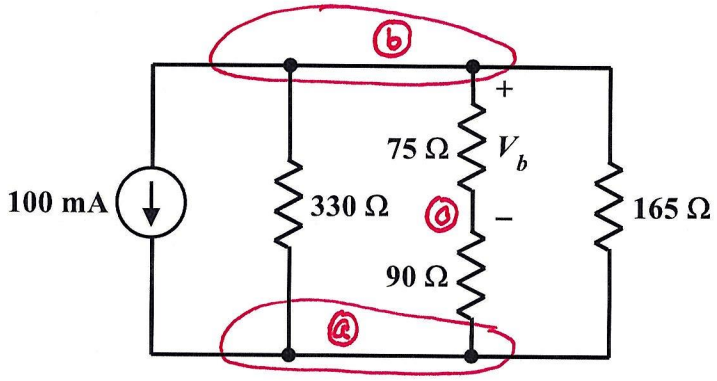
EE 2240

Homework Problem #025



Use the nodal analysis method to determine the value of V_b.

$$-100\text{mA} + \frac{V_a - V_b}{330\,\Omega} + \frac{V_a}{90\,\Omega} + \frac{V_a - V_b}{165\,\Omega} = 0 \qquad \text{(KCL at node a)}$$

$$100\text{mA} + \frac{V_b - V_a}{330\,\Omega} + \frac{V_b}{75\,\Omega} + \frac{V_b - V_a}{165\,\Omega} = 0 \qquad \text{(KCL at node b)}$$

In matrix form:

$$\begin{bmatrix} \frac{1}{330} + \frac{1}{90} + \frac{1}{165} & -\frac{1}{330} - \frac{1}{165} \\ -\frac{1}{330} - \frac{1}{165} & \frac{1}{330} + \frac{1}{75} + \frac{1}{165} \end{bmatrix} \begin{bmatrix} V_a \\ V_b \end{bmatrix} = \begin{bmatrix} 100 \times 10^{-3} \\ -100 \times 10^{-3} \end{bmatrix}$$

Solving yields $V_b = -3$ V

(see next page for MATLAB solution)

```
>> a=[1/330+1/90+1/165 -1/330-1/165; -1/330-1/165 1/330+1/75+1/165]

a =

    0.0202   -0.0091
   -0.0091    0.0224

>> c=[100e-3; -100e-3]

c =

    0.1000
   -0.1000

>> b=a\c

b =

    3.6000
   -3.0000
```