

Fundamentals of Engineering Design (FED) 101- LC9

Test 1

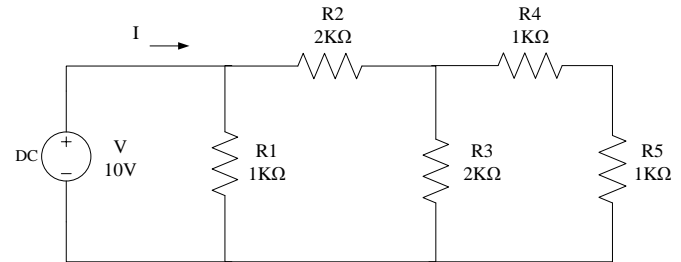
Student name:

Student ID number:

Please provide complete and clear answers.

In the circuit shown, there are five resistors and a battery $V=10$ volts.

1. Calculate R_{eq} for this circuit. (6 points)
2. Calculate the total current I . (2 points)
3. Calculate the voltage across $R1$. (2 points)



Solution:

1. To obtain R_{eq} , we combine the resistances starting from the end and going to the front (towards the battery)

First, $R5$ and $R4$ can be combined in series

$$R4 + R5 = 1K\Omega + 1K\Omega = 2K\Omega$$

The combination can then be combined with $R3$ in parallel

$$\frac{R3 + 2K\Omega}{2K\Omega * R3} = \frac{2K\Omega + 2K\Omega}{2K\Omega * 2K\Omega} = 1K\Omega$$

This result can be combined in series with $R2$

$$R2 + 1K\Omega = 2K\Omega + 1K\Omega = 3K\Omega$$

Finally, R_{eq} is the parallel combination of the $3K\Omega$ resistance with $R1$

$$R_{eq} = \frac{R1 + 3K\Omega}{3K\Omega * R1} = \frac{1K\Omega + 3K\Omega}{3K\Omega * 1K\Omega} = 0.75K\Omega$$

2. The total current I can be calculated using Ohm's Law

$$I = \frac{V}{R_{eq}} = \frac{10 \text{ volts}}{0.75K\Omega} = 13.33mA$$

3. Using KVL

$$\begin{aligned} V - V_{R1} &= 0 \\ V_{R1} &= V = 10V \end{aligned}$$

