EECE 2150 - Electrical Engineering Fall 2023
Quiz 4

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Student Name: _____

In class a while back, we talked about a variable resistor (potentiometer) used for a volume control. Let's look at whether such a device changes the output resistance. See the circuit in the figure. R_1 and R_2 are the two parts of the volume control, and $R_1 + R_2 = R_{total} = 10\,\mathrm{k\Omega}$ remains constant. Let's consider two cases where we set the volume to 90% and then to 50%. That is, $R_2 = 0.90R_{total}$ in the first case and $R_2 = 0.50R_{total}$ in the second, and in each case, compute the Thévenin equivalent circuit. The source voltage is 100 mV.

I suggest that you calculate the open–circuit voltage, short–circuit current, and resistance independently. Then you can check your answers.

1. What are the Thévenin voltages?

$V_T(90\%)=$ _____ and $V_T(50\%)=$ _____

.

2. What are the Thévenin resistances?

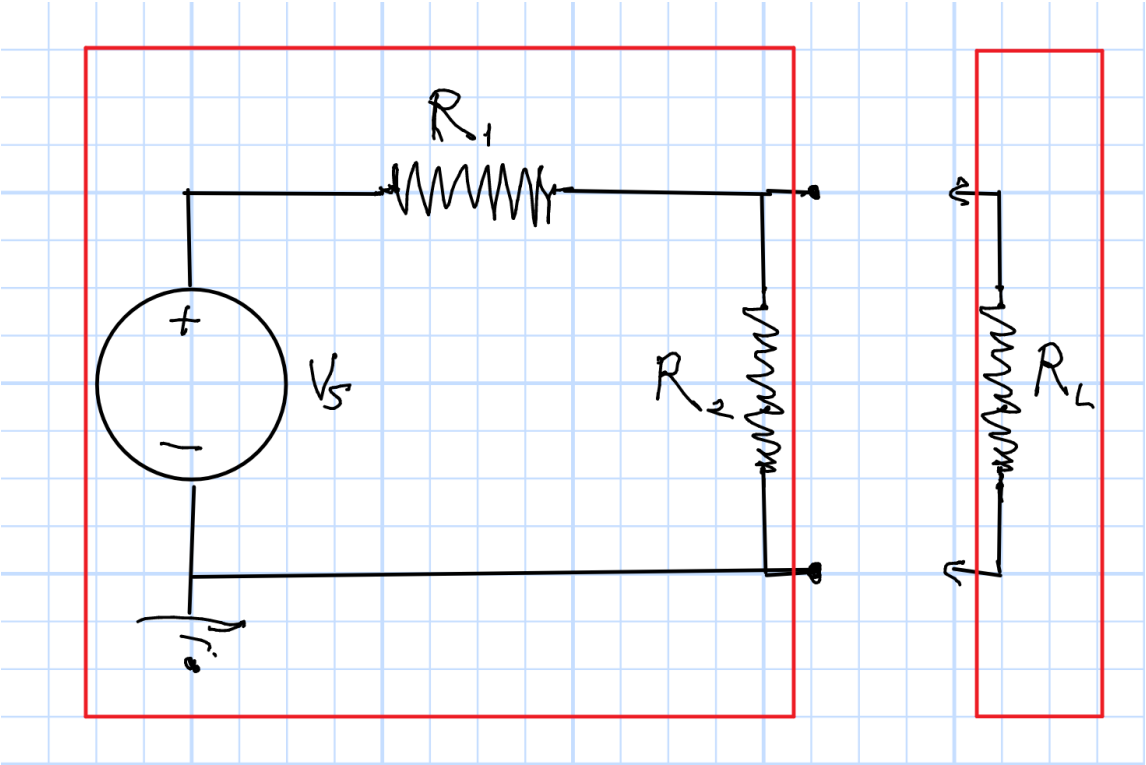
$R_T(90\%)=$ _____ and $R_T(50\%)=$ _____

.

3. What are the short–circuit currents?

$i_{sc}(90\%)=$ _____ and $i_{sc}(50\%)=$ _____

.


R1
+
Vs
−
R2
RL

Solution

1. $V_T = V_{oc} = V_S \frac{R_2}{R_1+R_2}$
$90\,\text{mV}$ and $50\,\text{mV}$

2. $R_T = R_1 \parallel R_2$
$R_2(90\%) = 9\,\text{k}\Omega$ and $R_2(50\%) = 5\,\text{k}\Omega$
$R_T(90\%) = 900\Omega$ and $R_T(50\%) = 2500\Omega$

3. $i_{sc} = V_T/R_T$
$i_{sc}(90\%) = 100\,\mu\text{A}$ and $i_{sc}(50\%) = 200\,\text{mA}$