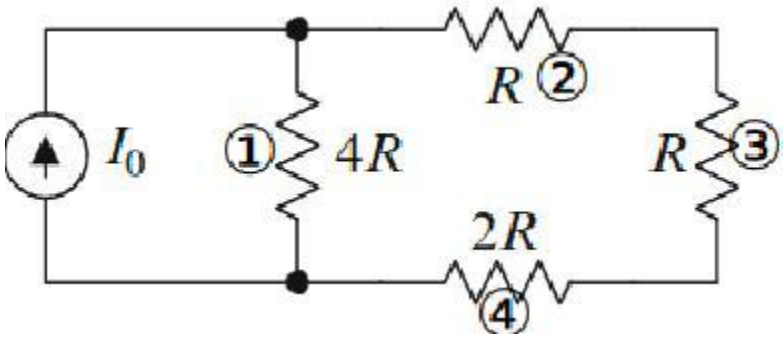
RBE 1001: Introduction to Robotics
C-Term 2019-20
HW 3.1: Solutions

Last modification: February 6, 2020

Solutions

From *Introduction to Circuit Analysis and Design* by Glisson.

Problem 5.12



The total resistance on line (1) is $4R$. The total resistance on line (2) is also $4R = R + R + 2R$. Therefore the current gets split evenly across both paths.

The power consumption of each resistor is:

$$P_1 = 4R(I_0/2)^2 \qquad P_2 = 2R(I_0/2)^2$$
$$P_3 = R(I_0/2)^2 \qquad P_4 = R(I_0/2)^2$$

Establish that $P_1 = 2P_2 = 4P_3 = 4P_4$. Thus, resistor (1) consumes the most power.

Problem 5.13

The given is

$$V_0 = 50\text{V} \qquad P_0 = 90.2\text{mW} \qquad V_A = 32\text{V} \qquad R_3 = 91\text{k}\Omega$$

From this deduce,

$$V_1 = V_0 - V_A = 18\text{V} \qquad V_2 = V_3 = V_A - 0 = 32\text{V}$$

The current provided by the power source is $I_0 = P_0/V_0 = 1.8\text{mA}$.

The current across R_1 is also I_0, and so $R_1 = V_1/I_0$.

The current across R_3 is $I_3 = V_3/R_3 = 0.35\text{mA}$.

The current across R_2 is thus $I_2 = I_0 - I_3 = 1.45\text{mA}$.

Obtain $R_2 = V_2/I_2$.

The numerical answer is,

$$R_1 = 9977\Omega \qquad R_2 = 22033\Omega$$