Experiment # 12

Circuit Analysis using MATLAB

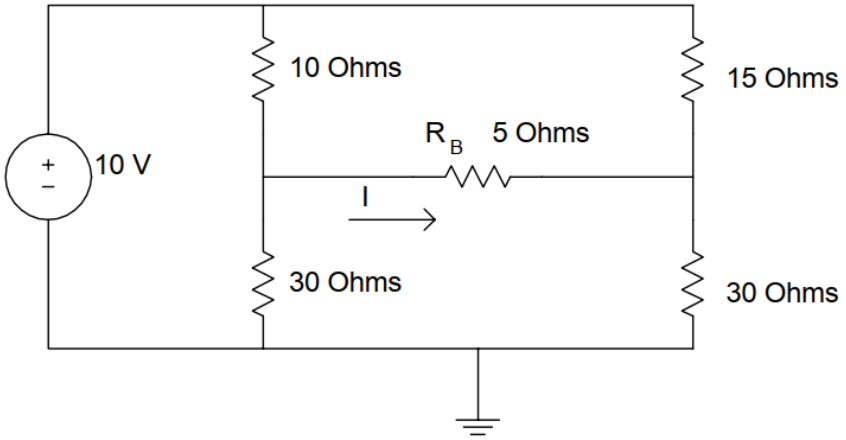
Objectives:

Objectives of this lab is to analyze given circuit using MATLAB

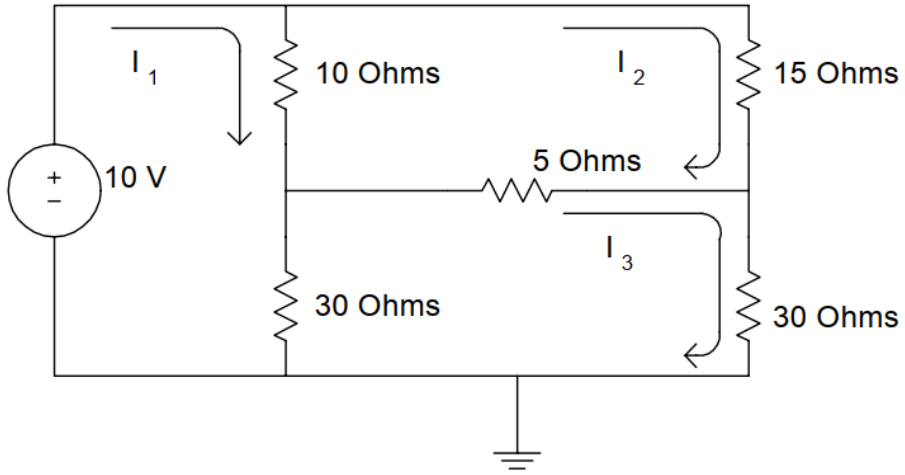
Apparatus:

- Computer with PSPICE and MATLAB software installed on it

Use the mesh analysis to find the current flowing through the resistor RB:



Using loop analysis and designating the loop currents as I_1, I_2, I_3, we obtain the following figure.



Note that $I = I_3 - I_2$

The loop equations are

Loop 1,

$$10(I_1 - I_2) + 30(I_1 - I_3) - 10 = 0$$

$$40I_1 - 10I_2 - 30I_3 = 10 \qquad (4.22)$$

Loop 2,

$$10(I_2 - I_1) + 15I_2 + 5(I_2 - I_3) = 0$$

$$-10I_1 + 30I_2 - 5I_3 = 0 \qquad (4.23)$$

Loop 3,

$$30(I_3 - I_1) + 5(I_3 - I_2) + 30I_3 = 0$$

$$-30I_1 - 5I_2 + 65I_3 = 0 \qquad (4.24)$$

In matrix form, Equations (4.22) and (4.23) become

$$\begin{bmatrix} 40 & -10 & -30 \\ -10 & 30 & -5 \\ -30 & -5 & 65 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ 0 \end{bmatrix} \qquad (4.25)$$

MatLab Code:

lab13.m

```
% this program determines the current
% flowing in a resistor RB
% it computes the loop currents given the impedance
% matrix Z and voltage vector V
% Z is the impedance matrix
% V is the voltage matrix
% initialize the matrix Z and vector V
clc
clear all
Z = [40 -10 -30;
-10 30 -5;
-30 -5 65];
V = [10 0 0]';
% solve for the loop currents
I = inv(Z)*V;
fprintf('the current through I1 is %.3f Amps \n',I(1))
fprintf('the current through I2 is %.3f Amps \n',I(2))
fprintf('the current through I3 is %.3f Amps \n',I(3))
% current through RB is calculated
IRB = I(3) - I(2);
fprintf('the current through R is %.3f Amps \n',IRB)
```

Output:

Command Window

```
the current through I1 is 0.475 Amps
the current through I2 is 0.198 Amps
the current through I3 is 0.235 Amps
the current through R is 0.037 Amps
>>
```

PSPICE Verification: