EECT111 – 51C

Lab 1 –Resistor Variability

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn the how resistors vary using 20 resistors with the same color code.

Select a set of 20, 1 kohm resistors.
Measure and record the resistance of each resistor.

Equipment needed:

1 – Digital Multimeter
1 – 20 resistors with the same color code.

Resistor color code = _____
Resistor value = _____
Resistor tolerance = _____

Using Microsoft Excel plot the resistor values and determine:

Smallest resistance = _____
Largest resistance = _____
Average resistance = _____
Standard Deviation = _____

Do any of your resistor values exceed the part tolerance? ____

Sample	Measured Value
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Observations:_____
_____
_____
_____
_____

EECT111 – 50C

Lab 2 – Reading and Sorting Resistors

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn the resistor color code using 15 resistors which must be sorted from smallest to largest value.
Build a resistor kit that includes 15 resistors and, sort resistors based on color code from smallest to largest and measure the resistance of each resistor and verify sorting

Equipment needed:

1 – Digital Multimeter
1 – 15 unique resistors

	Color Code	Measured Value
100 =		
220 =		
330 =		
470 =		
1K =		
2.2K =		
3.3K =		
4.7K =		
10K =		
22K =		
33K =		
47K =		
100K =		
1M =		
10M =		

Observations:_____
_____
_____
_____
_____

EECT111 – 50C

Lab 3 – Series Resistors

Names: _____, _____
Date: _____

The purpose of this lab is to:
Experiment with series circuits and verify that the simulation, analysis (calculations) and test results all agree.

From the resistor kit select 3 resistors (10K, 2.2K, 4.7K)

Measure and record the value of each resistor. Connect the resistors as shown in Figure 1. Measure and record the total resistance, RT. Then connect the resistors as shown in Figure 2, the 9V come from the Elvis II (Modular Engineering Educational Laboratory Platform). Then measure and record with the Digital Multimeter the current and voltages of the series circuit.

Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – resistors.

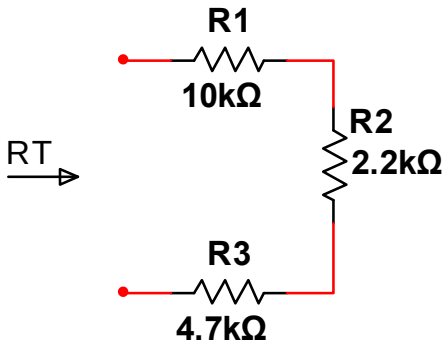


Figure 1

	Measured	Calculated	Simulated
R1 =			
R2 =			
R3 =			
RT =			

Measured = using Digital Multimeter
Calculated = based on color code and Excel values
Simulated = Multisim simulation

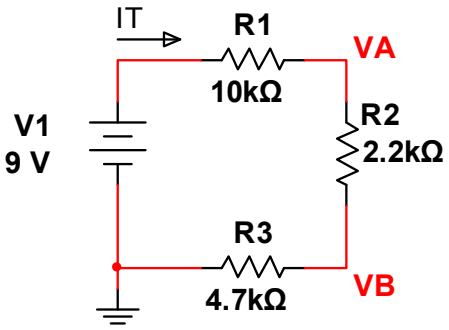


Figure 2

	Measured	Calculated	Simulated
IT =			
V1 =			
VA =			
VB =			

Measured = using Digital Multimeter
Calculated = based on color code and Excel values
Simulated = Multisim simulation

Observations:_____
_____
_____
_____
_____

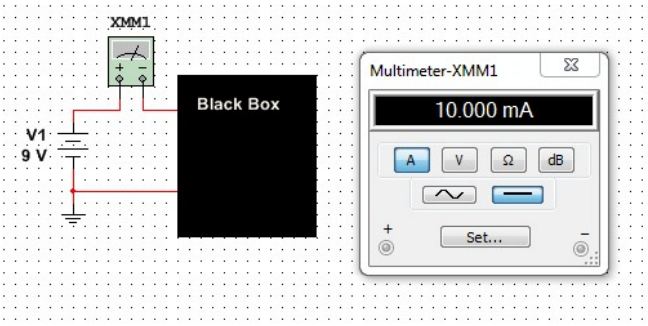
EECT111 – 01C

Lab 4 – Black Box Design

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn about series circuits

The voltage applied to a Black Box is 9V and the measured current draw is 10mA. Design a 3 resistor series circuit that meets the voltage and current requirements using “standard” resistor value.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors

	Design	Measured	Calculated	Simulated
V1 =				
IT =				
RT =				
R1 =				
R2 =				
R3 =				

Observations:_____
_____
_____
_____
_____

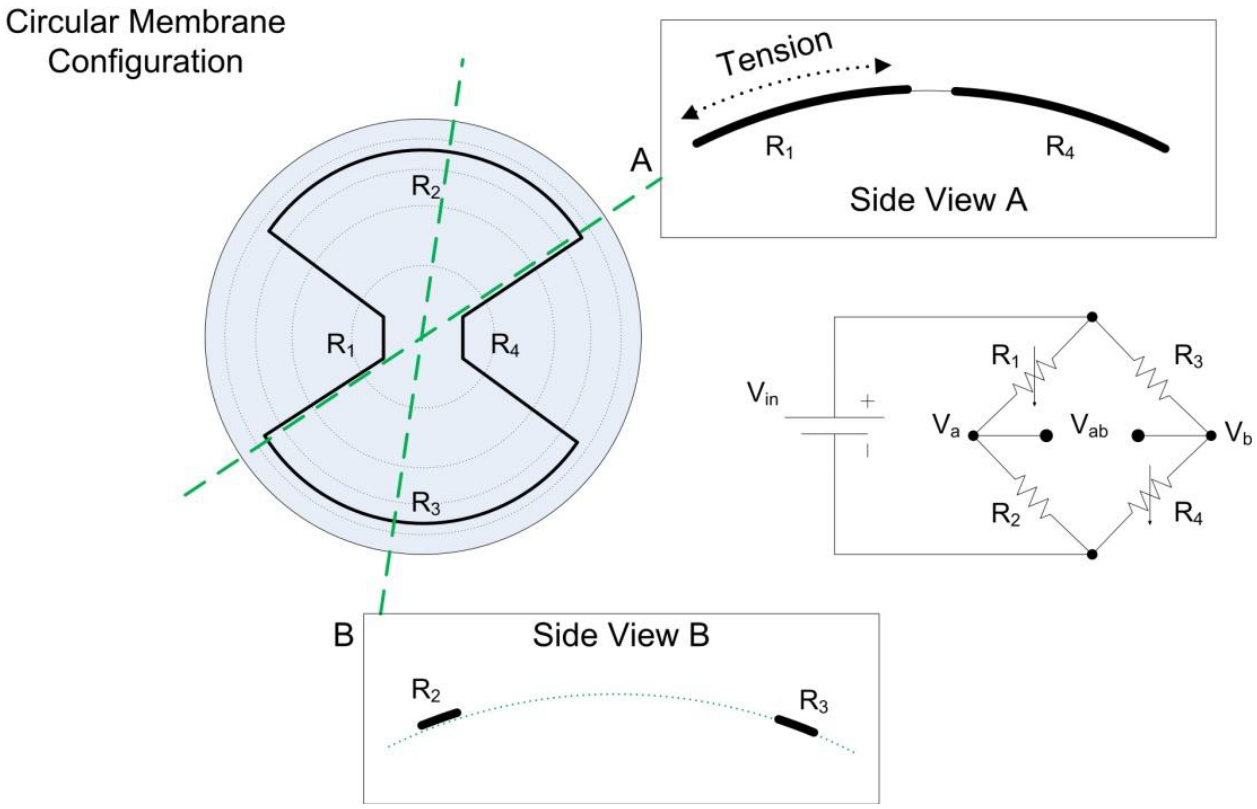
EECT111 – 01C

Lab 5 – MEMS Variable Resistor

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn about variable resistors and a Wheatstone Bridge

Using the Pressure Sensor Model Kit build resistors R1 – R4 except modify the resistor pattern so that only resistor varies, R1. Make R4 a fixed value resistor so that it has the same "pattern" as R2 and R3.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
1 – Pressure Sensor Model Kit
10 – paperclips

	Measured
R1 =	
R2 =	
R3 =	
R4 =	

Observations:_____
_____
_____
_____
_____

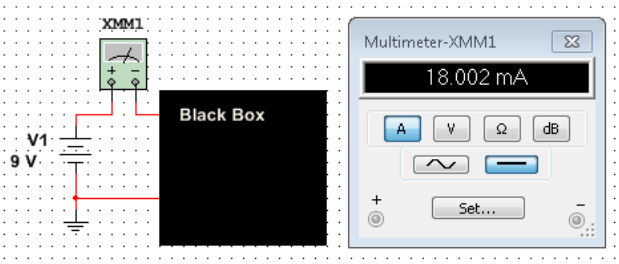
EECT111 – 50C

Lab 6 – Black Box Design

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn about parallel circuits

The voltage applied to a Black Box is 9V and the measured current draw is 18mA. Design a 2 resistor series circuit that meets the voltage and current requirements using “standard” resistor value.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors

	Design	Measured	Calculated	Simulated
V1 =				
IT =				
RT =				
R1 =				
R2 =				

Observations:_____
_____
_____
_____
_____

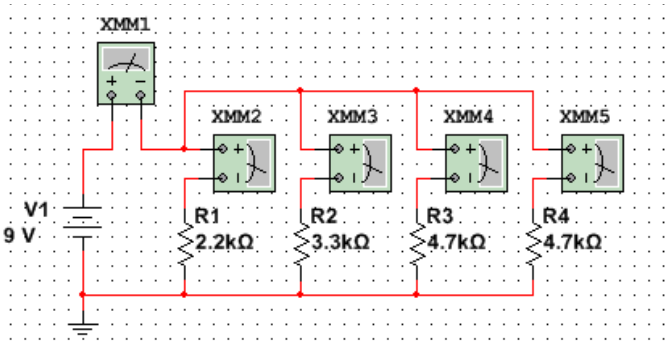
EECT111 – 01C

Lab 7 – 4 Resistor Parallel Circuit

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn about parallel circuits

The voltage applied to 4 parallel resistors x is 9V. Measure all the resistor values, total current and all the branch currents.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
3 – Standard Resistors

	Design	Measured
R1 =		
R2 =		
R3 =		
R4 =		

	Measured	Calculated	Simulated
V1 =			
RT =			
I1 =			
I2 =			
I3 =			
I4 =			
IT =			

Observations:_____
_____
_____
_____
_____

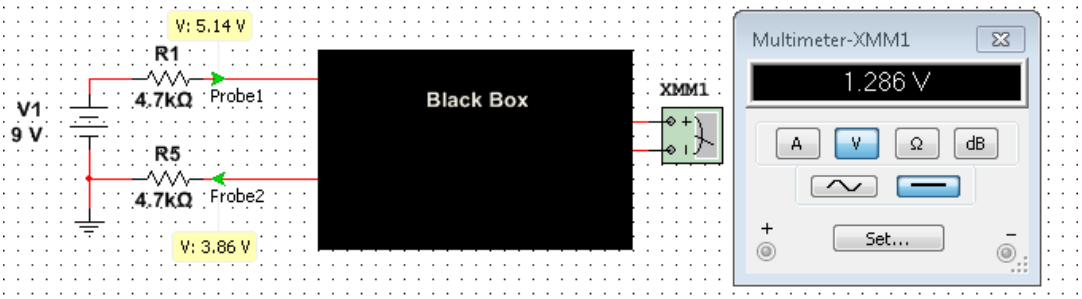
EECT111 – 01C

Lab8 – Black Box 3 Design

Names: _____, _____
Date: _____

The purpose of this lab is to:
Learn about building a circuit that produces exactly 1.3V

Using at least 3 equal value resistors (in the Black Box) design a circuit that produces an output voltage of 1.3V. Then adjust R1 so that the output voltage is exactly 1.3V.



Equipment needed:

1 – Digital Multimeter
1 – Elvis II
5 – Standard Resistors
1 – 5 Kohm pot

	Design	Measured
R1 =		
R2 =		
R3 =		
R4 =		
R5 =		
R(Black Box) =		
R1adj =		

	Measured	Calculated	Simulated
V1 =			
VA =			
VB =			
VA - VB =			
(VA - VB) adj =			

Observations:_____
_____
_____
_____
_____

EECT111 – 01C

Lab 9 – Series/Parallel Resistors

Names: _____, _____, _____, _____, _____

Date: _____

The purpose of this lab is to:
Experiment with series circuits and verify that the simulation, analysis (calculations) and test results all agree.

From the resistor kit select 8 resistors: 2 each 470Ω, 2 each 1kΩ, and 1 each of the following: 2.2kΩ, 3.3kΩ, 4.7kΩ, 10kΩ

Measure and record the value of each resistor. Connect the resistors as shown in Figure 1. Measure and record the total resistance, RT. Then connect the resistors as shown in Figure 2, the 9V come from the Elvis II (Modular Engineering Educational Laboratory Platform). Then measure and record with the Digital Multimeter the current and voltages of the series circuit.

Equipment needed:

1 – Digital Multimeter
1 – Elvis II
8 – resistors.

	Expected	Measured
R1 =		
R2 =		
R3 =		
R4 =		
R5 =		
R6 =		
R7 =		
R8 =		

Expected = value you expect it to be
Measured = using Digital Multimeter

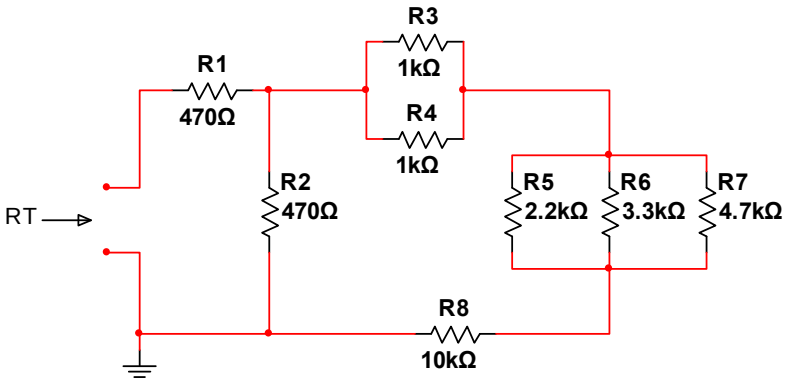


Figure 1
Series/Parallel Circuit

	Calculated	Simulated	Measured
R34 =			
R567 =			
R345678 =			
R2345678 =			
RT =			

Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

	Calculated	Simulated	Measured
V1 =			
IT =			
VA =			
VB =			
VC =			

Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

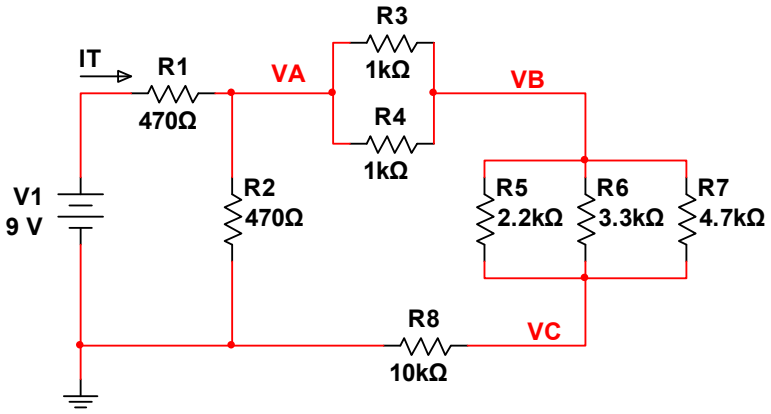


Figure 2
Series/Parallel Circuit

Adjust R2 so that the VA voltage is equal to 4.5V. Then measure the value of the new R2 and calculate and simulate a value that would produce the 4.5V.

	Measured	Simulated	Calculated
VA =			
R2 =			

Calculated = using Excel calculations
Simulated = Multisim simulation
Measured = using Digital Multimeter

Observations:_____
_____
_____
_____
_____

EECT111 – 01C

Lab 10 – Series/Parallel Capacitors

Names: _____, _____, _____

Date: _____

The purpose of this lab is to:
Experiment with series circuits and parallel combinations of capacitors.

The following capacitors are needed (1 each of the following): 10uF, 22uF and 47uF

Measure and record the capacitance of each capacitor using the LCR meter. Connect the capacitors as shown in Figure 1 and measure and record the total capacitance, CT. Then connect the capacitors as shown in Figure 2 and measure and record the total capacitance, CT.

Equipment needed:

1 – LCR Meter
1 – Elvis II
3 – capacitors

	Expected	Measured
C1 =		
C2 =		
C3 =		
CT =		

Expected = value you expect it to be
Measured = using LCR Meter

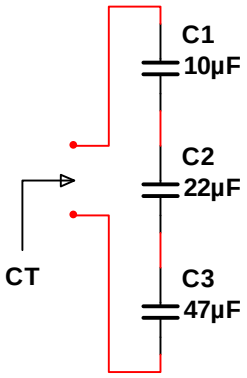


Figure 1
Series Circuit

	Expected	Measured
C1 =		
C2 =		
C3 =		
CT =		

Expected = value you expect it to be
Measured = using LCR Meter

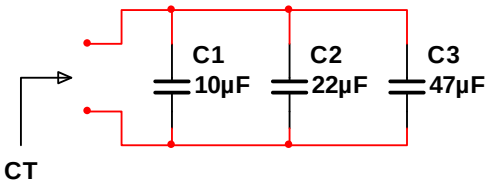


Figure 2
Parallel Circuit

Observations:_____
_____
_____
_____
_____

EECT111 – 01C

Lab 11 – RC Lab

Names: _____, _____, _____

Date: _____

The purpose of this lab is to:
Experiment with RC (Resistor & Capacitor) circuits.

The following capacitors are needed (1 each of the following): 0.47uF, 1uF and 2.2uF

Measure and record the resistor value using the DMM and measure and record the capacitor values using the LCR meter in Table 1. Connect the resistor and capacitor as shown in Figure 1. Connect the Function Generator to the input at V1 and connect Channel 1 of the Oscilloscope to the input and Channel 2 to the output. Adjust the voltage of the Function Generator to 1Vpp at the frequencies shown in Table 2. Measure the input and output voltages using the Oscilloscope. Record the results in Table 2. Change the capacitor and retest.

Equipment needed:

1 – Digital Multimeter
1 – LCR Meter
1 – Oscilloscope
1 – Function Generator
1 – Elvis II
3 – capacitors
1 – resistor

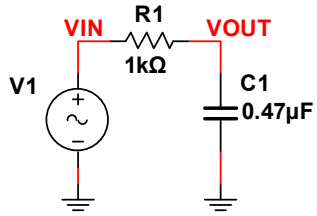


Figure 1
RC Circuit

	Capacitance or Resistance	
	Expected	Measured
C1 =		
C2 =		
C3 =		
R1 =		

Table 1 – Resistance and Capacitances
Expected = value you expect it to be
Measured = using LCR Meter or DMM

	Output Voltage C = _____			Output Voltage C = _____			Output Voltage C = _____		
	Expected	Measured		Expected	Measured		Expected	Measured	
Frequency	Output Voltage	Input Voltage	Output Voltage	Output Voltage	Input Voltage	Output Voltage	Output Voltage	Input Voltage	Output Voltage
10									
50									
100									
200									
300									
400									
500									
600									
700									
800									
900									
1,000									
2,000									
3,000									
4,000									
5,000									
6,000									
7,000									
8,000									
9,000									
10,000									

RC Frequency Response

Expected = value you expect it to be

Observations:_____

_____

_____

_____

_____

EECT111 – 01C

Lab 12 – Series/Parallel Inductors

Names: _____, _____, _____

Date: _____

The purpose of this lab is to:
Experiment with series circuits and parallel combinations of inductors.

The following inductors are needed (1 each of the following): 1mH, 2.2mH and 4.7mH

Measure and record the inductance of each inductor using the LCR meter. Connect the inductors as shown in Figure 1 and measure and record the total inductance, LT. Then connect the inductors as shown in Figure 2 and measure and record the total inductance, LT.

Equipment needed:

1 – LCR Meter
1 – Elvis II
3 – Inductors

	Expected	Simulated	Measured
L1 =			
L2 =			
L3 =			
LT =			

Expected = value you expect it to be
Simulated = using Multisim
Measured = using LCR Meter

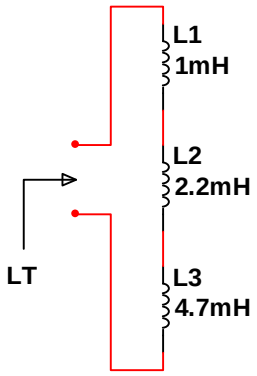


Figure 1
Series Circuit

	Expected	Simulated	Measured
L1 =			
L2 =			
L3 =			
LT =			

Expected = value you expect it to be
Simulated = using Multisim
Measured = using LCR Meter

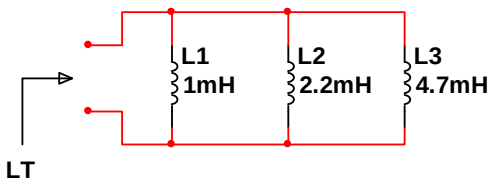


Figure 2
Parallel Circuit

Observations:_____
_____
_____
_____
_____

EECT111 – 01C

Lab 13 – RL Lab

Names: _____, _____, _____

Date: _____

The purpose of this lab is to:
Experiment with RL (Resistor & Inductor) circuits.

The following inductors are needed (1 each of the following): 1mH, 2.2mH and 4.7mH

Measure and record the resistor value using the DMM and measure and record the inductor values using the LCR meter in Table 1. Connect the resistor and inductor as shown in Figure 1. Connect the Function Generator to the input at V1 and connect Channel 1 of the Oscilloscope to the input and Channel 2 to the output. Adjust the voltage of the Function Generator to 1Vpp at the frequencies shown in Table 2. Measure the input and output voltages using the Oscilloscope. Record the results in Table 2. Change the inductor and retest.

Equipment needed:

1 – Digital Multimeter
1 – LCR Meter
1 – Oscilloscope
1 – Function Generator
1 – Elvis II
3 – inductors
1 – resistor, 100 ohm

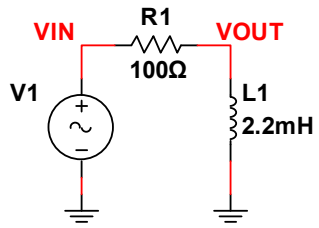


Figure 1
RL Circuit

	Inductance or Resistance	
	Expected	Measured
L1 =		
L2 =		
L3 =		
R1 =		

Table 1 – Resistance and Inductances
Expected = value you expect it to be
Measured = using LCR Meter or DMM

	Output Voltage L = _____			Output Voltage L = _____			Output Voltage L = _____		
	Expected	Measured		Expected	Measured		Expected	Measured	
Frequency	Output Voltage	Input Voltage	Output Voltage	Output Voltage	Input Voltage	Output Voltage	Output Voltage	Input Voltage	Output Voltage
10									
50									
100									
200									
300									
400									
500									
600									
700									
800									
900									
1,000									
2,000									
3,000									
4,000									
5,000									
6,000									
7,000									
8,000									
9,000									
10,000									

RL Frequency Response

Expected = value you expect it to be

Measured = Using Oscilloscope

Observations:_____

_____

_____

_____

_____