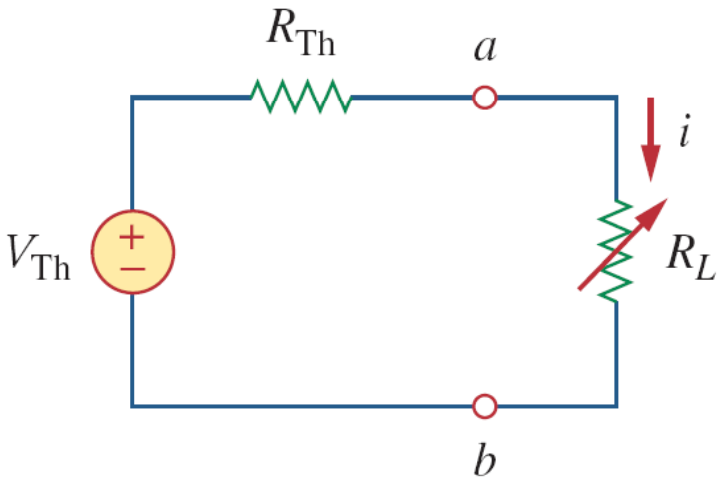
INGENIERIA
UNIVERSIDAD DE LOS ANDES
MÉRIDA VENEZUELA

INGENIERIA ELECTRICA
ULA

Teorema de Máxima Transferencia de Potencia

Prof. Gerardo Ceballos

R_L para que reciba la máxima potencia que puede entregar el circuito



$$p = i^2 R_L = \left(\frac{V_{Th}}{R_{Th} + R_L}\right)^2 R_L$$

$$\frac{dp}{dR_L} = V_{Th}^2 \left[\frac{(R_{Th} + R_L)^2 - 2R_L(R_{Th} + R_L)}{(R_{Th} + R_L)^4}\right]$$

$$= V_{Th}^2 \left[\frac{(R_{Th} + R_L - 2R_L)}{(R_{Th} + R_L)^3}\right] = 0$$

$$0 = (R_{Th} + R_L - 2R_L) = (R_{Th} - R_L)$$

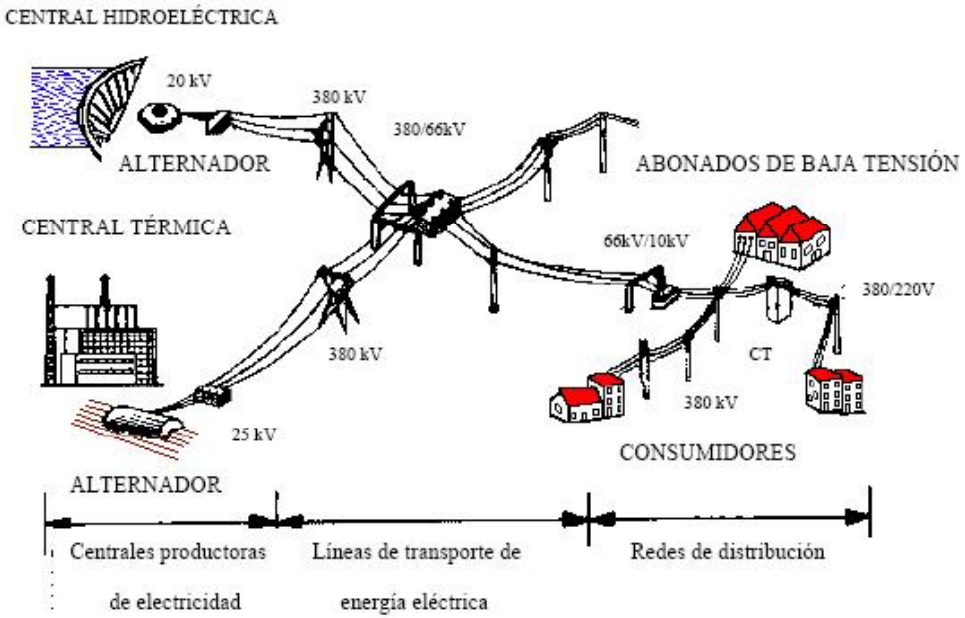
$$\boxed{R_L = R_{Th}}$$

$$p_{L_{max}} = \left(\frac{V_{Th}}{2R_{Th}}\right)^2 R_{Th}$$

$$\boxed{p_{max} = \frac{V_{Th}^2}{4R_{Th}}}$$

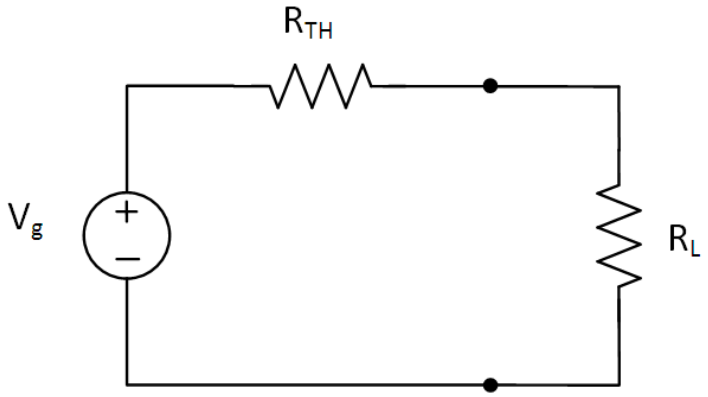
INGENIERIA
UNIVERSIDAD DE LOS ANDES
MÉRIDA VENEZUELA

Eficiencia



$$\eta = \frac{p_L}{p_g}.100\%$$

Eficiencia



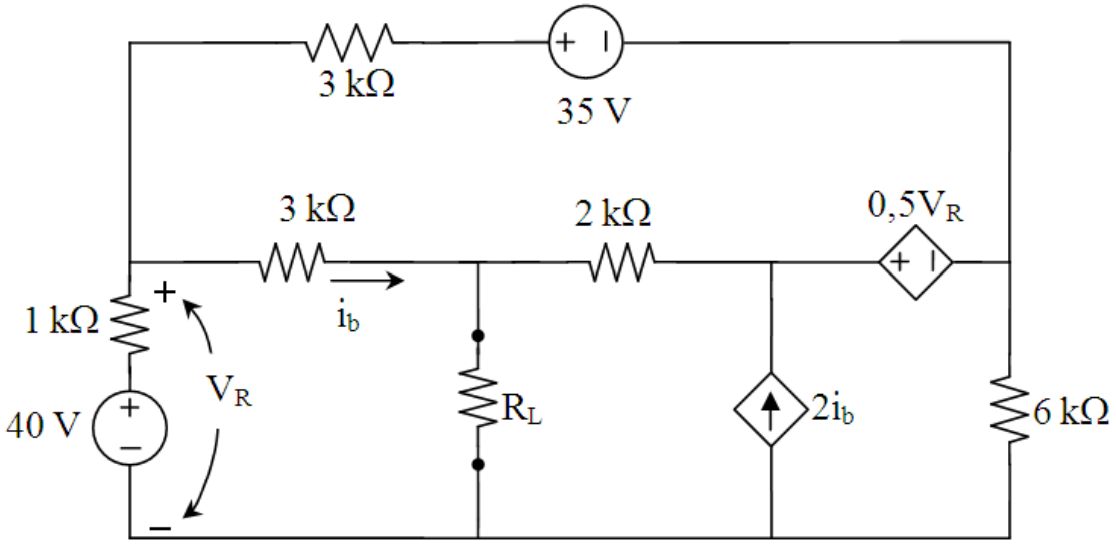
$$\eta = \frac{p_L}{p_g}.100\% \qquad \eta = \frac{i^2(R_L)}{i^2(R_{Th}+R_L)}.100\%$$

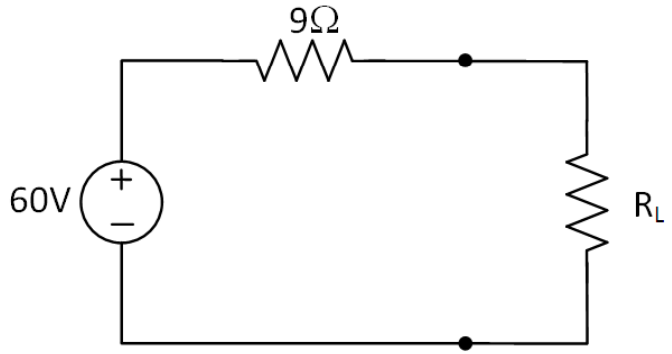
$$\eta = \frac{R_L}{R_{Th}+R_L}.100\%$$

Para Máxima Transferencia de potencia:

$$\eta = \frac{R_{Th}}{2R_{Th}}.100\%$$

$$\eta = 50\%$$





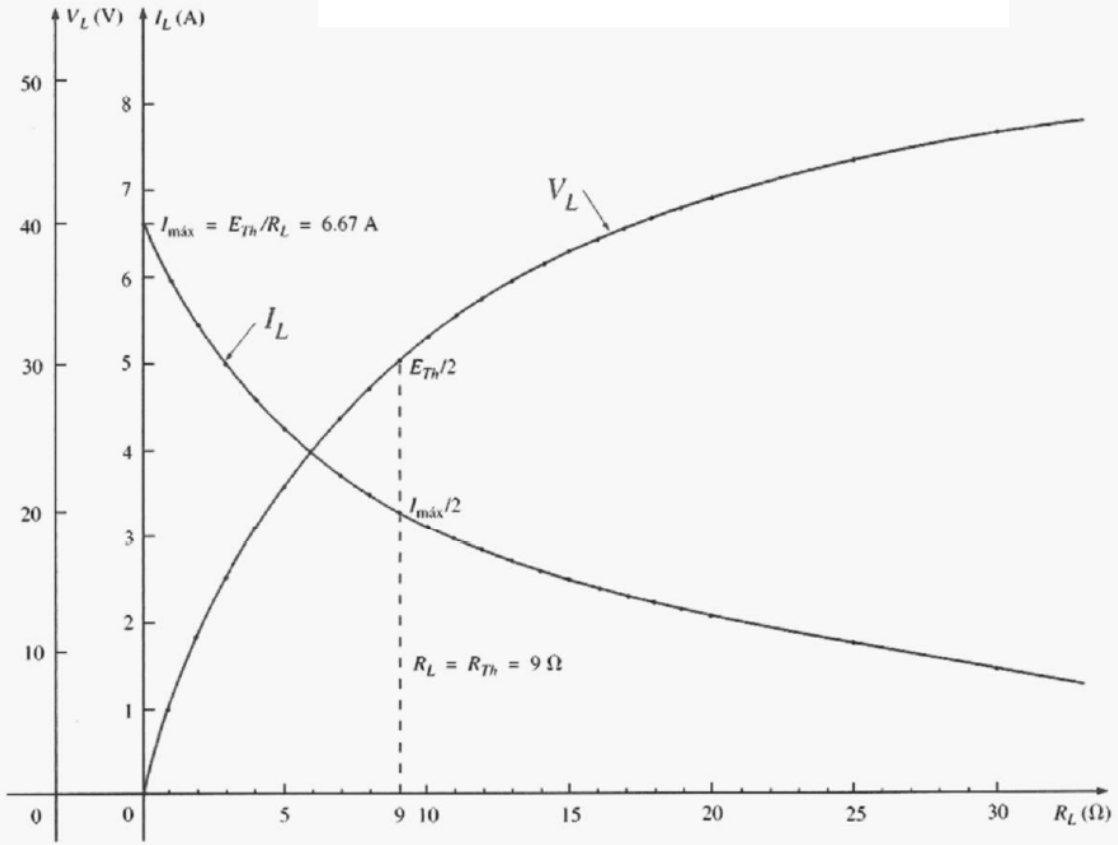
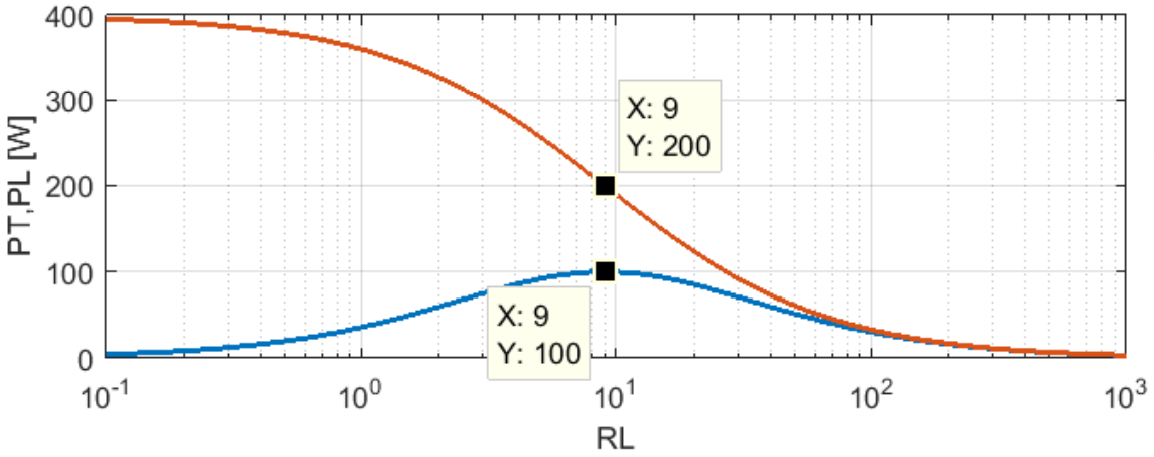
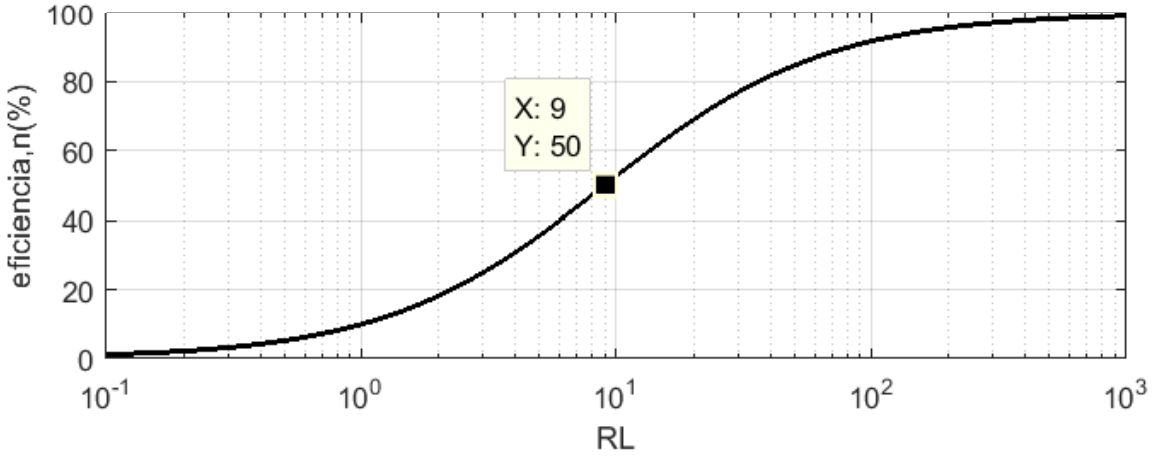
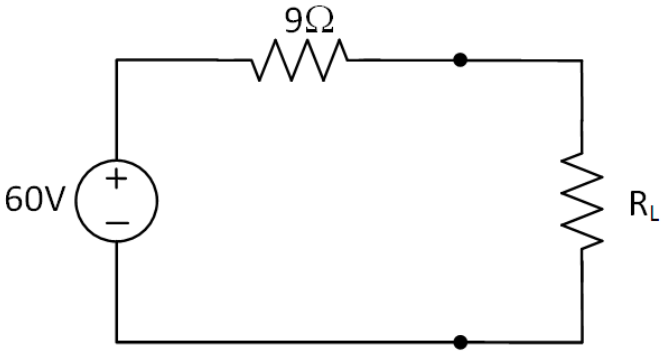


FIGURA 9.81
V_L e I_L en función de R_L para la red de la figura 9.79.







$$p_{L_{max}} = \frac{V_{Th}^{\ 2}}{4.R_{Th}}$$

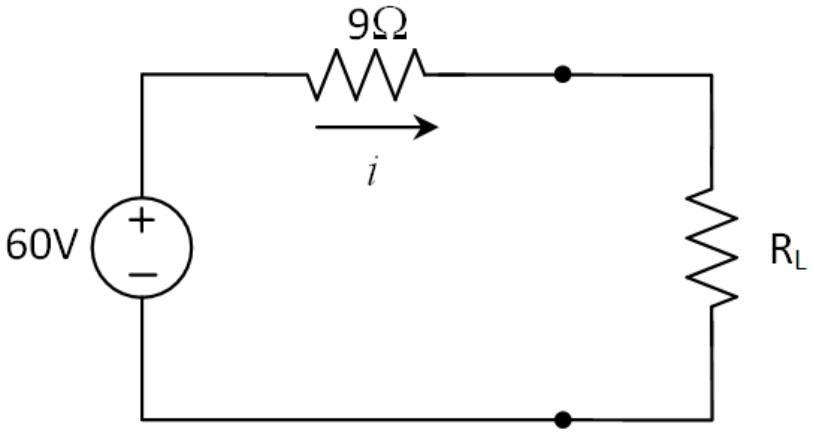
$$p_{L_{max}} = \frac{60^2}{4.9} = 100W$$

$$p_{60} = 200W$$

INGENIERIA
UNIVERSIDAD DE LOS ANDES
MÉRIDA VENEZUELA

INGENIERIA ELECTRICA
ULA

¿Qué valor debe tener R_L para que consuma 70W?



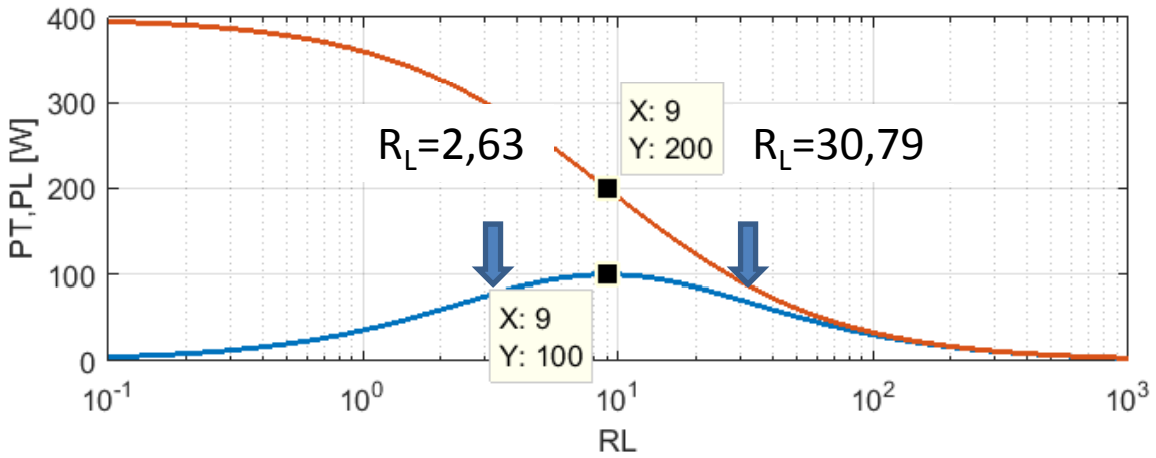
$$1)\quad i = \frac{60}{9 + R_L}$$

$$2)\quad i^2 R_L = 70$$

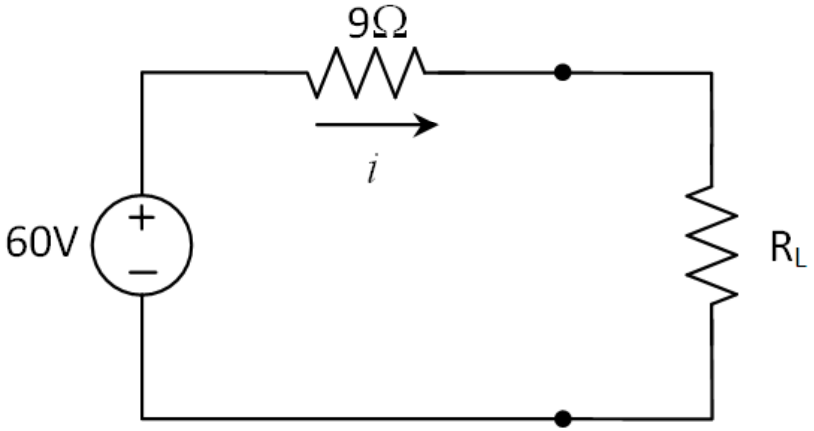
$$9i^2 - 60i + 70 = 0$$

$$R_L{}^2 + \left(18 - \frac{60^2}{70}\right) R_L + 9^2 = 0$$

R_L=2,63Ω R_L=30,79Ω



¿Qué valor debe tener R_L para n=75%?



$$\eta = \frac{R_L}{R_{Th} + R_L}$$

$$0{,}75 = \frac{R_L}{9 + R_L}$$

$$0{,}75(9 + R_L) = R_L$$

$$6{,}75 + 0{,}75R_L = R_L$$

$$0{,}25R_L = 6{,}75$$

R_L=27Ω