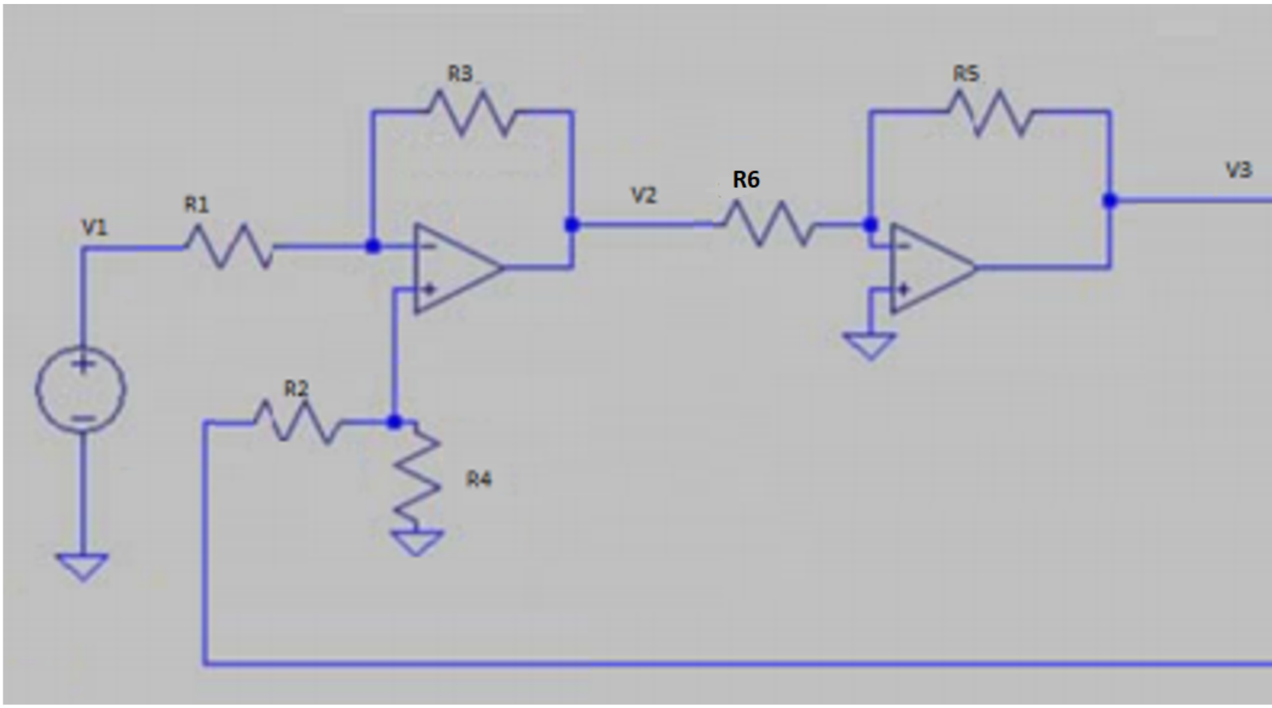

Figure 1: Feedback Control System Circuit

The first amplifier is a voltage subtractor. The transfer function for the voltage subtractor in the circuit is given by equation (1).

$$V_{out}(s) = -\frac{R_3}{R_1}V_{in}(s) + \frac{R_4}{R_2+R_4}\frac{R_1+R_3}{R_1}V_{out}(s) \tag{1}$$

The feedback gain is 0.4. So, the input to the feedforward gain is $V_{in} - 0.4V_{out}$. The feedforward gain is 4 and is implemented using an inverting amplifier. The inverting amplifier provides a gain of -4. Therefore, the subtractor must provide an output of $-V_{in}+0.4V_{out}$ to ensure the proper input is provided to the DC machine.

By equation (1), $\frac{R_3}{R_1} = 1$. Therefore, $R_3 = R_1$. If R_1 is provided, R_3 is determined to have the same resistance.

Substitute $R_3 = R_1$ into equation (1) and consider $V_{out}(s)$'s coefficient.

$$\frac{2R_4}{R_2+R_4} = \frac{1}{2} \rightarrow 2R_4 = \frac{R_2+R_4}{2} \rightarrow \frac{3}{2}R_4 = \frac{R_2}{2} \rightarrow R_2 = 3R_4 \tag{2}$$

Therefore, if R_4 is provided, then R_2 is determined to have thrice the resistance.

The inverting amplifier's gain is -4 and also given by $-\frac{R_5}{R_6}$. Therefore, $R_5 = 4R_6$. If R_6 is provided, R_5 is determined to be $4R_6$.

The following ratios must hold in the circuit. Assume that R_1, R_4, and R_6 are free parameters. R_3 could also be a free parameter instead of R_1, R_2 instead of R_4, or R_5 instead of R_6.

$$R_3 = R_1 \tag{3}$$

$$R_2 = 3R_4 \tag{4}$$

$$R_5 = 4R_6 \tag{5}$$