Problem Set 10 – circuits with more than two resistors

Problems 1 and 2 use the circuit at the right. In each problem,

calculate the current through resistor 1, the voltage across

resistor 3, and the power delivered to resistor 2.

**For number 2**, also calculate the resistance of resistor 3.

R2

R1

R3

1. resistor 1 is 6Ω 2. resistor 1 is 6Ω

 resistor 2 is 3Ω resistor 2 is 3Ω

 resistor 3 is 1Ω V2 is 6 V

 Vsource is 12 V Psource = 40 W

Problems 3 and 4 use the circuit at the right. In each problem,

calculate the current through resistor 1, the voltage across

resistor 3, and the power delivered to resistor 2.

**For number 4**, also calculate the resistance of resistor 3.

R1 R2 R3

3. resistor 1 is 60Ω 4. resistor 1 is 60Ω

 resistor 2 is 30Ω resistor 2 is 90Ω

 resistor 3 is 20Ω Vsource is 9 V

 Isource is 1.5 A Isource is 300 mA

D

B

C

A

5. Given: Calculate the:

 A = 20 ohms (a) current through A

 B = 6 ohms (b) voltage across D

 C = 12 ohms (c) voltage across C

 D = 16 ohms (d) current through B

 V battery = 120 volts

 A C

 D

 B

 E

6. I think my circuit has a bad part in it. I measure

 the voltage across resistor B and get a reading

 of 12.5 volts. Is my circuit working properly?

Justify your answer!

A = 50 ohms D = 30 ohms

B = 100 ohms E = 100 ohms

C = 20 ohms V battery = 25 volts

24 V

10 Ω

15 Ω

25 Ω

7. The resistors are light bulbs with different resistances, as shown.

 (a) How much power does each bulb use?

In parts b & c, I tell you a bulb burns out.

 Consider the other two bulbs in the circuit good and

 working except the one that I tell you burns out.

(b) The 10 ohm bulb burns out. How much power do the other bulbs use now?

 (c) The 25 ohm bulb burns out. How much power do the other bulbs use now?

Answers:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| problem | current through resistor 1 | voltage across resistor 3 | power used by resistor 2 | resistor 3 |
| 1 | 1.2 A | 1.2 V | 4.3 W |  |
| 2 | 2 A | 2 V | 12 W | 1 Ω |
| 3 | 0.25 A | 15 V | 7.5 W |  |
| 4 | 0.15 A | 9 V | 0.9 W | 180 Ω |

5. IA = 3 A 6. NO! The voltage across resistor B

 VD = 48 V should be 16.7 volts.

 VC = 12 V

 IB = 2 A

7.

|  |  |  |  |
| --- | --- | --- | --- |
| part | 10-ohm resistor | 15-ohm resistor | 25-ohm resistor |
| a | 57.6 W | 5.4 W | 9.0 W |
| b | 0 W | 5.4 W | 9.0 W |
| c | 57.6 W | 0 W | 0 W |