SAMPLE
PSPICE
REPORT

PSPICE Assignment #1

John Doe
EGR 299
Electrical Circuits 1
Due date: 9-9-99

Problem Description:

1. Bridge Circuit with Known Resistances

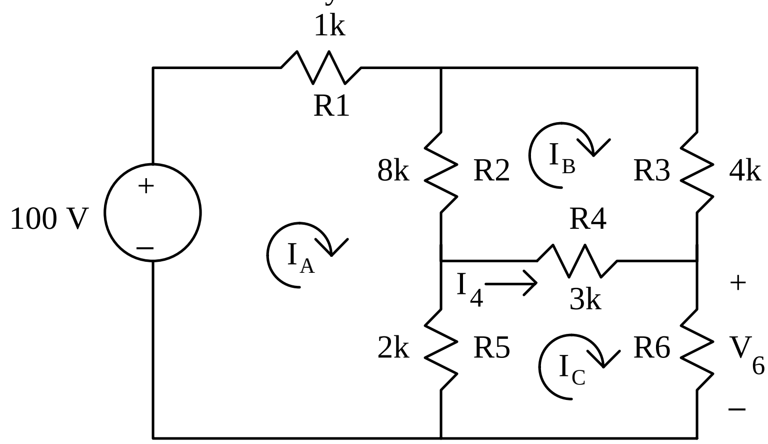
A. Analyze the circuit below when R6 = 2 kΩ by hand in order to determine the values of I_4 and V_6 .

B. Analyze the circuit below using PSPICE when R6 = 2 kΩ. Use a current printer and a voltage printer to print the values of I_4 and V_6.

C. Compare the results of step A and step B in a table.

Preliminary Analysis:

Analyze the circuit below when R6 = 2 kΩ by hand in order to determine the values of I_4 and V_6 .



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 B: $2I_C + 2(I_C - I_A) + 3(I_C - I_B) = 0$

$$\begin{bmatrix} 11 & -8 & -2 \\ -8 & 15 & -3 \\ -2 & -3 & 7 \end{bmatrix} \cdot \begin{bmatrix} I_A \\ I_B \\ I_C \end{bmatrix} = \begin{bmatrix} 100 \\ 0 \\ 0 \end{bmatrix} \quad \text{so} \quad \begin{matrix} I_A = 21.24 \text{ mA} \\ I_B = 13.72 \text{ mA} \\ I_C = 11.95 \text{ mA} \end{matrix}$$

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

$$\boxed{I_4 = -1.77 \text{ mA}}$$

BOX YOUR FINAL ANSWERS

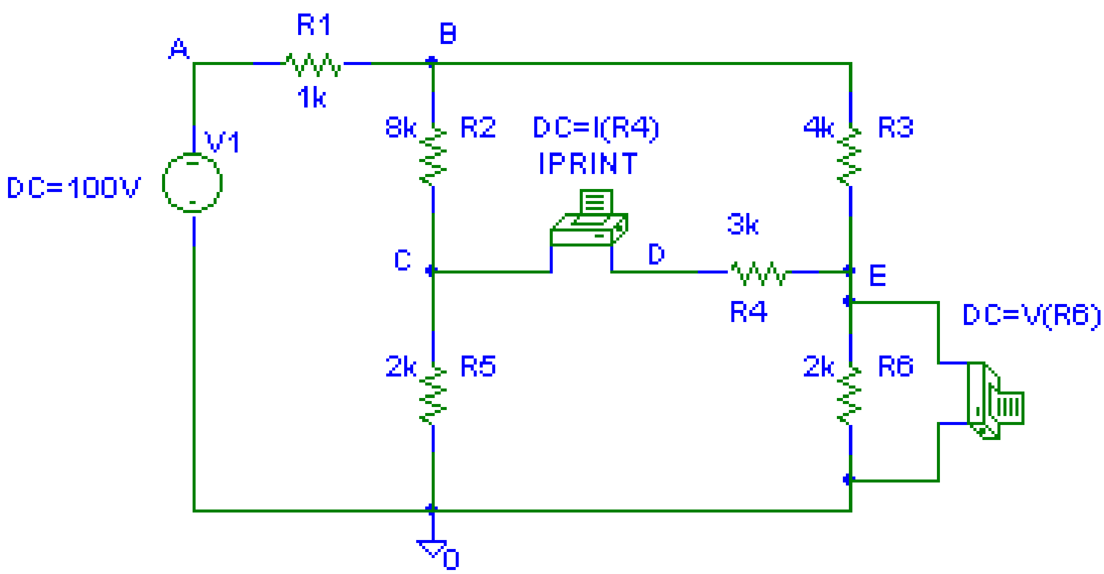
$$V_6 = R6 \cdot I_C = (2\ k\Omega)(11.95 \text{ mA})$$

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

EGR 200
Electric Circuits I
Name: John Doe
File: PS_SAMP1.SCH

Assignment #1 - Problem 1

Purpose: Determine the current through R4 and the voltage across R6 fo
case where R6 = 2000 ohms.



Hints for good schematics:

- Include name, course, Assignment Number
- Label all nodes
- Include a Purpose statement
- Display all attributes that are changed, such as source voltages, variables to be printed, ranges over which a quantity is varied, etc.
- Identify any variables (such as voltages or currents referred to in the problem)
- Use component names identical to the ones used in the hand analysis
- Other useful comments

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**** 09/27/99 12:45:18 ********* NT Evaluation PSpice (July 1997) ************

 * H:\EGR271\PSPICE\PS_SAMP1.sch

 ****     CIRCUIT DESCRIPTION

**************************************************************************

* Schematics Version 8.0 - July 1997
* Mon Sep 27 12:45:16 1999

** Analysis setup **
.DC LIN V_V1 100 100 1
.OP

* From [SCHEMATICS NETLIST] section of msim.ini:
.lib nom.lib

.INC "PS_SAMP1.net"

**** INCLUDING PS_SAMP1.net ****
* Schematics Netlist *

R_R1        A B  1k
V_PRINT1         C D 0V

.PRINT       DC I(V_PRINT1)

.PRINT        DC V([E],[0])
V_V1        A 0 DC 100V
R_R2        B C  8k
R_R5        C 0  2k
R_R3        B E  4k
R_R6        E 0  2k
R_R4        E D  3k

.probe


.END
```

Be sure to include the NETLIST with each circuit

**** 09/27/99 12:45:18 ********* NT Evaluation PSpice (July 1997) ************

* H:\EGR271\PSPICE\PS_SAMP1.sch

****   DC TRANSFER CURVES   TEMPERATURE =   27.000 DEG C

****

V_V1   I(V_PRINT1)

1.000E+02 -1.770E-03   **so I(R4) = -1.77 mA**

Be sure to highlight and clearly define appropriate outputs

**** 09/27/99 12:45:18 ********* NT Evaluation PSpice (July 1997) ************

* H:\EGR271\PSPICE\PS_SAMP1.sch

****   DC TRANSFER CURVES   TEMPERATURE =   27.000 DEG C

****

V_V1   V(E,0)

1.000E+02   2.389E+01   **so V(R6) = 23.89 V**

**** 09/27/99 12:45:18 ********* NT Evaluation PSpice (July 1997) ************

* H:\EGR271\PSPICE\PS_SAMP1.sch

****   SMALL SIGNAL BIAS SOLUTION   TEMPERATURE =   27.000 DEG C

****

NODE   VOLTAGE   NODE   VOLTAGE   NODE   VOLTAGE   NODE   VOLTAGE

(A) 100.0000 (B)   78.7610 (C)   18.5840 (D)   18.5840   (E)   23.8940

VOLTAGE SOURCE CURRENTS
NAME   CURRENT

V_PRINT1   -1.770E-03
V_V1   -2.124E-02

TOTAL POWER DISSIPATION   2.12E+00 WATTS

JOB CONCLUDED
TOTAL JOB TIME   .21

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	23.9 V
V(R6)	-1.77 mA	23.89 V

Be sure
to compare hand
results and PSPICE
results (in a table)
whenever possible.

Problem Description:

2. Bridge Circuit with a Variable Resistor

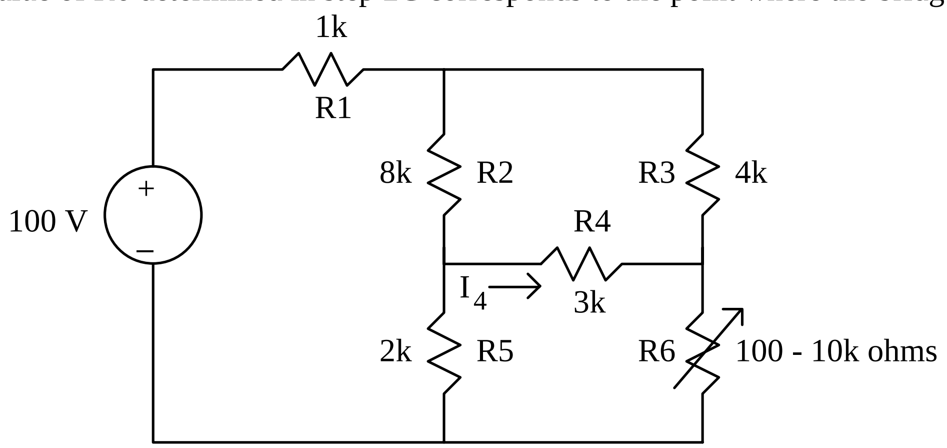
A. Analyze the circuit below where R6 is varied from 100 Ω to 10 kΩ (use 25 points per decade).

B. Use PROBE to graph I_4 versus R6. Place a cursor on the graph where R6 = 2 kΩ and mark the point.

C. Place a cursor on the graph where $I_4 = 0$ and mark the point. This point shows the value of R6 required to make $I_4 = 0$.

D. Compare the value of I_4 revealed in step 2B with the value of I_4 determined in step 1B.

E. The current I_4 should equal zero when the bridge circuit is "balanced". Verify that the value of R6 determined in step 2C corresponds to the point where the bridge is balanced.

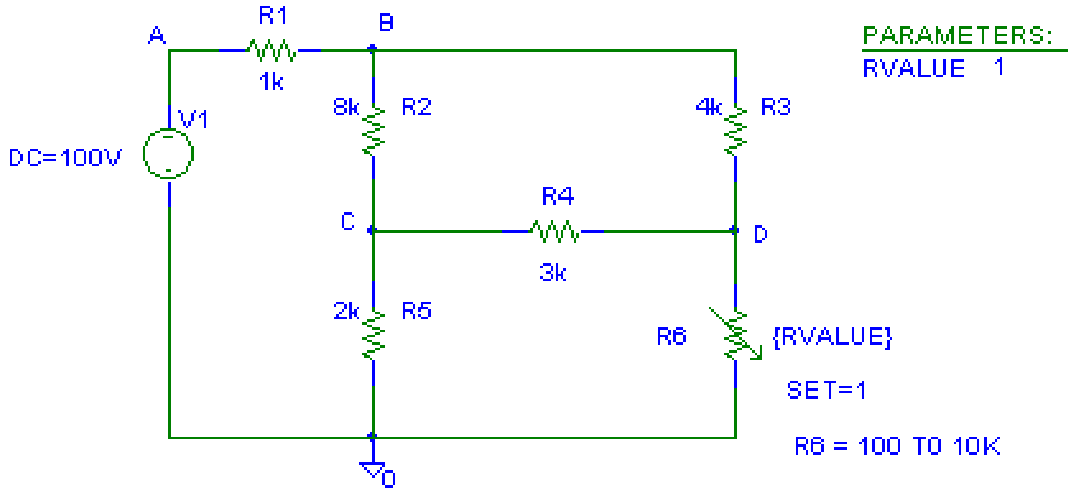


Preliminary Analysis: None required

EGR 200
Electric Circuits I
Name: John Doe
File: PS_SAMP2.SCH

Assignment #1 - Problem 2

Purpose: Vary resistor R6 from 100 ohms to 10,000 ohms and use PROBE to plot I(R4) versus R6.



```
 * H:\EGR271\PSPICE\PS_SAMP2.sch

 ****     CIRCUIT DESCRIPTION

******************************************************************************

* Schematics Version 8.0 - July 1997
* Mon Sep 27 13:23:30 1999

.PARAM         RVALUE=1

** Analysis setup **
.DC LIN PARAM RVALUE 100 10K 25
.OP

* From [SCHEMATICS NETLIST] section of msim.ini:
.lib nom.lib

.INC "PS_SAMP2.net"

**** INCLUDING PS_SAMP2.net ****
* Schematics Netlist *

R_R1        A B  1k
V_V1        A 0 DC 100V
R_R2        B C  8k
R_R5        C 0  2k
R_R3        B D  4k
R_R4        C D  3k
R_R6        D 0 {{RVALUE}*1+.001}

.probe
.END

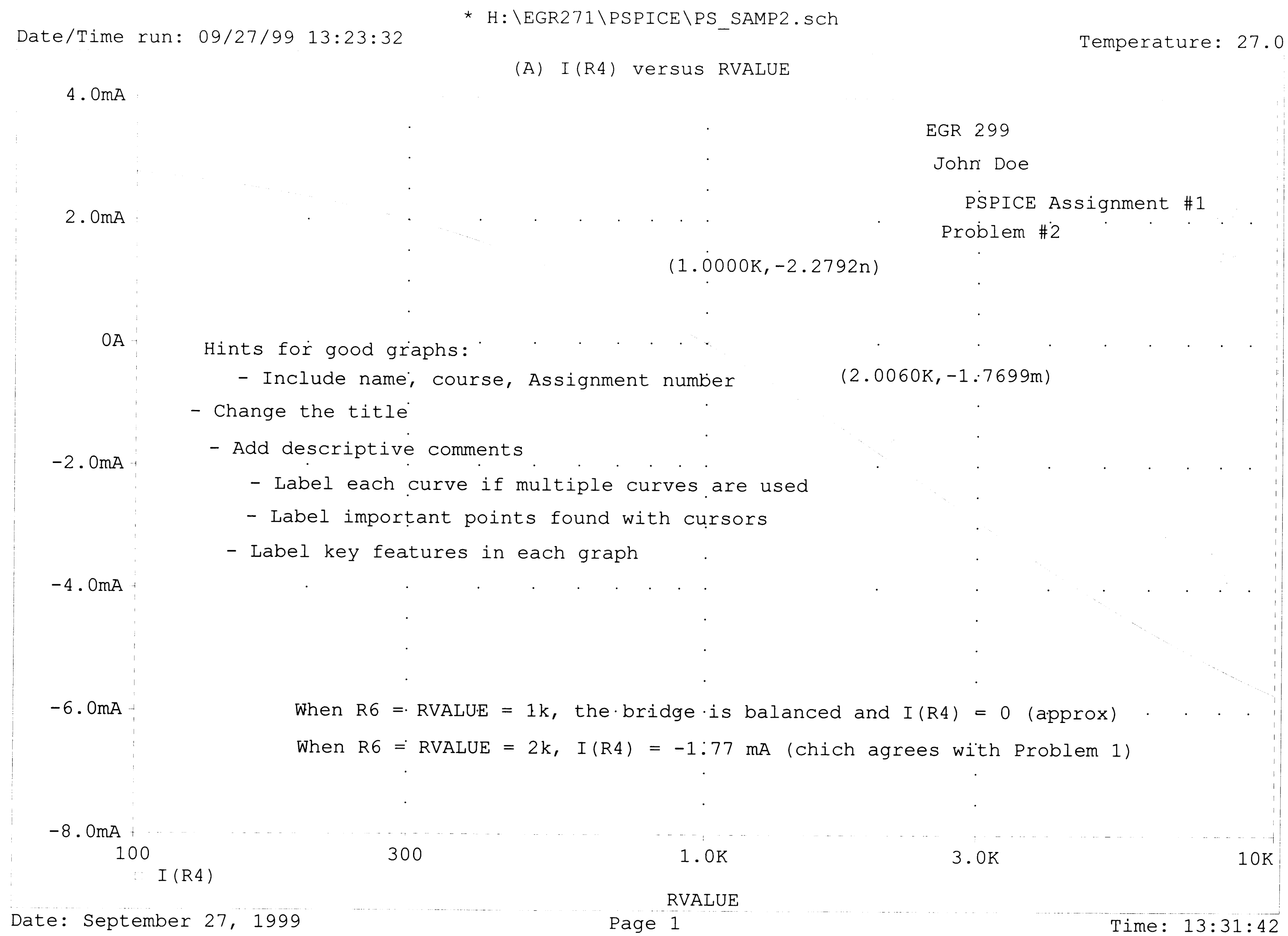
   VOLTAGE SOURCE CURRENTS
   NAME         CURRENT

   V_V1       -2.640E-02

   TOTAL POWER DISSIPATION   2.64E+00  WATTS

        JOB CONCLUDED
        TOTAL JOB TIME            .69
```

Be sure to include the .OUT file (at least the parts containing the NETLIST and any required outputs).


* H:\EGR271\PSPICE\PS_SAMP2.sch
Date/Time run: 09/27/99 13:23:32
Temperature: 27.0
(A) I(R4) versus RVALUE
4.0mA
2.0mA
0A
-2.0mA
-4.0mA
-6.0mA
-8.0mA
EGR 299
John Doe
PSPICE Assignment #1
Problem #2
(1.0000K,-2.2792n)
(2.0060K,-1.7699m)
Hints for good graphs:
- Include name, course, Assignment number
- Change the title
- Add descriptive comments
- Label each curve if multiple curves are used
- Label important points found with cursors
- Label key features in each graph
When R6 = RVALUE = 1k, the bridge is balanced and I(R4) = 0 (approx)
When R6 = RVALUE = 2k, I(R4) = -1.77 mA (chich agrees with Problem 1)
100
300
1.0K
3.0K
10K
I(R4)
RVALUE
Date: September 27, 1999
Page 1
Time: 13:31:42

Analysis/Discussion:

The graph of I(R4) versus R6 generated using PROBE shows that I(R4) varies over a wide range of positive and negative values as R6 is varied. Two points of special interest are marked on the graph:

1) A point was marked where R6 = 2 kΩ (as close as possible). This corresponds to the circuit analyzed in Problem 1 where R6 was a fixed resistor with value 2 kΩ. The result in both cases is the same: I(R4) = -1.77 mA. This also agrees with the hand analysis, as seen in Problem 1.
2) A point was marked where I(R4) = 0 (as close as possible). It is a known fact that this current should be zero when the bridge is "balanced", i.e., when $R2 \cdot R6 = R3 \cdot R5$. Since R2, R3, and R5 are fixed resistors, it is possible to solve for the value of R6 required for a balanced bridge, as shown below:

$$R6 = \frac{R3 \cdot R5}{R2} = \frac{4\ k\Omega \cdot 2\ k\Omega}{8\ k\Omega} = 1\ k\Omega$$

This result is verified by the graph where it is marked that I(R4) = 0 when R6 = 1 kΩ.

EGR 299
Electric Circuits 1
File: PS_SAMP

Due date: 9-9-99

Attached Assignment Sheet (optional)

PSPICE Assignment #1

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B. Analyze the circuit below using PSPICE when R6 = 2 kΩ. Use a current printer and a voltage printer to print the values of I_4 and V_6.

C. Compare the results of step A and step B in a table.

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A. Analyze the circuit below where R6 is varied from 100 Ω to 10 kΩ (use 25 points per decade).

B. Use PROBE to graph I_4 versus R6. Place a cursor on the graph where R6 = 2 kΩ and mark the point.

C. Place a cursor on the graph where $I_4 = 0$ and mark the point. This point shows the value of R6 required to make $I_4 = 0$.

D. Compare the value of I_4 revealed in step 2B with the value of I_4 determined in step 1B.

E. The current I_4 should equal zero when the bridge circuit is "balanced". Verify that the value of R6 determined in step 2C corresponds to the point where the bridge is balanced.