



## Ch—07 Alternating Current

### Daily Practice Problem 03

**Q1.** A coil has an inductance of  $1\text{ H}$ . (i) At what frequency will it have a reactance of  $3142\ \Omega$ ? (ii) What should be the capacity of a capacitor which has the same reactance at that frequency?

**Q2.** Alternating emf,  $\epsilon = 220 \sin 100\pi t$  is applied to a circuit containing an inductance of  $1/\pi\text{ H}$ . Write an equation for instantaneous current through the circuit. What will be the reading of an a.c. ammeter if connected in the circuit?

**Q3.** A pure inductance of  $1.0\text{ H}$  is connected across a  $110\text{ V}$ ,  $70\text{ Hz}$  source. Find the (a) reactance, (b) current, and (c) peak value of current.

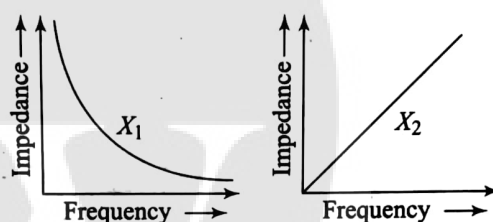
**Q4.** Calculate the frequency at which the inductive reactance of  $0.7\text{ H}$  inductor is  $220\ \Omega$ .

**Q5.** Find the maximum value of current when an inductance of one henry is connected to an a.c. source of  $200\text{ volts}$ ,  $50\text{ Hz}$ .

**Q6.** A  $1.50\ \mu\text{F}$  capacitor is connected to a  $220\text{ V}$ ,  $50\text{ Hz}$  source. Find the capacitive reactance and the current (rms and peak) in the circuit.

**Q7.** A  $200\text{ mH}$  (pure) inductor, and a  $5\ \mu\text{F}$  (pure) capacitor, are connected, one by one, across a sinusoidal ac voltage source  $V = [70.7 \sin(1000 t)]$  volt. Obtain the expressions for the current in each case.

**Q8.** The graphs given below depict the dependence of two reactive impedances  $X_1$  and  $X_2$  on the frequency of the alternating e.m.f. applied individually to them. We can then say that



- $X_1$  is an inductor and  $X_2$  is a capacitor
- $X_1$  is a resistor and  $X_2$  is a capacitor
- $X_1$  is a capacitor and  $X_2$  is an inductor
- $X_1$  is an inductor and  $X_2$  is a resistor

**Q9.** Voltage and current in an ac circuit are given by  $V = 5 \sin \left( 100\pi t - \frac{\pi}{6} \right)$  and  $I = 4 \sin \left( 100\pi t + \frac{\pi}{6} \right)$

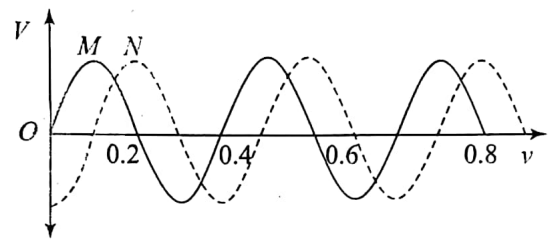
- Voltage leads the current by  $30^\circ$
- Current leads the voltage by  $30^\circ$
- Current leads the voltage by  $60^\circ$

d. Voltage leads the current by  $60^\circ$

is the frequency, and the phase relationship between th

**Q10.** A capacitor has a capacitance of  $1/\pi \mu F$ . Find its reactance for a frequency of (i)  $50 \text{ Hz}$  and (ii)  $10^6 \text{ Hz}$ .

**Q11.** Two sinusoidal voltages of the same frequency are shown in the diagram. What



Frequency in Hz

- (a) 0.4
- (b) 2.5
- (c) 2.5
- (d) 2.5

Phase lead of N over M in radians

- $-\pi/4$
- $-\pi/2$
- $+\pi/2$
- $-\pi/4$

# ANSWERS

1.  $500 \text{ Hz}$ ;  $0.11 \mu\text{F}$

5.  $0.9 \text{ A}$

9. c

2.  $2.2 \sin\left(100\pi t - \frac{\pi}{2}\right)$

6.  $212 \Omega$ ,  $1.04 \text{ A}$ ,  $1.47 \text{ A}$

10.  $10 \Omega$ ,  $0.5 \Omega$

$1.556 \text{ A}$

7.  $I = 0.3535 \sin\left(1000t - \frac{\pi}{2}\right)$

11. b

3. a.  $440 \Omega$       b.  $0.25 \text{ A}$

$I = 0.3535 \sin\left(1000t - \frac{\pi}{2}\right)$

c.  $0.353 \text{ A}$

8. c

4.  $50 \text{ Hz}$

