Izmir Institute of Technology
Elec. & Electronics Eng. Dep.
Circuit Lab

Linearity, Proportionality, and Superposition And Node-Mesh Analysis
Lab#2

Preparation Task

1. For the circuit in *Figure 1*, calculate the proportionality constant that relates the output voltage to the input voltage, **k= Vout/Vin.**

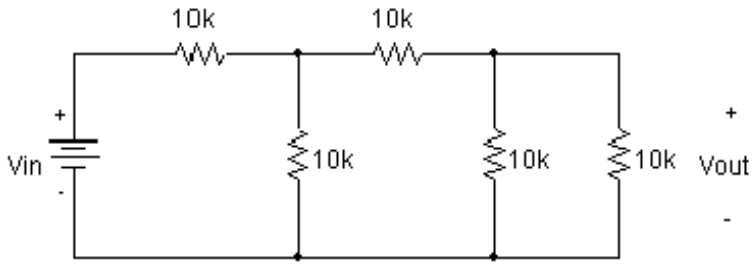


Figure 1: *Circuit for Problem 1*

2. Using the node and mesh analysis, calculate the voltages V_1 and V_2 and the currents I_1, I_2, I_3 as shown in *Figure 2*. (V_{in1}=8V, V_{in2} =12V)

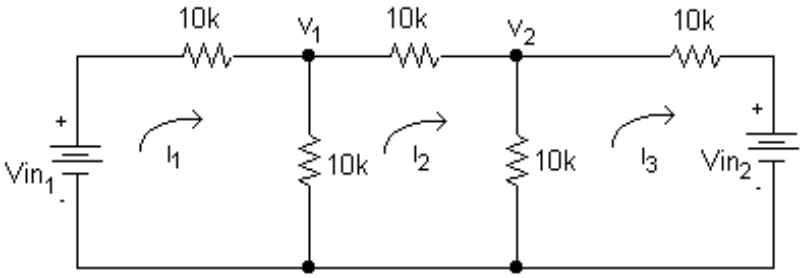


Figure 2: *Circuit for Problem 2*

3. Calculate the voltages V_1 and V_2 as shown in *Figure 3* and *Figure 4* respectively.

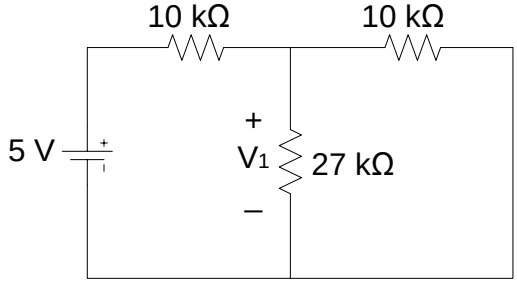


Figure 3: *Circuit 1 for Problem 3*

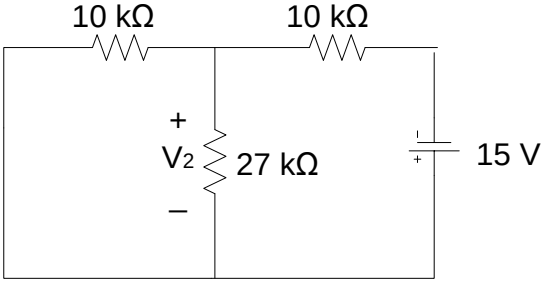


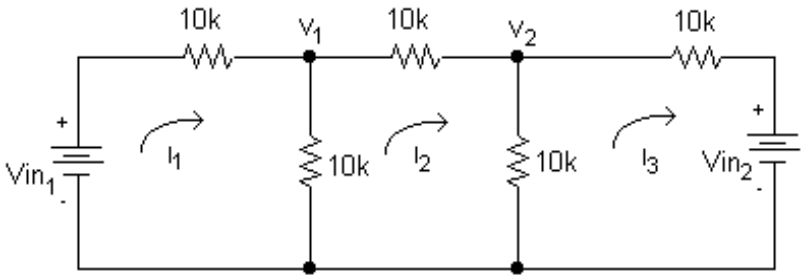
Figure 4: *Circuit 2 for Problem 3*

Instructional objectives

- Measure circuit parameters to determine if they are linearly related.
- Measure circuit parameters to determine proportionality constants.
- Verify the node voltage and mesh current methods.
- Verify the superposition theorem.

Procedure

1. Measure the V1 and V2 node voltages, I1, I2 and I3 mesh currents in ***Figure 1***. (V_{in1}=8V,



V_{in2} =12V)

Figure 1. Node voltages and mesh currents

Table 1. *Data for Figure 1.*

V1 (V)	***V2 (V)***	***I1 (A)***	***I2 (A)***	***I3 (A)***

2. We will now verify the superposition circuit. Since we will be constructing three circuits, it is advised that each lab partner builds one circuit and takes the measurements for that circuit. Construct the circuit shown in *Figure 2* on your breadboard and measure V_{out}. Record your data in *Table 2.*

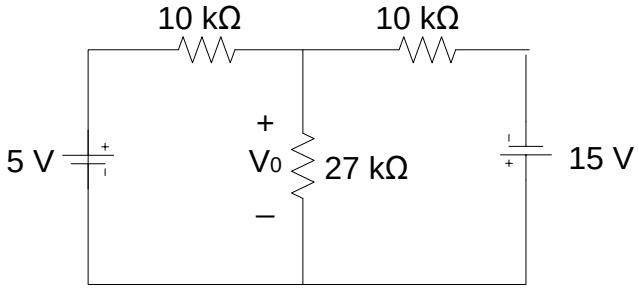


Figure2 . *Circuit to Verify Superposition.*

***Table 2**. Data for verify Superposition.*

Quantity	***Measured Voltage (V)***
V_{out}	
V_1	
V_2	

3. Now remove the 15 V source by replacing it with a short circuit from the circuit shown in *Figure 3.* Measure the voltage across the 27kΩ resistor. Record your data in *Table 2.*

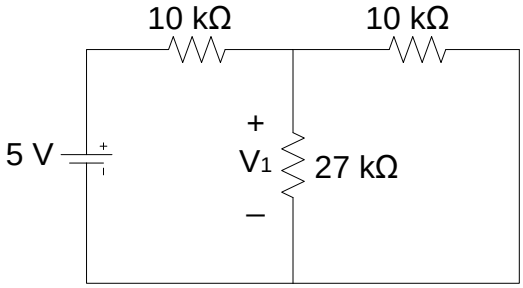


***Figure 3.** Superposition Circuit with One Source Removed.*

4. Reconnect the 15V source and replace the 5V source with a short circuit from the circuit shown in *Figure 4.* and measure the voltage across the 27kΩ resistor. Record your data in *Table 2.*

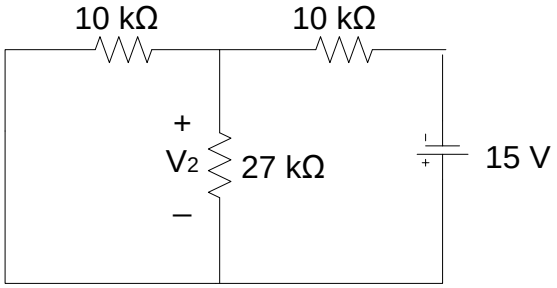


***Figure 4** Superposition Circuit Missing a Voltage Source*