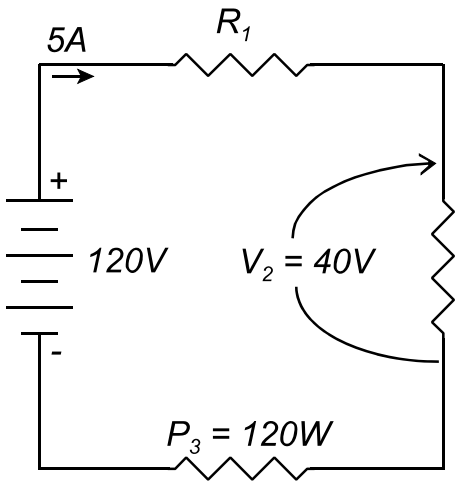
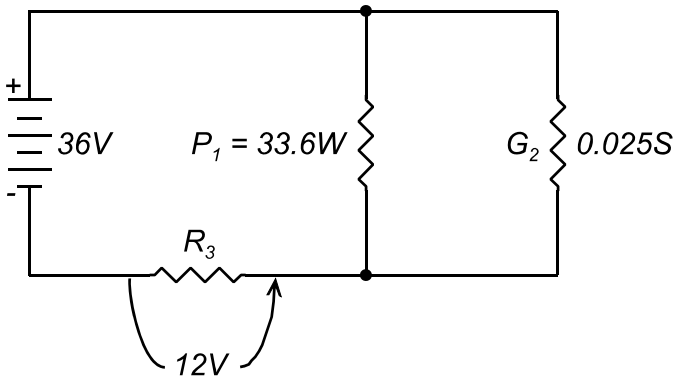
ELECTROTECHNOLOGY
ELTK1100
ASSIGNMENT #4

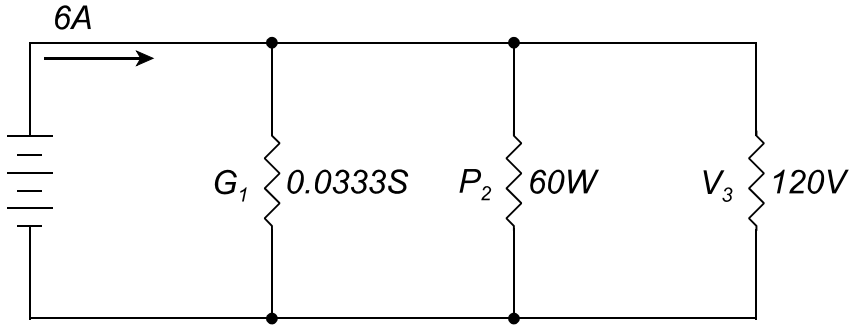
1. Find the Unknown Resistances.



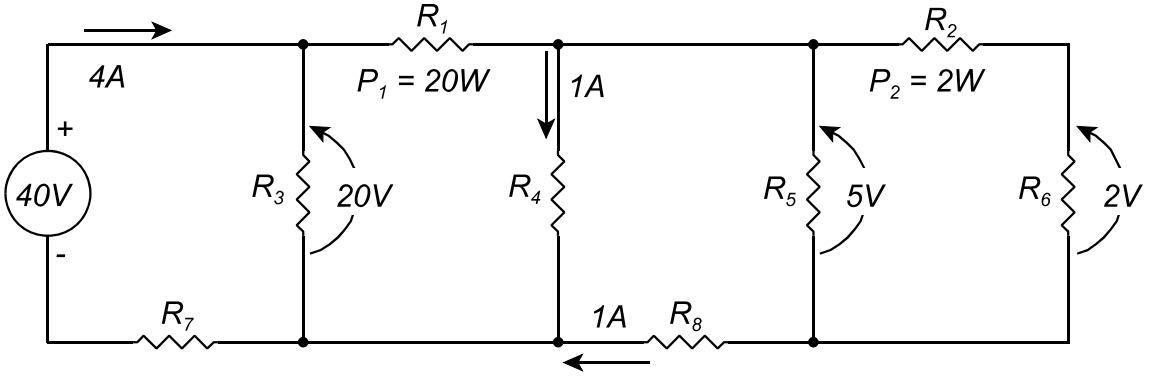
2. Find the Unknown Resistances.



3. Find the Unknown Resistances.



4. Find the Unknown Resistances.



5. How much current will flow through a wire supplying a 1.5 hp motor at 120V? How much will it cost to run this motor for 8 h/day for 50 days if energy costs 6¢/kW-h?

6. An oven heating element on an electric range operating on 240V has a resistance of 6Ω. How much current does it draw? What is the power rating for this element? How much will it cost, if the element is on for 6 hours and energy costs 6¢/kW-h?

7. A 50 bulb set of series connected, Xmas mini-lights consumes 25W of power from a 120V source. Determine:

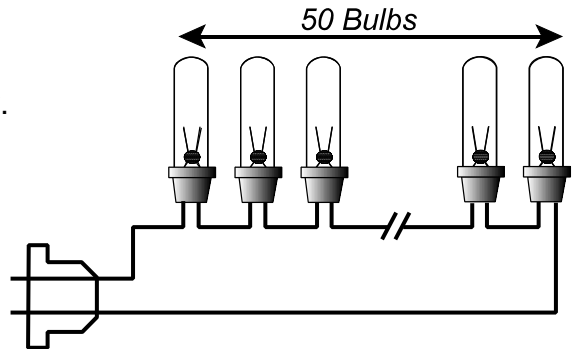
(a) the power delivered to each bulb.
(b) the voltage drop across each bulb.
(c) the resistance of each bulb.
(d) the cost to operate these lights for 6 hrs/day for the 12 days of Xmas, if electrical energy costs $0.08/kWh.

8. For the circuit of Question 7, if a single bulb were to become an open circuit, the entire string would stop working. To prevent this from occurring, each light bulb has a small metal strip which shorts the light bulb when the filament fails.

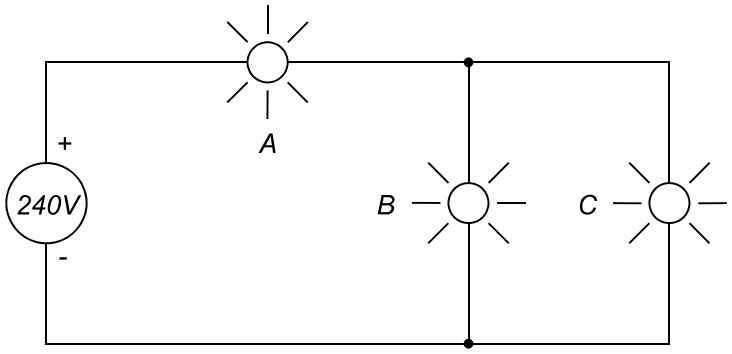
If two light bulbs fail, what would be the effect on the rest of the bulbs?

(i) they would be off.
(ii) they would be brighter.
(i) they would be dimmer.
(i) they would be the same intensity.

Reason out your answer.



9. Three identical light bulbs (A, B & C) are connected as shown. When the power is turned on, the brightness of light bulb A will be:
(i) dimmer than light bulb B.
(ii) equal in brightness to light bulb B.
(iii) brighter than light bulb B.
Reason out your answer.



10. If the light bulbs for Question 9 have a resistance of 240Ω and are rated at 60W, explain the operation of the circuit when the power is applied.

11. Assuming a rate of $0.06 per kW-h, determine the cost of operating the following electrical equipment for 30 days:
(a) 1.2 kW iron for 45 minutes/day.
(b) 2 hp motor for 5 h/day.
(c) one 300 W, four 100 W, two 60 W and six 40 W lamps for 6 h/day.
(d) 750 W microwave for 30 minutes/day.

12. A 120V outlet is protected by a 25A circuit breaker. A 700W toaster, an 800W coffee maker and a 900W microwave oven are already operating from this outlet. Can you plug in a 1000W hair dryer without tripping the circuit breaker?

13. 1 kg. of a liquid with a specific heat of 0.8, is to have it's temperature raised from 10°C to 50°C. How long will it take if the heating element is rated for 240V, 8A and the efficiency is 75%? What would be the temperature of this liquid, if it was left on the heating element for 2 minutes?

14. It costs a manufacturer $20.00 to heat a mass of water from 25°C to 100°C in 5 hours for his production line. Energy costs 8¢/kW-h. The water heater is rated at 480V and it's efficiency is 75%. What current flows? What is the mass of water heated?

15. A 10Ω heating element operates from a 580V source. It takes 20 minutes to heat 100 kg. of water from 20°C to boiling point, what is the efficiency of heat transfer.