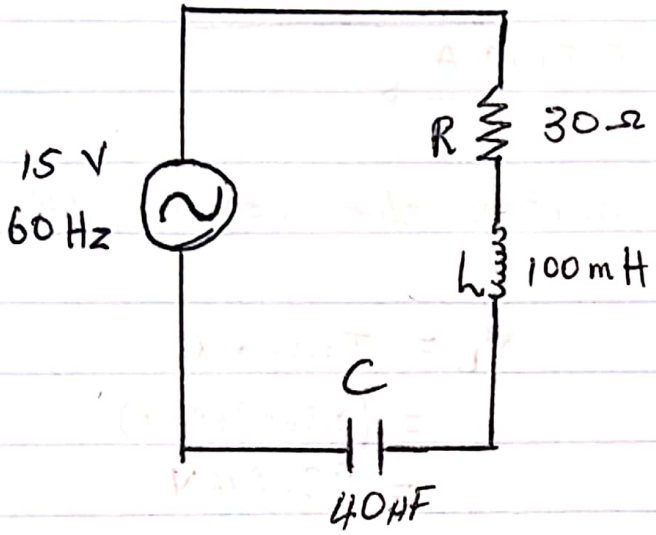
SERIES RLC CIRCUIT

* A 40 μF capacitor is in series with a 100 mH inductor, a 30 ohm resistor, and a 15 V AC signal with a frequency of 60 Hz.



* Calculate the capacitive reactance and the inductive reactance in the circuit.

$$X_C = \frac{1}{2\pi f \cdot C}$$

$$= \frac{1}{2\pi \times (60)(40\times10^{-6})}$$

$$= 66.3\ \Omega$$

$$X_L = 2\pi f L$$

$$= 2\pi \times (60)(100\times10^{-3})$$

$$= 37.7\ \Omega$$

* Determine the impedance of the circuit.

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{(30)^2 + (37.7 - 66.3)^2}$$

$$= 41.45\ \Omega$$

* Calculate the rms current in this circuit.

$$I_{rms} = \frac{V_s}{Z}$$

$$= \frac{15}{41.45}$$

$$= \underline{0.3619\ A}$$

* Calculate voltage across the resistor, capacitor and induct

$V_R = I_{rms} \cdot R$

$= (0.3619)(30)$

$= 10.857\ V$

$V_L = I_{rms} \times X_L$

$= (0.3619)(37.7)$

$= 13.64\ V$

$V_C = I_{rms} \times X_C$

$= (0.3619)(66.3)$

$= 23.994\ V$

* How much power is consumed in the circuit ?

$P = I^2 \cdot R$

$= (0.3619)^2 \times (30)$

$= 3.929\ W$

* What is the resonant frequency of this circuit?

$$f_R = \frac{1}{2\pi\sqrt{L \times C}}$$

$$= \frac{1}{2\pi\sqrt{(100 \times 10^{-3})(40 \times 10^{-6})}}$$

$$= 79.57\ Hz$$