IAE ACADEMY INSTITUTE FOR ENGINEERS

CORE JOBS · INTERVIEW QUESTIONS

IAE Academy free study material · Updated 30 October 2026

Networks (Electric Circuits) Interview Questions

INSIDE

- 25 questions with short answers
- 6 numericals with the working
- Grouped by topic

Companies do not publish their interview questions; these are ours.

Online, with links to the notes: **iaeacademy.in/study/networks/interview-questions**

FREE COUNSELLING

Preparing for GATE or a core job? Talk to IAE Academy.

Or call **+91 84204 36524**

Every day, 10:30 am to 7:30 pm

Chat on WhatsApp

Circuit laws, sources, and node and mesh analysis

1. State Kirchhoff's two laws and say what each one rests on.

KCL: the algebraic sum of currents at a node is zero, because charge cannot pile up at a node of a lumped circuit. KVL: the algebraic sum of voltages around any closed loop is zero, because the electric field is conservative. Both hold for lumped circuits, where no changing flux links the loop.

2. What is the difference between an ideal voltage source and a practical one?

An ideal voltage source holds its terminal voltage fixed whatever current it supplies, so its internal resistance is zero. A practical source is an ideal source in series with an internal resistance, so its terminal voltage falls as the load current rises. The current source is the dual: ideal has infinite parallel resistance.

3. A delta network has three equal resistors of 30 ohm each. What is the resistance of each arm of the equivalent star?

Each arm of the equivalent star is 10 ohm, since a balanced delta converts to a star with arms one third of the delta resistance.

WORKING

1. For a balanced delta, $R_Y = R_\Delta / 3$.
2. $R_Y = 30 / 3$.
3. $R_Y = 10\ \Omega$.

4. Why is a supernode needed in nodal analysis?

An ideal voltage source between two non-reference nodes carries a current that its voltage does not fix, so KCL at either node cannot be written in node voltages alone. Joining the two nodes into one supernode lets you write a single KCL for the pair, and the source supplies the extra equation $V_a - V_b = V_s$, with its positive terminal at node a.

Network theorems

5. What does Thevenin's theorem say, and how is each part of the equivalent found?

A linear two-terminal network can be replaced by a voltage source V_{th} in series with a resistance R_{th}. V_{th} is the open-circuit voltage. R_{th} is the resistance seen at the terminals with independent sources turned off. Dependent sources stay in, so use a test source or V_{oc}/I_{sc}. The equivalent holds only at the terminals.

6. Why can superposition not be applied directly to power?

Power depends on the square of current or voltage, which is not a linear function. If a current is the sum of two components, $P = I^2 R$ gives cross terms, so powers from each source do not add. Find the total current or voltage by superposition first, then compute the power.

7. A linear network has a Thevenin voltage of 12 V and a Thevenin resistance of 4 ohm. Find the maximum power it can deliver to a resistive load.

The maximum power delivered to the load is 9 W, when the load resistance equals the Thevenin resistance of 4 ohm.

WORKING

1. Maximum power transfer needs $R_L = R_{th} = 4\ \Omega$.
2. $I = 12/(4+4) = 1.5$ A.
3. $P = I^2 R_L = 1.5^2 \times 4 = 9$ W.
4. Check: $V_{th}^2/(4R_{th}) = 144/16 = 9$ W.

8. What is the difference between the Thevenin and Norton equivalents?

Both describe the same two-terminal network. Thevenin is a voltage source V_{th} in series with R_{th}. Norton is a current source $I_N = V_{th}/R_{th}$ in parallel with the same R_{th}. Source transformation converts one to the other, except that an ideal voltage source has no Norton form and an ideal current source has no Thevenin form.

Transients in RL, RC and RLC circuits

9. Why can the voltage across a capacitor and the current through an inductor not change instantly?

They set the stored energy, $\frac{1}{2}CV^2$ and $\frac{1}{2}LI^2$. A jump would need infinite power from a finite source, since power is the rate of change of energy. So $v_C(0^+) = v_C(0^-)$ and $i_L(0^+) = i_L(0^-)$, unless an impulse is applied.

10. A 10 kilohm resistor in series with an uncharged 100 microfarad capacitor is connected to a 10 V DC source at t = 0. Find the capacitor voltage at t = 1 s.

The capacitor voltage at 1 s is about 6.32 V, which is 63.2 percent of the final 10 V because 1 s equals one time constant.

WORKING

1. $\tau = RC = 10 \times 10^3 \times 100 \times 10^{-6} = 1$ s.
2. $v_C(t) = V_s\left(1 - e^{-t/\tau}\right)$.
3. $v_C(1) = 10\,(1 - e^{-1})$.
4. $v_C(1) = 10 \times 0.632 = 6.32$ V.

11. How do the overdamped, critically damped and underdamped responses of a series RLC circuit differ?

They depend on $\alpha = R/2L$ against $\omega_0 = 1/\sqrt{LC}$. Overdamped ($\alpha > \omega_0$): two real roots, slow decay with no oscillation. Critically damped ($\alpha = \omega_0$): equal roots, the fastest decay without oscillation. Underdamped ($\alpha < \omega_0$): complex roots, a decaying oscillation at $\omega_d = \sqrt{\omega_0^2 - \alpha^2}$.

12. Why does the transient current in an RL circuit switched onto an AC source depend on the instant of switching?

With the inductor initially unenergised, its current cannot jump, so a decaying natural term must cancel the steady-state current at the switching instant. That steady-state value depends on the source phase at that instant. If the switch closes when the steady-state current would be zero, there is no transient. In a highly inductive circuit the worst case lets the first peak approach twice the steady-state peak.

Sinusoidal steady state, AC power and resonance

13. Define active, reactive and apparent power and state how they are related.

For rms voltage and current with phase angle φ: active power $P = VI\cos\varphi$ (watts) is the average power converted to work or heat. Reactive power $Q = VI\sin\varphi$ (var) is energy exchanged with inductors and capacitors. Apparent power $S = VI$ (VA) satisfies $S^2 = P^2 + Q^2$, and the power factor is P/S.

14. Why is the power factor of a load corrected with a parallel capacitor?

At a fixed voltage and real power, a lower power factor needs more current, since $I = P/(V\cos\varphi)$. That raises I^2R loss and voltage drop in cables, and loads cables and transformers rated in VA. A parallel capacitor supplies the reactive power locally, so the line current falls while the real power stays the same.

15. A load takes 4 kW at a power factor of 0.8 lagging from a 230 V, 50 Hz supply. Find the reactive power a parallel capacitor must supply to bring the power factor to unity.

The capacitor must supply 3000 var (3 kvar), equal to the reactive power the load draws at 0.8 lagging, so that the supply sees only the 4 kW of active power and the line current falls to its minimum.

WORKING

1. $\cos\varphi = 0.8$, so $\sin\varphi = 0.6$ and $\tan\varphi = 0.75$.
2. $Q_{load} = P\tan\varphi = 4000 \times 0.75 = 3000$ var.
3. For unity power factor, $Q_C = Q_{load} = 3000$ var.

16. What is the difference between series and parallel resonance?

Both occur near $\omega_0 = 1/\sqrt{LC}$ for ideal elements, where the reactances cancel. In series resonance the impedance is minimum (equal to R) and the current is maximum. In parallel resonance the impedance is maximum and the line current is minimum. Series resonance magnifies voltage across L and C; parallel magnifies current in the branches.

Magnetically coupled circuits

17. What does the dot convention tell you about coupled coils?

A current entering the dotted terminal of one coil induces a mutual voltage in the other coil that is positive at its dotted terminal. When both currents enter, or both leave, the dotted terminals, the mutual voltage aids the self voltage in each coil. When one enters and the other leaves, it opposes. The dots therefore fix the sign of every M term.

18. Two coils of 0.4 H and 0.6 H have a mutual inductance of 0.2 H. They are connected in series so that their fluxes oppose. Find the equivalent inductance.

The equivalent inductance is 0.6 H, because the mutual inductance reduces the total by twice its value when the fluxes oppose.

WORKING

1. Series opposing: $L_{eq} = L_1 + L_2 - 2M$.
2. $L_{eq} = 0.4 + 0.6 - 2 \times 0.2$.
3. $L_{eq} = 0.6$ H.

19. Why can the coupling coefficient of two coils not exceed 1?

The energy stored in a passive pair of coils cannot be negative for any currents. Energy is $\frac{1}{2}L_1 i_1^2 + M i_1 i_2 + \frac{1}{2}L_2 i_2^2$, and requiring it to be at least zero for all i_1, i_2 gives $M^2 \le L_1 L_2$. Hence $k = M/\sqrt{L_1 L_2} \le 1$.

Two-port networks

20. How are the Z parameters of a two-port defined, and how is each one found?

They relate port voltages to port currents: $V_1 = z_{11} I_1 + z_{12} I_2$ and $V_2 = z_{21} I_1 + z_{22} I_2$. Each is an open-circuit measurement. For example $z_{11} = V_1/I_1$ with port 2 open, and $z_{21} = V_2/I_1$ with port 2 open. They exist only when the network allows these open-circuit relations.

21. Why are ABCD parameters used for cascaded two-ports?

The output voltage and current of the first network are the input of the second, so the ABCD matrices simply multiply in order: $[T] = [T_1][T_2]$. This holds with the port 2 current taken as leaving the port. Z parameters add for series connection and Y parameters add for parallel connection, which is not what a cascade does.

22. What conditions on the parameters show that a two-port is reciprocal, and what more shows it is symmetric?

A linear two-port is reciprocal when $z_{12} = z_{21}$, or $y_{12} = y_{21}$, or $AD - BC = 1$, or $h_{12} = -h_{21}$; a network of only R, L, C and coupled coils always is. It is symmetric if, in addition, the two ports can be swapped unchanged: $z_{11} = z_{22}$, $y_{11} = y_{22}$ or $A = D$.

Balanced three-phase circuits

23. How do line and phase quantities differ in balanced star and delta connections?

In a balanced star, line current equals phase current and line voltage is $\sqrt{3}$ times phase voltage. In a balanced delta, line voltage equals phase voltage and line current is $\sqrt{3}$ times phase current. In both cases the quantity that is $\sqrt{3}$ times larger is displaced by 30° from its phase value: star line voltage leads, delta line current lags, for positive sequence.

24. A balanced three-phase load draws 20 A from a 400 V line-to-line supply at a power factor of 0.8 lagging. Find the total active power.

The total active power is about 11085 W, which is $\sqrt{3}\, V_L I_L \cos\varphi$ for a balanced load in star or delta.

WORKING

1. $P = \sqrt{3}\, V_L I_L \cos\varphi$.
2. $P = 1.732 \times 400 \times 20 \times 0.8$.
3. $P = 13856 \times 0.8 \approx 11085$ W.

25. Why can one wattmeter read negative in the two-wattmeter method?

For a balanced load the readings are $V_L I_L \cos(30^\circ - \varphi)$ and $V_L I_L \cos(30^\circ + \varphi)$. When the load angle φ exceeds 60°, the second cosine is negative, so that meter reads negative. The algebraic sum of the two readings is still the total power.

FROM IAE ACADEMY

Preparing for GATE or a core job?

IAE Academy teaches GATE in seven papers in Ballygunge, Kolkata, and online. Counselling is free: ask us about batches, fees or your preparation.

FREE COUNSELLING

Chat on WhatsApp

Call +91 84204 36524

Open every day, 10:30 am to 7:30 pm.

Scan to chat on WhatsApp

GATE COURSES

Classroom batches in Ballygunge and online batches. Fees and details are on the course pages.

Scan: courses

See the courses

FREE ON IAEACADEMY.IN

Notes and solved previous-year questions for Networks (Electric Circuits), topic by topic.

Scan: the notes

Open the notes

Found this useful? Send it to a friend preparing for core-job interviews.

Send to a friend on WhatsApp

IAE Academy free study material. Companies do not publish their interview questions; these are ours. Prepared and published by IAE Academy, Kolkata. Free to read and free to share, unaltered and with attribution.

IAE ACADEMY INSTITUTE FOR ENGINEERS

GATE coaching in Kolkata since 2012 · EC, EE, IN, CS and IT, DA, BT and CE · in the classroom and online

227A Rash Behari Ave, Ballygunge, Kolkata 700019

+91 84204 36524 · iaeacademy.in · Updated 30 October 2026

Get directions