

Ch—07 Alternating Current

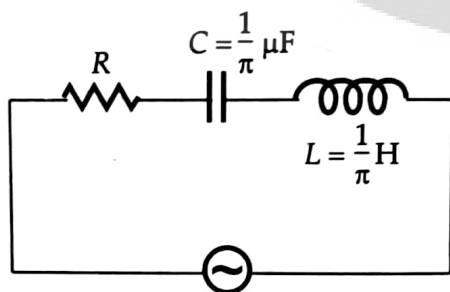
Daily Practice Problem 07

Q1. An inductor coil joined to a 6 V battery draws a steady current of 12 A . This coil is connected in series to a capacitor and a.c. source of alternating emf 6 V . If the current in the circuit is in phase with the emf, find the *rms* current.

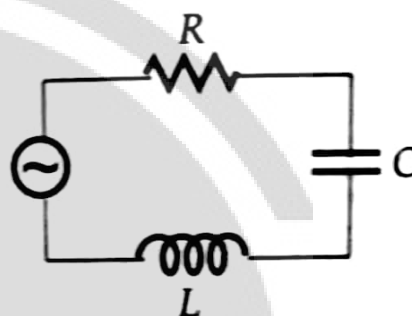
Q2. A resistor of resistance $400\ \Omega$, and a capacitor of reactance $200\ \Omega$, are connected in series to a 220 V , 50 Hz , a.c. source. If the current in the circuit is 0.49 ampere , find the

- voltage across the resistor and capacitor
- value of inductance required so that voltage and current are in phase.

Q3. In the a.c. circuit shown in Fig., the main supply has constant voltage but variable frequency. For what frequency will the voltage across the resistance R be maximum?



Q4. A series LCR circuit with $L = 4.0\text{ H}$, $C = 100\ \mu\text{F}$ and $R = 60\ \Omega$ is connected to a variable frequency 240 V source as shown in Fig.



Calculate:

- the angular frequency of the source which drives the circuit at resonance.
- the current at the resonating frequency.
- the *rms* potential drop across the inductor at resonance.

Q5. A capacitor, resistor of $5\ \Omega$ and an inductor of 50 mH are in series with an a.c. source marked 100 V , 50 Hz . It is found that voltage is in phase with the current. Calculate the capacitance of the capacitor and the impedance of the circuit.

Q6. A series LCR circuit containing a resistance of $120\ \Omega$ has angular resonance frequency $4 \times 10^5\text{ rad s}^{-1}$. At resonance

the-voltages across resistance and inductance are 60 V and 40 V , respectively.

a. The value of inductance L is

- (1) 0.1 mH
- (2) 0.2 mH
- (3) 0.35 mH
- (4) 0.4 mH

c. At what frequency, the current in the circuit lags the voltage by 45° ?

- (1) $4 \times 10^5\text{ rad s}^{-1}$
- (2) $3 \times 10^5\text{ rad s}^{-1}$
- (3) $8 \times 10^5\text{ rad s}^{-1}$
- (4) $2 \times 10^5\text{ rad s}^{-1}$

b. The value of capacitance C is

- (1) $\frac{1}{32}\mu\text{F}$
- (2) $\frac{1}{16}\mu\text{F}$
- (3) $32\mu\text{F}$
- (4) $16\mu\text{F}$

ANSWERS

1. 12 A

2. 196 V , 98 V , 0.64 H

3. 500 Hz

4. 50 rad s^{-1} , 4 A , 800 V

5. $2.02 \times 10^{-4}\text{ F}$, 5Ω

6. a. 2, b. 1, c. 3

