Calculation

Consider the harmonically driven series LCR circuit shown.

$V_{max} = 100\ V$

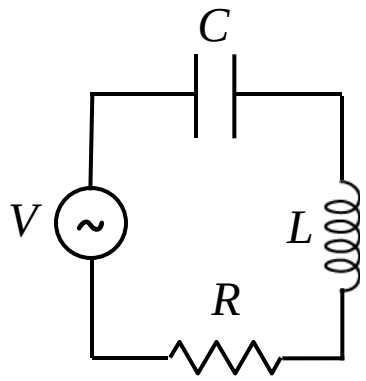
$I_{max} = 2\ mA$

$V_{Cmax} = 113\ V$

The current leads generator voltage by 45^o

L and R are unknown.

What is X_L, the reactance of the inductor, at this frequency?

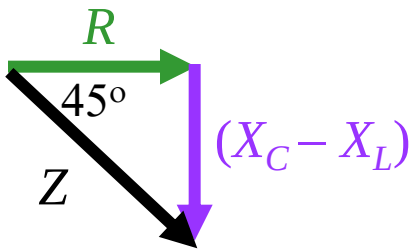


$Z = 50k\Omega$

$R = 35.4k\Omega$

A) $70.7\ k\Omega$ B) $50\ k\Omega$ C) $35.4\ k\Omega$ **D) $21.1\ k\Omega$**

We start with the impedance triangle:



$$\frac{X_C - X_L}{R} = \tan 45^\circ = 1 \rightarrow X_L = X_C - R$$

What is X_C?

$$V_{Cmax} = I_{max} X_C$$

$$X_C = \frac{113}{2} = 56.5k\Omega$$

$$X_L = 56.5\ k\Omega - 35.4\ k\Omega$$