Problem Set 9 – circuits with two resistors

1. Resistor 1 is 60 Ω and resistor 2 is 20 Ω. The two resistors are connected in series and the combination is connected to a 12-V source.

(a) What is the total resistance in the circuit? (e) What is the voltage drop across resistor 1?

(b) What current is produced by the source? (f) What is the voltage drop across resistor 2?

(c) What is the current through resistor 1? (g) What power is produced by the source?

(d) What is the current through resistor 2? (h) What is the power consumption of each resistor?

2. Resistor 1 is 60 Ω and resistor 2 is 20 Ω. The two resistors are connected in parallel and the combination is connected to a 12-V source.

(a) What is the total resistance in the circuit? (e) What is the voltage drop across resistor 1?

(b) What current is produced by the source? (f) What is the voltage drop across resistor 2?

(c) What is the current through resistor 1? (g) What power is produced by the source?

(d) What is the current through resistor 2? (h) What is the power consumption of each resistor?

3. Resistors 1 and 2 are connected in series and the combination connected to a 9-V battery. The resistance of resistor 1 is 6 Ω and the current through resistor 1 is 1 A.

(a) What is the voltage across resistor 1? (d) What is the resistance of resistor 2?

(b) What is the current through resistor 2? (e) Without using your answer from (d), what is the

(c) What is the voltage across resistor 2? resistance of the circuit?

4. Resistors 1 and 2 are connected in parallel and the combination connected to a 9-V battery. The resistance of resistor 1 is 6 Ω and the current through resistor 2 is 1 A.

(a) What is the voltage across resistor 1? (d) What is the resistance of resistor 2?

(b) What is the current through resistor 1? (e) Without using your answer from (d), what is the

(c) What is the voltage across resistor 2? resistance of the circuit?

5. A single 120 Ω resistor (resistor A) is connected to a 12-V battery.

(a) What is the voltage across resistor A? (c) What is the total resistance of the circuit?

(b) What is the current through resistor A? (d) What current does the source produce?

6. Another 120 Ω resistor (resistor B) is connected in series with resistor A from problem 5?

(a) What is the total resistance of the circuit? (c) What is the current through resistor A?

(b) What current does the source produce? (d) What is the voltage across resistor A?

7. A 120 Ω resistor (resistor C) is connected in parallel with resistor A from problem 5?

(a) What is the total resistance of the circuit? (c) What is the current through resistor A?

(b) What current does the source produce? (d) What is the voltage across resistor A?

8. A variable resistor is in series with a lamp. The lamp has a resistance of 200 ohms. The variable resistor has a range from zero ohms to 5000 ohms. The lamp-resistor combination is connected to a 120-volt source. Calculate the power to the lamp when the resistance of the variable resistor is:

(a) zero ohms.

(b) 100 ohms.

(c) 400 ohms.

(d) 5000 ohms.

(e) What happens to the brightness of the bulb as the resistance of the variable resistor increases

from zero to 5000 ohms?

ANSWERS

1. (a) 80 Ω 2. (a) 15 Ω 3. (a) 6 V 4. (a) 9 V 5. (a) 12 V 6. (a) 240 Ω 7. (a) 60 Ω

(b) 0.15 A (b) 0.8 A (b) 1 A (b) 1.5 A (b) 0.1 A (b) 0.05 A (b) 0.2 A

(c) 0.15 A (c) 0.2 A (c) 3 V (c) 9 V (c) 120 Ω (c) 0.05 A (c) 0.1 A

(d) 0.15 A (d) 0.6 A (d) 3 Ω (d) 9 Ω (d) 0.1 A (d) 6 V (d) 12 V

(e) 9 V (e) 12 V (e) 9 Ω (e) 3.6 Ω

(f) 3 V (f) 12 V

(g) 1.8 W (g) 9.6 W

(h) P1 = 1.35 W 2. (h) P1 = 2.4 W 8. (a) 72 W (b) 32 W (c) 8 W

P2 = 0.45 W P2 = 7.2 W (d) 0.11 W (e)