

*Sample  
PSPICE  
Report*

PSPICE Assignment #1

*Note: The report should  
include a title page similar to  
the one shown.*

John Doe  
EGR 260  
Circuit Analysis  
Due date: 9-9-09

**Note:** The report should include the following 4 sections for each problem:

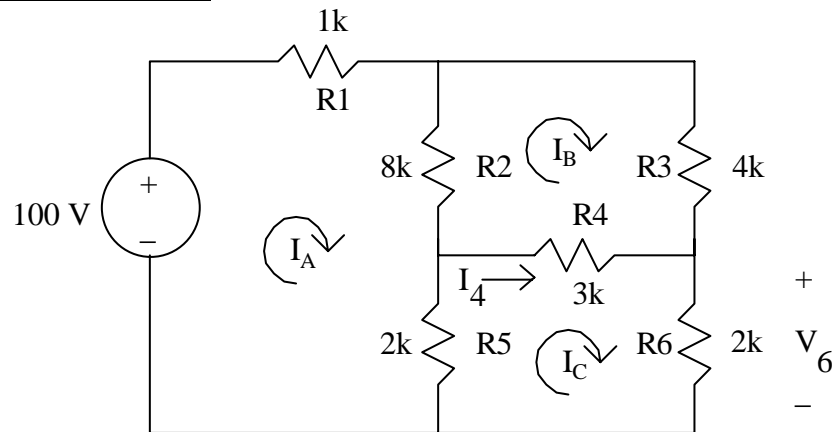
- A) *Problem Description*  
 B) *Preliminary Analysis*  
 C) *PSPICE Analysis*  
 D) *Discussion/Conclusion*

## Problem 1. Analysis of a Bridge Circuit

### A. Problem Description:

- 1) Analyze the bridge circuit below by hand to determine  $I_4$ ,  $V_6$ , and the power dissipated by the  $4k\Omega$  resistor.
- 2) Analyze the circuit below using PSPICE.
  - Use a Bias Point analysis.
  - Only the values requested should be displayed on the schematic.
  - Move the requested values a short distance away from the circuit components or wires so that the schematic isn't crowded by the values.
- 3) Compare the results of step A and step B in a table and discuss the results.

### B. Preliminary Analysis:



**Mesh Analysis is used to first solve for  $I_A$ ,  $I_B$ , and  $I_C$  :**

**KVL, mesh A:**  $-100 + 1I_A + 8(I_A - I_B) + 2(I_A - I_C) = 0$

**KVL, mesh B:**  $4I_B + 3(I_B - I_C) + 8(I_B - I_A) = 0$

**KVL, mesh C:**  $2I_C + 2(I_C - I_A) + 3(I_C - I_B) = 0$

$$\begin{bmatrix} 11 & -8 & -2 \\ -8 & 15 & -3 \\ -2 & -3 & 7 \end{bmatrix} \cdot \begin{bmatrix} I_A \\ I_B \\ I_C \end{bmatrix} = \begin{bmatrix} 100 \\ 0 \\ 0 \end{bmatrix}$$

so  $I_A = 2124 \text{ mA}$   
 $I_B = 13.72 \text{ mA}$   
 $I_C = 11.95 \text{ mA}$

**Note:** The hand analysis does not need to be typed.

$$I_4 = I_C - I_B = 11.95 - 13.72$$

$$I_4 = -177 \text{ mA}$$

$$V_6 = R_6 \cdot I_C = (2 \text{ k}\Omega)(11.95 \text{ mA})$$

$$V_6 = 23.9 \text{ V}$$

$$P_{4k} = R_3 \cdot (I_B)^2 = (4 \text{ k}\Omega)(-13.72 \text{ mA})^2$$

$$P_{4k} = 0.753 \text{ W}$$

**Note:** Box your final answers

### C. PSPICE Analysis:

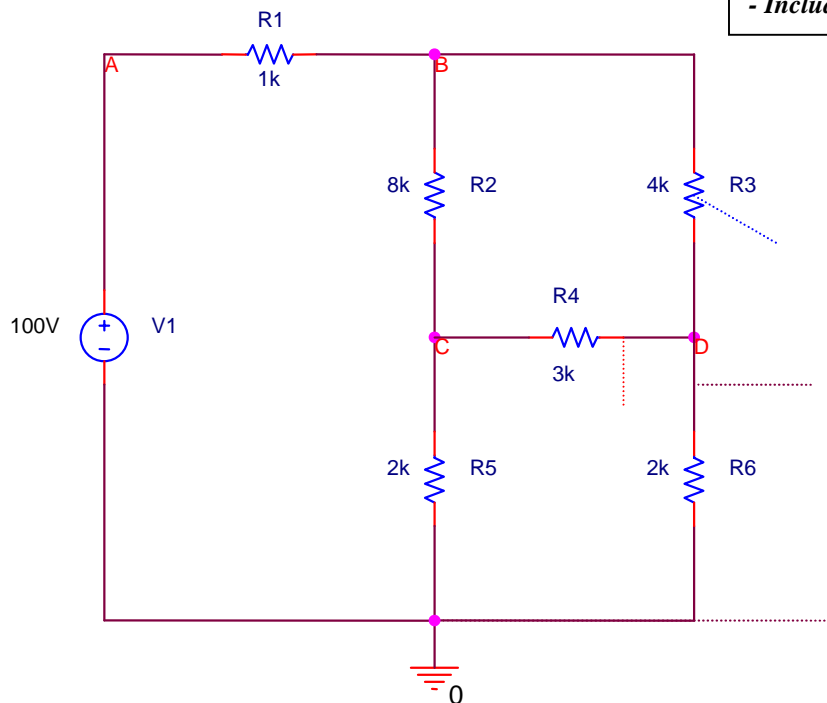
EGR 260  
Circuit Analysis  
Assignment #1 - Problem  
John Doe

Purpose: Find the current through R4, the voltage across R6, and the power dissipated by R3

Analysis type: Bias Point

**Hints for good schematics:**

- Include your name, course name and number, assignment number and problem number
- Label all nodes
- Include a Purpose statement
- List the type of analysis (and details)
- Display all attributes that are changed
- Use component names identical to the ones used in the hand analysis when possible
- Include any other useful comments



**This section of the report should include:**

- Schematic
- Output File (only if it contains any required output information)
- Any required graphs generated by PSPICE.

**Note:** Schematics and graphs can be printed directly from PSPICE or they can be copied into a word processing document using the Windows clipboard. Output files are text files and can be opened using a word processor and copied.

**D. Analysis/Discussion:**

The results of the hand analysis and the PSPICE analysis for Problem 1 are shown in the table below. All results are in agreement.

Value	Hand Results	PSPICE Results
I(R4)	-1.77 mA	-1.770 mA *
V(R6)	23.9 V	23.89 V **
P(R3)	753 mW	752.6 mW

*Note: Be sure to compare PSPICE and hand values. They should agree!*

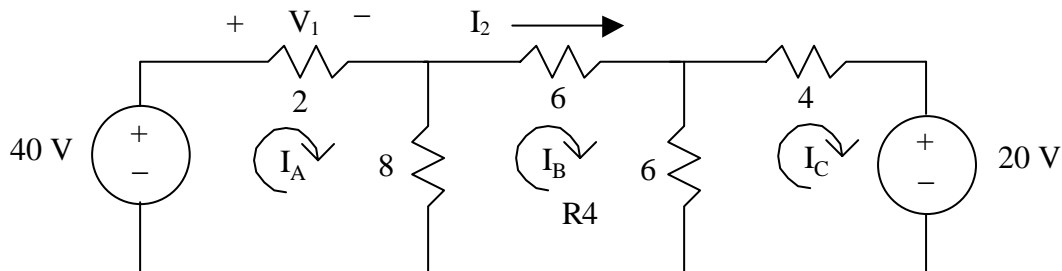
Notes:

- \* The specified direction for I(R4) is to the right through R4. The current value placed on the schematic by PSPICE is to the right of R4, indicating that the current 1.770 mA is to the left. So the current to the right is  $-1.770$  mA.
- \*\* V(R6) is found by taking the difference of the node voltages shown on the schematic.  $V(R6) = V(D) - V(0) = 23.89 - 0 = 23.89$  V.

*Note: Be sure to add notes explaining any sign differences or showing how to calculate a required value from the information provided by PSPICE.*

**Problem 2: (Example 4.4 in Electric Circuits, 6<sup>th</sup> Edition)****A. Problem Description:**

- 1) Analyze the circuit below by hand to determine  $V_1$  and  $I_2$ .
- 2) Analyze the circuit below using PSPICE.
  - Use a DC Sweep analysis.
  - Use a voltage printer and a current printer so that the values of  $V_1$  and  $I_2$  will be displayed in the OUTPUT file. Box and label the results in the OUTPUT file.
- 3) Compare the results of step A and step B in a table and discuss the results.

**B. Preliminary Analysis:**

**Mesh Analysis is used to first solve for  $I_A$ ,  $I_B$ , and  $I_C$  :**

**KVL, mesh A:**  $-40 + 2I_A + 8(I_A - I_B) = 0$

**KVL, mesh B:**  $8(I_B - I_A) + 6I_B + 6(I_B - I_C) = 0$

**KVL, mesh C:**  $6(I_C - I_B) + 4I_C + 20 = 0$

$$\begin{bmatrix} 10 & -8 & 0 \\ -8 & 20 & -6 \\ 0 & -6 & 10 \end{bmatrix} \cdot \begin{bmatrix} I_A \\ I_B \\ I_C \end{bmatrix} = \begin{bmatrix} 40 \\ 0 \\ -20 \end{bmatrix} \quad \text{so} \quad \begin{array}{l} I_A = 5.60 \text{ A} \\ I_B = 2.00 \text{ A} \\ I_C = -0.80 \text{ A} \end{array}$$

$V_1 = 2 I_A = 2(5.6) = 11.20 \text{ V}$

$V_1 = 11.20 \text{ V}$

$I_2 = I_B = 2.00 \text{ A}$

$I_2 = 2.00 \text{ A}$

### C. PSPICE Analysis:

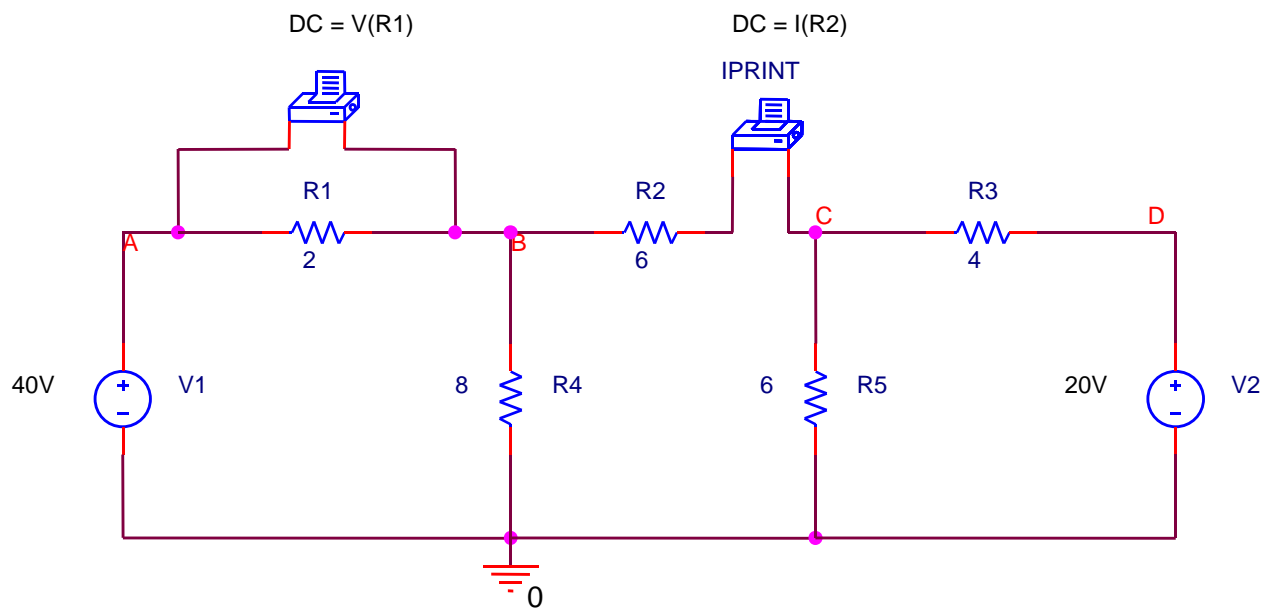
#### Schematic:

EGR 260  
Circuit Analysis  
Assignment #1 - Problem  
#0hn Doe

Purpose: Find the voltage across R1 using a voltage  
and the current through R2 using a current  
printer

Analysis type: DC Sweep - Vary V1 from 40V to 40V in steps of  
1V

**Note:** Be sure to display the  
DC properties of the current  
printer (IPRINT) and the  
voltage printer (VPRINT2).



**Output File:** (see next page)

### D. Analysis/Discussion:

The results of the hand analysis and the PSPICE analysis for Problem 2 are shown in the table below. All results are in agreement.

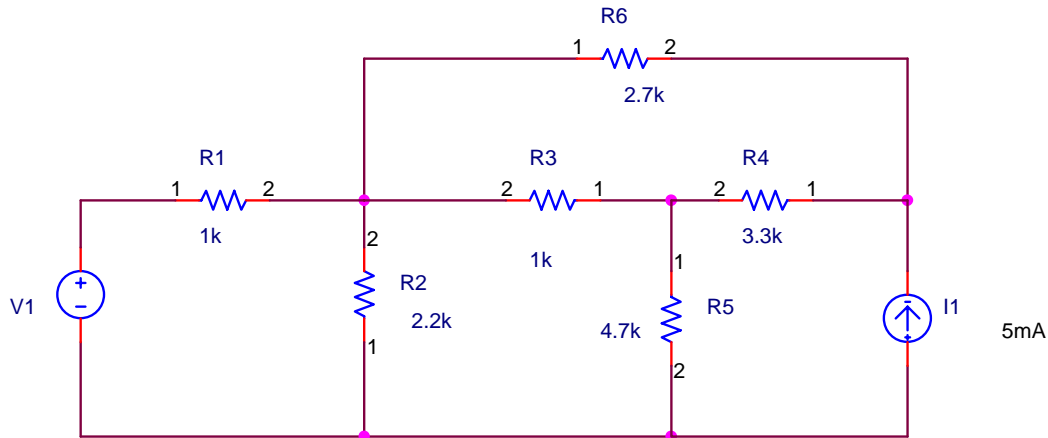
Value	Hand Results	PSPICE Results
V <sub>1</sub>	11.20 V	11.20 V
I <sub>2</sub>	2.000 A	2.00 A



### Problem 3: Varying a voltage source

#### A. Problem Description:

- 1) No hand analysis is required.
- 2) Analyze the circuit below using PSPICE. Vary the voltage source from 0 to 30V in increments of 0.5V to find the value of V1 where the current through R3 is zero.
  - Use a DC Sweep analysis.
  - No OUTPUT file is required with the report.
  - Be sure to include appropriate text on both the schematic and on the graph.
- 3) Discuss the results. Why does the current through R3 become zero?



#### B. Preliminary Analysis: (none required)

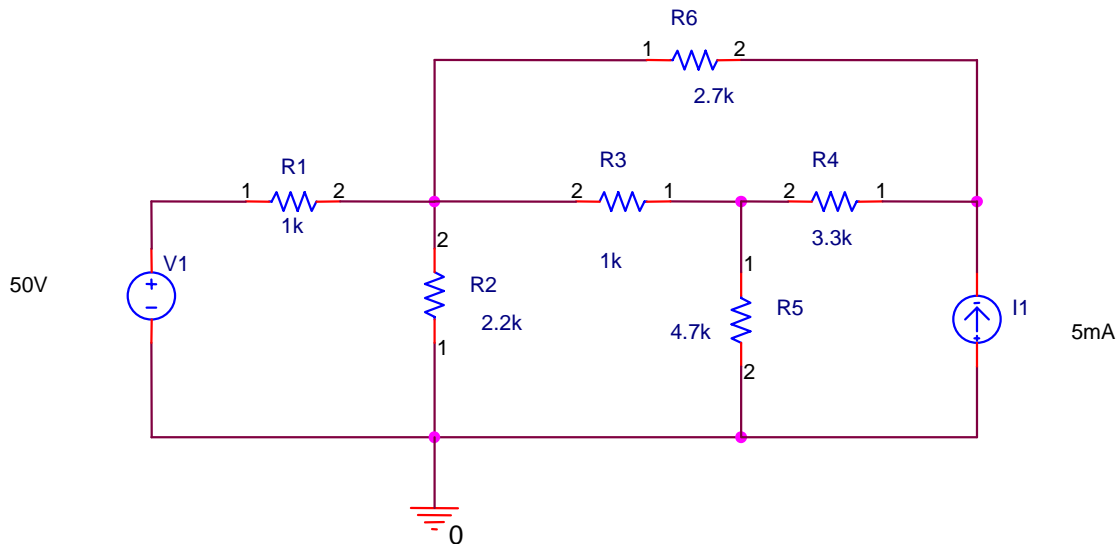
#### C. PSPICE Analysis:

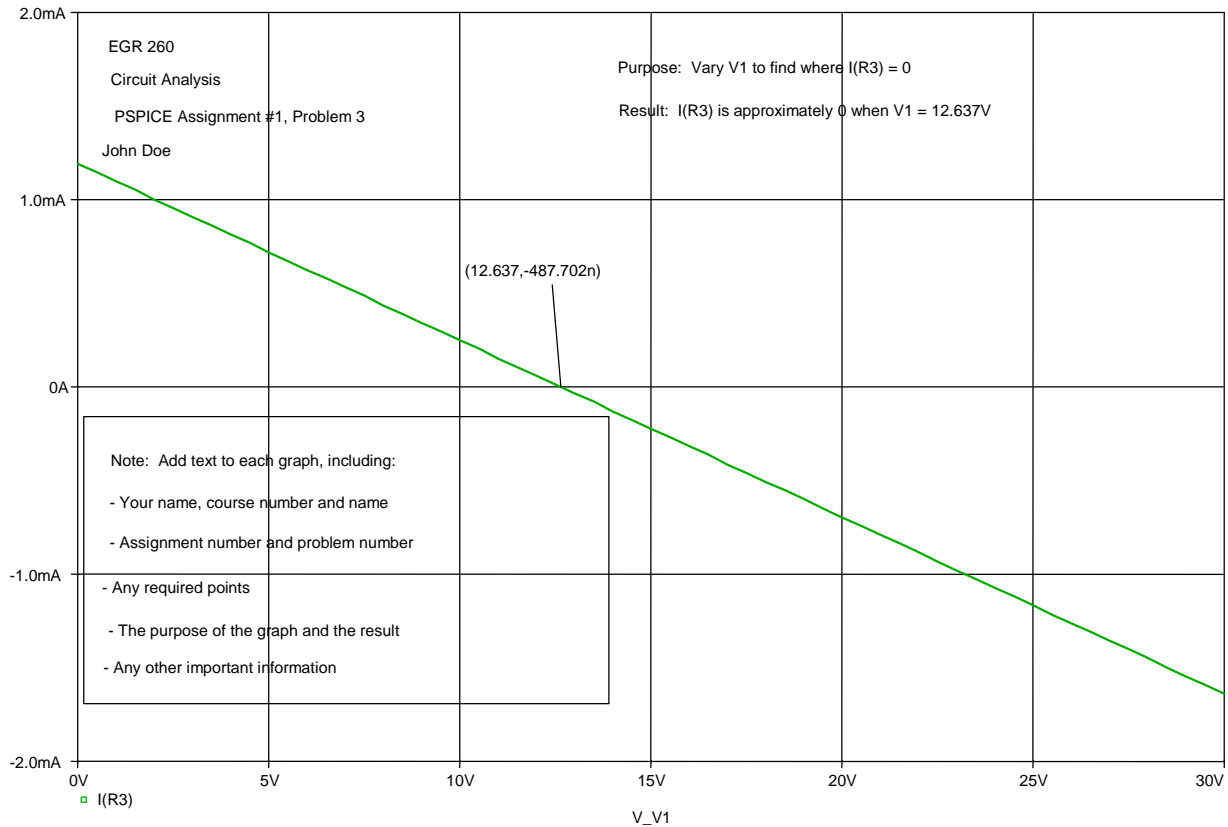
##### Schematic:

EGR 260  
 Circuit Analysis  
 John Doe  
 PSPICE Assignment #1, Problem 3

Purpose: Vary the voltage source, V1, from 0 to 30 V in increments of 0.5V to determine the value of V1 such that the current through R3 is zero.

Analysis Type: DC Sweep - Vary V1 from 0 to 30V in 0.5V increments.



**Graphical Results:****D. Analysis/Discussion:**

As seen from the graph above, the current through resistor R3 becomes approximately zero when the voltage source V1 equals 12.637 V. The principle of superposition is useful in understanding this result. Superposition states that the current through R3 can be found by finding the current found due to each independent source separately with all others “killed” and then by adding the contributions due to each source. In simple terms, the voltage source sends a current to the right through R3 and the current source sends a current to the left through R3. These currents add. When  $V1 = 12.637 V$ , the two currents are equal and cancel each other, resulting in no current passing through R3.