ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 34

Subject : PHYSICS

27.07.20

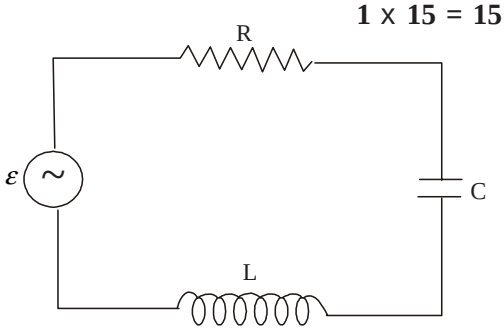
CLASS : XII

Topic : LCR, phasor diagram, impedance, resonance curve, resonance, bandwidth, Q-factor.

Chapter : Alternating current

Multiple Choice Question : **1 x 15 = 15**

1. Consider the figure, the resistor, inductor and capacitor are in series, therefore



(a) the AC current in each element is same at any time

(b) amplitude and phase are same in each element

(c) both (a) and (b) (d) Neither (a) nor (b)

Ans. (c) both (a) and (b)

2. In a series *L*-*C*-*R* circuit, the frequency of 10 V AC voltage source is adjusted in such a fashion that the reactance of the inductor measures $15\,\Omega$ and that of the capacitor $11\,\Omega$. If $R = 3\,\Omega$, the potential difference across the series combination of *L* and *C* will be

(a) 8 V (b) 10 V (c) 22 V (d) 52 V

Ans. (a) 8 V

3. The current in the series *L*-*C*-*R* circuit is

(a) $i = i_m \sin(\omega\tau + \phi)$ (b) $i = \dfrac{V_m}{\sqrt{R^2 + (X_c - X_L)^2}} \sin(\omega\tau + \phi)$

(c) $i = 2i_m \cos(\omega\tau + \phi)$ (d) both (a) and (b)

Ans. (d) both (a) and (b)

4. In a series *L*-*C*-*R* series AC circuit, then voltage across each of the components, *L*,*C* and *R* is 50 V. The voltage across the *C*–*R* combination will be

(a) 50 V (b) $50\sqrt{2}\ V$ (c) 100 V (d) zero

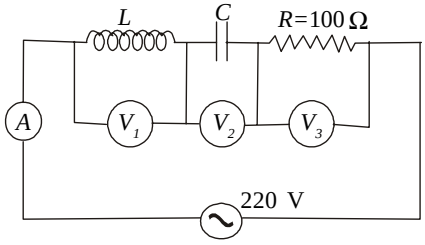
Ans. (b) $50\sqrt{2}\ V$

5. In an *L*-*C*-*R* series AC circuit, the voltage across each of the components, *L*,*C* and *R* is 50 V. The voltage across the *L*–*C* combination will be

(a) 50 V (b) $50\sqrt{2}\ V$ (c) 100 V (d) 0 V

Ans. (d) 0 V

6. In the given circuit, the readings of voltmeters V_1 and V_2 are 300 V each. The readings of the voltmeter V_3 and ammeter *A* are respectively



(a) 100 V, 2.0 A (b) 150 V, 2.2 A

(c) 220 V, 2.2 A (d) 220 V, 2.0 A

Ans. (c) 220 V, 2.2 A

7. The phenomenon of resonance is common among systems that have a tendency
(a) to oscillate at a particular frequency (b) to get maximum amplitude
(c) both (a) and (b) (d) neither (a) nor (b)
Ans. (a) to oscillate at a particular frequency

8. At resonant frequency, the current amplitude of an *R-L-C* circuit is
(a) minimum (b) maximum (c) may be minimum (d) never maximum
Ans. (b) maximum

9. In an *L-C-R* series circuit, the potential difference between the terminals of the inductance is 60 V, between the terminals of the capacitor is 30 V and that across the resistance is 40 V. Then, supply voltage will be equal to
(a) 50 V (b) 70 V (c) 130 V (d) 10 V
Ans. (a) 50 V

10. In R-L-C series circuit with L = 1.00 mH, C = 1.00 nF two values of R are (i) $R = 100\,\Omega$ and (ii) $R = 200\,\Omega$. For the source applied with V_m = 100V. Resonant frequency is
(a) 1 x 10^3 rad/s (b) 1 x 10^6 rad/s (c) 1.56 x 10^6 rad/s (d) 1.75 x 10^3 rad/s
Ans. (a) 1 x 10^3 rad/s

11. Resonant circuits are used in
(a) the tuning mechanism of radio (b) TV set
(c) both (a) and (b) (d) neither (a) nor (b)
Ans. (c) both (a) and (b)

12. Banddwidth of the resonant L-C-R circuit is
(a) $\frac{R}{L}$ (b) $R / 2L$ (c) $\frac{2R}{L}$ (d) $\frac{4R}{L}$
Ans. (b) $R / 2L$

13. If resonant frequency of a *R-L-C* circuit is ω_0 and bandwidth is $A\omega$, then which of the following quantity is regarded as a measure of the sharpness of resonance?
(a) $\frac{\omega_0}{\Delta\omega}$ (b) $\frac{\omega_0}{2\Delta\omega}$ (c) $\frac{2\omega_0}{\Delta\omega}$ (d) $\frac{\Delta\omega}{2\omega_0}$ Ans. (b) $\frac{\omega_0}{2\Delta\omega}$

14. Which of the following ratio is called the quality factor, Q of the circuit?
(a) $Q = \frac{\omega_0 L}{R}$ (b) $Q = \frac{2\omega_0 L}{R}$ (c) $Q = \frac{\omega_0 L}{2R}$ (d) $Q = \frac{\omega_0 L}{4R}$
Ans. (a) $Q = \frac{\omega_0 L}{R}$

15. In an *L-C-R* circuit, capacitance is changed from C to $2C$. For the resonant frequency to remain unchanged, the inductance should be change from L to
(a) $4L$ (b) $2L$ (c) $L / 2$ (d) $L / 4$
Ans. (c) $L / 2$

Ambarnath Banerjee