

EECE 2150 - Electrical Engineering Fall 2022

Quiz 2

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Student Name: _____

The figure shows the familiar circuit for car lights, where the wires have some resistance, $R_{w1} = 0.10\Omega$, $R_{w2} = 0.05\Omega$, and $R_{w3} = 0.10\Omega$. Each light is designed to consume 50 Watts of power at a voltage of $v_1 = 12$ Volts.

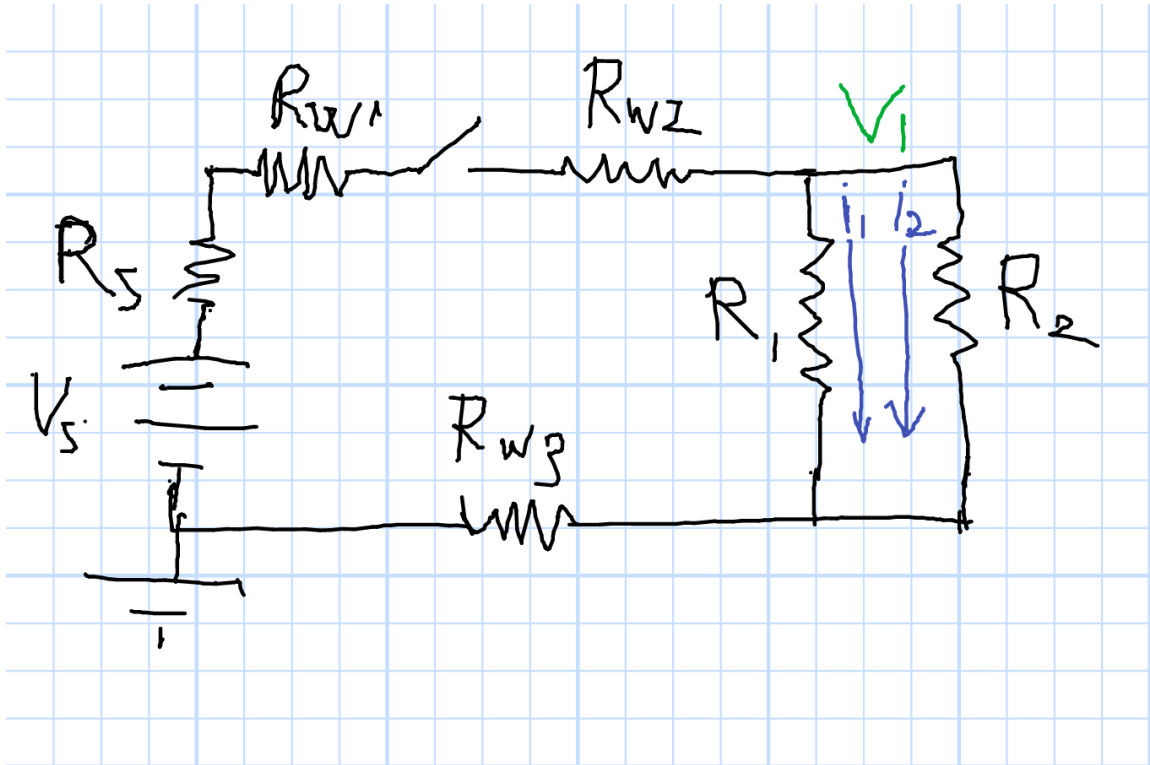
1. What current is required to power each light?

2. What is the resistance of each lamp, $R_1 = R_2 = ?$.

3. What current is required from the voltage source, V_s ?

4. Combine all the resistors into a single resistor $R_{equivalent}$. What is the value of that resistor?

5. What is the required source voltage, V_s ?



Solution

1. $i = P/v_1 = 50 \text{ Watts}/12 \text{ Volts} = 4.2 \text{ Amperes}$

2. $R_1 = v_1/i_1 = 12 \text{ Volts}/8.3 \text{ Amperes} = 2.9\Omega$

3. $i_s = 2i_1 = 8.3 \text{ Amperes}$

$$4. R_{equivalent} = R_{w1} + R_{w2} + (R_1 \parallel R_2) + R_{w3}$$
$$R_{equivalent} = R_{w1} + R_{w2} + (R_1/2) + R_{w3} = 1.64\Omega$$

5. $V_s = i_s R_{equivalent} = 13.7 \text{ Volts}$

Matlab:

```
>> Rw1=0.1;Rw2=0.05;Rw3=0.1;v1=12;p1=50;
>> i1=p1/v1
i1 =
    4.1667
>> R1=v1/i1
R1 =
    2.8800
>> is=2*i1
is =
    8.3333
>> Req=Rw1+Rw2+R1/2+Rw3
Req =
    1.6400
>> vs=is*Req
vs =
   13.6667
```