More Follow-Up

Consider the harmonically driven series LCR circuit shown.

$V_{max} = 100\ V$

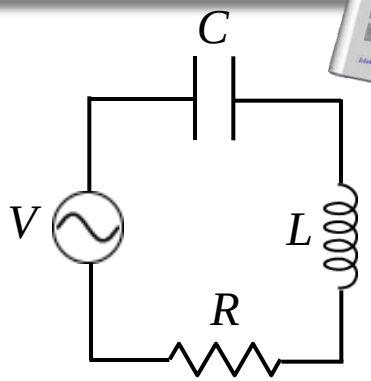
$I_{max} = 2\ mA$

$V_{Cmax} = 113\ V\ (= 80\ \text{sqrt}(2))$

$\rightarrow \quad X_C = 40\sqrt{2}\ k\Omega$

The current leads generator voltage by 45^o (cos = sin = 1/sqrt(2))

L and R are unknown.



$R = 25\sqrt{2}\ k\Omega$

$X_L = 15\sqrt{2}\ k\Omega$

By what factor should we increase ω to bring circuit to resonance?

i.e. if $\omega_0 = f\omega$, what is f?

A) $f = \sqrt{2}$ B) $f = 2\sqrt{2}$ C) $f = \sqrt{\frac{8}{3}}$ D) $f = \sqrt{\frac{8}{5}}$

If ω is increased by a factor of f:

X_L increases by factor of f

X_C decreases by factor of f

$\rightarrow \quad X_L \rightarrow f \cdot 15\sqrt{2}$

$X_C \rightarrow (1/f) \cdot 40\sqrt{2}$

At resonance $X_L = X_C$

$\rightarrow \quad 15f = \frac{40}{f} \quad \rightarrow \quad f^2 = \frac{40}{15} \quad \rightarrow \quad f = \sqrt{\frac{8}{3}}$