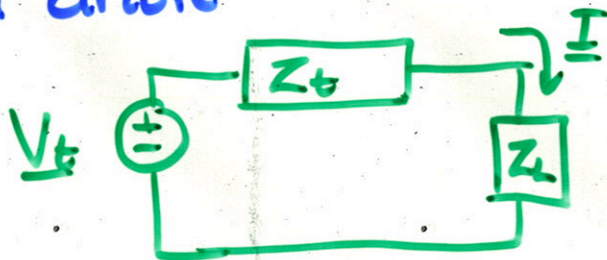


Maximum Power Transfer in Phasor Domain.

Given a circuit:



What is the value of Z_L for maximum power transfer to the load?

$$P_{av} = \frac{I_m^2}{2} R_L$$

where the current phasor \underline{I} has magnitude I_m

$$\underline{I} = \frac{\underline{V}_t}{\underline{Z}_t + \underline{Z}_L} = \frac{V_t}{(R_t + R_L)^2 + (X_t + X_L)^2}$$

$$\Rightarrow P_{av} = \frac{I_m^2 R_L}{2} = \frac{|V_t|^2 R_L}{(R_t + R_L)^2 + (X_t + X_L)^2}$$

Now choose R_L and X_L to make P_{av} large.

① choose $X_L = -X_t$ so part of the denominator disappears.

② by finding $\frac{dP_{av}}{dR_L}$ and setting it to zero P_{av} is maximized when $R_L = R_t$

HENCE

maximum power transfer is achieved when

$$Z_L = Z_t^*$$