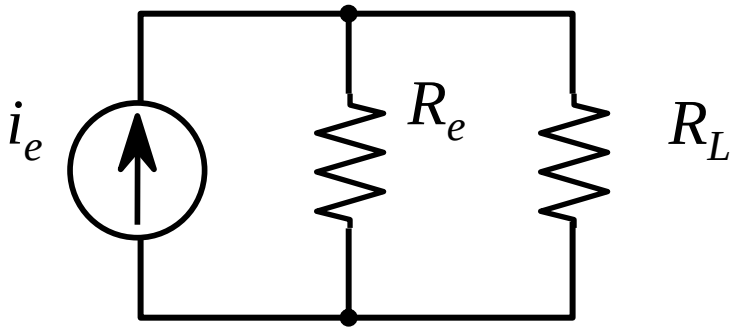
Problem 1



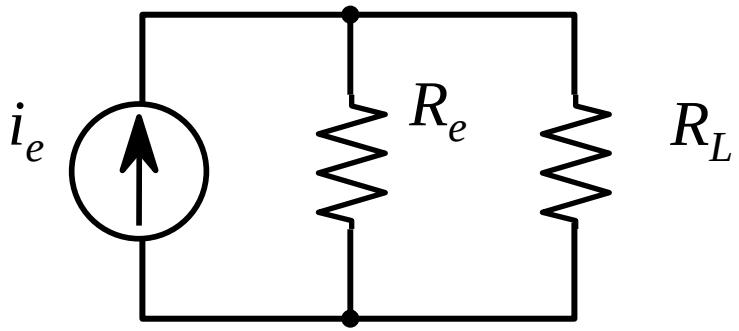
Given $I_e = 10$ mA

$R_e = 600\ \Omega$

$R_L = 1.5\ \text{k}\Omega$

Find the voltage across the load and the current through the load.

Problem 1 Solution



$$i_e = V_L\left(\frac{1}{R_e}+\frac{1}{R_L}\right)$$

$$i_L = \frac{V_L}{R_L}$$

$$i_L = \frac{R_e}{R_L + R_e} i_e$$

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Ie = 10e-3;
Re = 600;
RL = 1.5e3;
Gp = 1/Re + 1/RL;
VL = Ie/Gp;
IL = VL/RL;
fprintf('VL %.2f V, IL = %.2f mA\n',VL,IL*1e3);
% test final formula
fprintf('(alt) IL = %.2f mA\n',Re*Ie/(Re+RL)*1e3);
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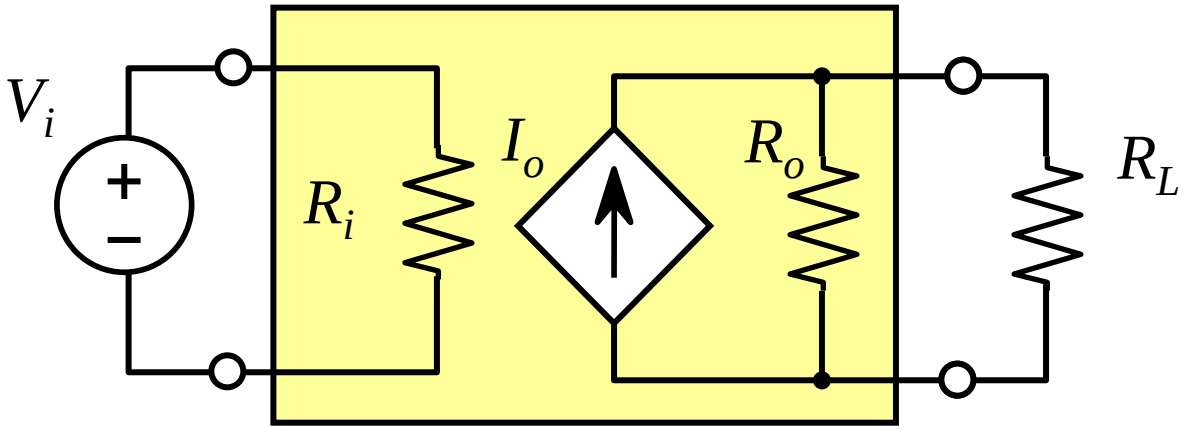
Answers: V_L = 4.29 V, I_L = 2.86 mA

Problem 2



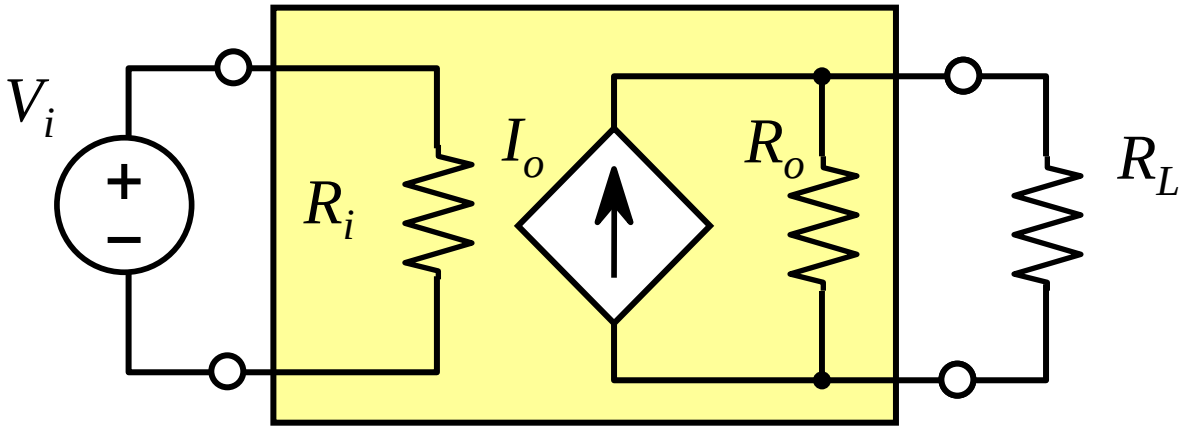
$I_o = G_m V_i$

Given

$V_i = 0.1$ V
$G_m = 100$ mS
$R_i = 10$ kΩ
$R_o = 600$ Ω
$R_L = 1.5$ kΩ

Find the voltage across the load and the current through the load.
Find the ratio of output power to input power.

Problem 2 Solution



$I_o = G_m V_i$

Given

$V_i = 0.1$ V
$G_m = 100$ mS
$R_i = 10$ kΩ
$R_o = 600$ Ω
$R_L = 1.5$ kΩ

$I_o = G_m V_i = 10$ mA
Then its like the first problem.

$$P_L = I_L V_L = 2.86 \cdot 4.29 = 12.3 \text{ mW}$$

$$P_I = \frac{V_i^2}{R_i} = \frac{(.01)^2}{10^4} = 10^{-8} \text{ W} = 10 \text{ nW}$$

$$\frac{P_L}{P_I} \approx 10^6$$

Multisim Solution