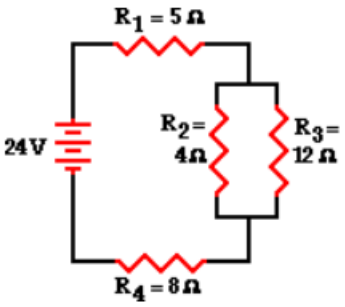
Homework 3: Basic Circuitry and Flight Dynamics

1. (a) Analyze the following circuit to find the variables listed. Show your calculations.

Solution to **Q.1a**



R_{tot} = 16 Ω I_{tot} = 1.5 A

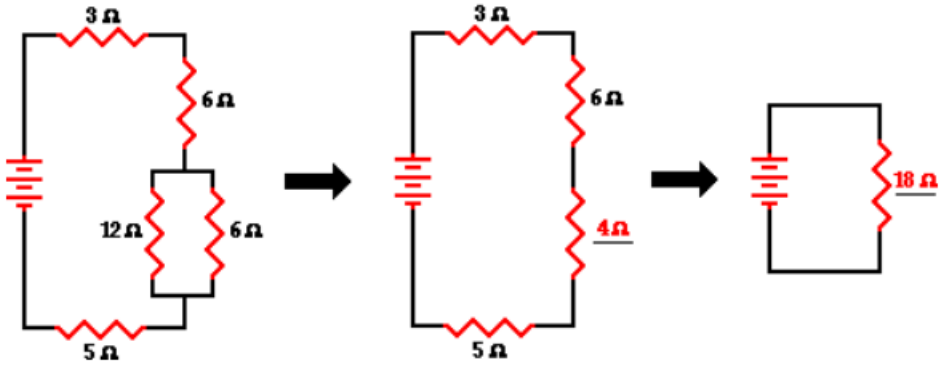
I_1 = 1.5 A ΔV_1 = 7.5 V

I_2 = 1.125 A ΔV_2 = 4.5 V

I_3 = 0.375 A ΔV_3 = 4.5 V

I_4 = 1.5 A ΔV_4 = 12 V

Solution to **Q.1b**



2. Match the appropriate flight controller input with the corresponding quadcopter motion:

Roll	Aileron
Pitch	Elevator
Yaw	Rudder
Increase in elevation	Throttle

3. Complete problem 3.4 from the textbook.

$$L_V = 2.86lbs \text{ x } 32.2\frac{ft}{s^2} = 92.09\ lbs\frac{ft}{s^2},\quad a_x = 0.75\frac{ft}{s^2},\quad m = 2.42lbs$$

$$L_R = \frac{L_V}{cos\ \alpha}$$

$$a_x = \frac{L_R\ sin\ \alpha}{m} = \frac{L_V\ sin\ \alpha}{m\ cos\ \alpha} = \frac{L_V}{m}\ tan\ \alpha$$

$$\alpha = \tan^{-1}\frac{a_x m}{L_V} = \tan^{-1}\frac{0.75\frac{ft}{s^2} \times 2.42lbs}{2.86lbs \times 32.2\frac{ft}{s^2}} = 1.13°$$