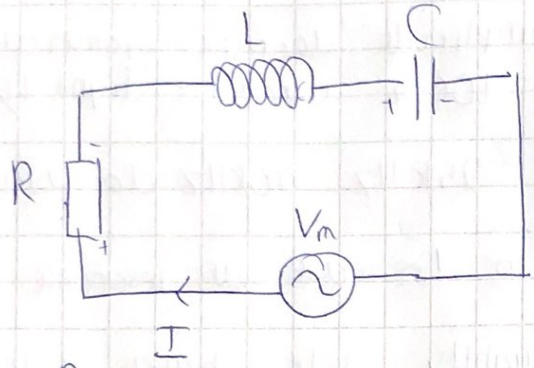
RLC - Resonance

1/



Since ~~Us in~~ Resonance frequency f_R appears when the inductive reactance (Z_L) of inductor equal to capacitive reactance (Z_C) of capacitor. Thus we have

$$Z_L = Z_C \iff 2\pi f_R L = \frac{1}{2\pi f_R C}$$

$$\iff 4\pi^2 f_R^2 = \frac{1}{LC}$$

$$\iff f_R^2 = \frac{1}{4\pi^2 LC} \iff \boxed{f_R = \frac{1}{2\pi\sqrt{LC}}}$$

2/ Since f_R above equation does not depend on R, in both (a) & (b) we have

$$f_R = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{(25 \cdot 10^{-3})(1 \cdot 10^{-9})}} \approx 31831\ Hz$$

$$\approx 32\ kHz$$

3/ (a) The two Plots represent the amplitude & phase angle of the total impedance Z. Since Z is complex number, it can be presented in polar form, which consisting amplitude & phase angle in frequency domain

(b) In case of 1Ω the amplitude decrease dramatically at near 40KHZ while 100Ω it reduce slightly.
Both are considered in 25KHz - 40KHz domain

(c) In ~~frequ~~ phase angle in 1Ω case at resonance frequency, it increase straightly while change in 100Ω is slightly a bit