

- c) A is true but R is false. d) A is false but R is true.
7. **Assertion:** In alternating current, direction of motion of free electrons changes periodically. [1]
Reason: Alternating current changes its direction after a certain time interval.
- a) Assertion and reason both are correct statements and reason is correct explanation for assertion. b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement.
8. The electric mains in a house are: 220 V, 50 Hz. Write down the equation for instantaneous voltage. [1]
9. An alternating emf of peak value 350 V is applied across an a.c. ammeter of resistance 100 Ω . What is the reading of the ammeter? [1]
10. The peak value of an alternating voltage applied to a 50 Ω resistance is 10 V. Find the rms current. If the voltage frequency is 100 Hz, write the equation for the instantaneous current. [1]
11. The electric current in a circuit is given by $i = i_0(t/\tau)$ for some time. Calculate the rms current for the period $t = 0$ to $t = \tau$. [1]
12. A light bulb is rated 100 W for 220 V ac supply of 50 Hz. Calculate, [1]
 i. the resistance of the bulb
 ii. the rms current through the bulb.
13. Why is choke coil needed in the use of fluorescent tubes with a.c. mains? Why can we not use an ordinary resistor instead of the choke coil? [1]
14. An AC current, $I = I_0 \sin \omega t$ produces certain heat H in a resistor R over a time $T = 2\pi/\omega$. Write the value of the DC current that would produce the same heat in the same resistor in the same time. [1]
15. An electric heater is connected, turn by turn, to a dc and ac sources of equal voltages. Will the rate of heat production be same in the two cases? Explain. [1]
16. What is the average value of a.c. over a cycle and why? [1]
17. Is a motor starter a variable R or L or C? [1]
18. Write the impedance of a series LCR resonant circuit in terms of L, C and R. [1]
19. A choke coil in series with a lamp is connected to a dc line. The lamp is seen to shine brightly. Insertion of an iron core in the choke causes no change in the lamp's brightness. Predict the corresponding observations if the connection is to an a.c. line. [1]
20. What is an alternating current? Write an expression for its instantaneous value. [1]
21. An electric bulb operates 12 V d.c. If this bulb is connected to an a.c. source and gives normal brightness, what would be the peak value of the source? [1]

Section B

22. An alternating voltage given by $V = 70 \sin 100 \pi t$ is connected across a pure resistor of 25 Ω . Find [2]
 i. the frequency of the source.
 ii. the rms current through the resistor.
23. An alternating voltage given by $V = 140 \sin 314t$ is connected across a pure resistor of 50 Ω . Find [2]
 i. the frequency of the source.
 ii. the rms current through the resistor.

24. A light bulb is rated at 100W for a 220 V supply. Find [2]
a. the resistance of the bulb;
b. the peak voltage of the source; and
c. the rms current through the bulb.

25. On the basis of power dissipation in a.c. circuit, distinguish between resistance, reactance and impedance. [2]

26. An alternating voltage given by [2]

$V = 280 \sin 100\pi t$ is connected across a pure resistor of 40Ω , Find

- i. the frequency of the source.
ii. the rms current through the resistor.

27. Distinguish between alternating current and direct current. [2]

Section C

28. A sinusoidal voltage of peak value 10 V is applied to a series LCR circuit in which resistance, capacitance, and inductance have values of 10Ω , $1\mu\text{F}$ and 1 H respectively. Find [3]

- i. the peak voltage across the inductor at resonance
ii. quality factor of the circuit.

29. If the effective value of current is 50 Hz a.c. The circuit is 5.0 A, what is [3]

- i. the peak value of current
ii. the mean value of current over half cycle and
iii. the value of current $\frac{1}{300}$ s after it was zero?

30. The instantaneous value of an alternating voltage in volts is given by the expression $\varepsilon_t = 140 \sin 300 t$, where t is in second. What is [3]

- i. the peak value of the voltage,
ii. its rms value and
iii. frequency of the supply?

Take $n = 3$, $\sqrt{2} = 1.4$

31. A resistance of 40Ω is connected to an a.c. source of 220 V, 50 Hz. Find [3]

- i. the rms current
ii. the maximum instantaneous current in the resistor and
iii. the time taken by the current to change from its maximum value to the rms value.