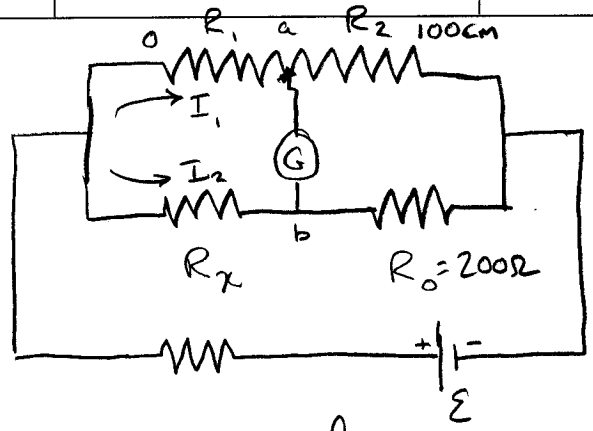
25-109 GIVEN:



FIND: R_x FOR $l_a = 18\text{cm}$
$l_a = 60\text{cm}$
$l_a = 95\text{cm}$

$$-I_1R_1 + I_2R_x = 0 \qquad -I_1R_2 + I_2R_0 = 0$$

$$R_x = \frac{I_1R_1}{I_2} \qquad I_1 = \frac{I_2R_0}{R_2}$$

$$R_x = \frac{\left(\frac{\cancel{I_2}R_0}{R_2}\right)R_1}{\cancel{I_2}} = \frac{R_1}{R_2}R_0$$

$$R_1 = \frac{l_a\rho}{A} \qquad R_2 = \frac{(100-l_a)\rho}{A}$$

$$\frac{R_1}{R_2} = \frac{\frac{l_a\rho}{A}}{\frac{(100-l_a)\rho}{A}} = \frac{l_a}{100-l_a}$$

$$R_x = \left(\frac{l_a}{100-l_a}\right)R_0$$

$l_a = 18\text{cm}$ $\quad R_x = \left(\frac{18\text{cm}}{100\text{cm}-18\text{cm}}\right)200\Omega = \boxed{43.9\Omega}$

$l_a = 60\text{cm}$ $\quad R_x = \left(\frac{60\text{cm}}{100\text{cm}-60\text{cm}}\right)200\Omega = \boxed{300\Omega}$

$l_a = 95$ $\quad R_x = \left(\frac{95\text{cm}}{100\text{cm}-95\text{cm}}\right)200\Omega = \boxed{3800\Omega}$