Ch—07 Alternating Current

Daily Practice Problem 04

Q1. When an inductor L and a resistor R in series are connected across a $12\,V$, $50\,Hz$ supply, a current of 0.5 Allows in the circuit. The current differs in phase from applied voltage by $\pi/3$ radian. Calculate the value of R.

Q2. A bulb of resistance $10\,\Omega$, connected to an inductor of inductance L, is in series with an a.c. source marked $100\,V$, $50\,Hz$. If the phase angle between the voltage and current is it $4\,radian$, calculate the value of L.

Q3. A student connects a long air core coil of manganin wire to a $100\,V$ d.c. source and records a current of $1.5\,A$. When the same coil is connected across $100\,V$, $50\,Hz$ a.c. source the current reduces to $1.0\,A$.

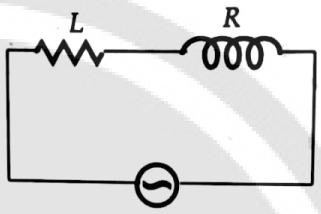
(i) Give reason for this observation.

(ii) Calculate the value of the reactance of the coil.

Q4. In the circuit shown in Fig., the potential difference across the inductor L and resistor R are $120\,V$ and $90\,V$ respectively and the rms value of current is $3\,A$. Calculate

(i) the impedance of the circuit and

(ii) the phase angle between the voltage and current.



Q5. When $100\,V$ dc is supplied across a solenoid, a current of $1.0\,A$ flows in it. When $100\,V$ ac is applied across the same coil, the current drops $0.5\,A$. the frequency of ac source is $50\,Hz$, then the impedance and inductance of the solenoid are

(a) $200\,\Omega$ and $0.55\,H$

(b) $100\,\Omega$ and $0.86\,H$

(c) $200\,\Omega$ and $1.0\,H$

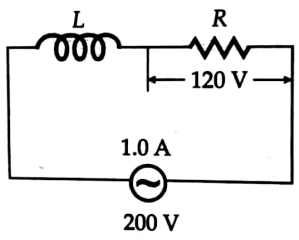
(d) $100\,\Omega\,and\,0.93\,H$

Q6. The virtual current in the a.c. circuit shown in Fig., is $1.0\,A$. Find

(i) virtual voltage across the coil L,

(ii) impedance of the circuit and

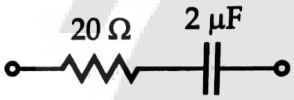
(iii) reactance of the coil.



Q7. Find the impedance of the circuit shown in Fig., for

(i) direct current and

(ii) alternating current of frequency $10/\pi\ kHz$.



Q8. In a series R-C circuit, $R = 30\,\Omega$, $C = 0.25\,\mu F$, $V = 100\,V$ *and* $\omega =$ $10{,}000\ rad\ s^{-1}$. Find the current in the circuit and calculate the voltage across the resistor and the capacitor.

Q9. A series circuit contains a resistor of $20\,\Omega$, a capacitor and an ammeter of negligible resistance. It is connected to a source of $220\ V - 50\ Hz$. If the reading of the ammeter is $2.5\ A$, calculate the reactance of the capacitor.

Q10. What is the value of current in the $a.c.$ circuit containing $R = 10\,\Omega$, $C = 50\,\mu C$ in series across $200\ V$, $50\ Hz$ a.c. source?

ANSWERS

1. $12\ \Omega$

2. $0.0318\ H$

3. $74.53\ \Omega$

4. $50\ \Omega$; $53.1°$

5. a

6. $(i)\ 160\ V$

$(ii)\ 200\ \Omega$

$(iii)\ 160\ \Omega$

7. (i) infinite $(ii) 32\ \Omega$

8. $0.25\ A$; $7.5\ V$; $100\ V$

9. $85.7\ \Omega$

10. $3.10\ A$