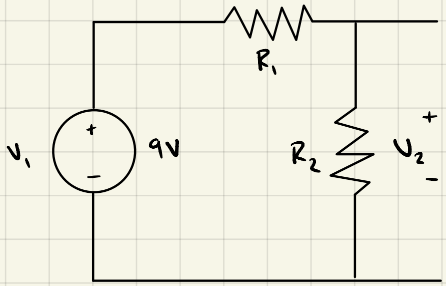
Joaquin Salas ECEN - 214 - 502 2/2/23




$R_1$ variable is over the range $0 \le R_1 \le 10k\Omega$

Find largest value of $R_2$ that allows output voltage to vary over range $1.5V \le V_2 \le 5.0V$

$$V_2 = V_1 \frac{R_2}{R_1 + R_2}$$ 10k pot, so $R_1 + R_2 = 10k\Omega$

①

$$V_2 = V_1 \frac{R_2}{R_1+R_2} \longrightarrow (1.5V) = (9.0V)\frac{R_2}{10\Omega + R_2} \rightarrow \left(\frac{1}{6}\right)V = \frac{R_2}{10k\Omega + R_2}$$

$$\rightarrow \left(\frac{1}{6}\right)(10k\Omega + R_2) = R_2$$

$$\rightarrow \frac{5}{3} + \frac{1}{6}R_2 = R_2 \longrightarrow \frac{5}{3} = \frac{5}{6}R_2 \qquad \underline{R_2 = 2\Omega}$$

$$5V = 9V\left(\frac{2k\Omega}{R_1 + 10k\Omega}\right)$$

$$\rightarrow \boxed{1.6k\Omega \le R_1 \le 10k\Omega}$$

②

$$V_2 = V_1 \frac{R_2}{R_1+R_2} \longrightarrow 5V = 9V\left(\frac{10k\Omega}{R_1 + 10k\Omega}\right) \rightarrow \underline{R_1 = 8k\Omega}$$

$$= \frac{9R_2}{8k\Omega + R_2} \rightarrow 1.6k\Omega \rightarrow \boxed{1.5k\Omega \le R_2 \le 10k\Omega}$$

$$\frac{9K_2}{8}$$

③ Minimum output

$$1.5V = (9V)\frac{R_2}{10k\Omega} \longrightarrow \frac{1.5V}{9V} = \frac{R_2}{10k\Omega} \rightarrow 10k\Omega\left(\frac{1}{6}V\right) = \left(\frac{R_2}{10k\Omega}\right)10k\Omega$$

$$\underline{R_2 = 1.667}$$

Maximum Output

$$5V = (9V)\frac{R_2}{10k\Omega} \longrightarrow \frac{5V}{9V} = \frac{R_2}{10k\Omega} \longrightarrow 10k\Omega\left(\frac{5}{9}\right) = \underline{R_2 = 5.556}$$

So, $\boxed{1.667 \le R_2 \le 5.556}$