Basic Electrical Engineering Important Questions PDF

Basic Electrical Engineering usually covers DC circuits and network theorems, single-phase and three-phase AC circuits, transformers, electrical machines (DC, induction and synchronous) and electrical installations. Expect Thevenin and superposition numericals, RLC resonance, three-phase power, transformer EMF and efficiency, induction motor slip and energy bill questions.

Key takeaways

- DC circuits: KCL, KVL, mesh and nodal analysis, superposition, Thevenin, Norton and maximum power transfer.
- AC circuits: RMS and average values, phasors, RLC series resonance, power factor and three-phase star-delta relations.
- Transformers: EMF equation, losses, efficiency, regulation and the condition for maximum efficiency.
- Machines and installations: DC machine EMF, induction motor slip, MCB, RCCB, earthing and energy calculation.
- These are practice questions based on common syllabus topics, not verified past papers.

About these important questions

These are **practice questions** built from topics that appear in most Indian B.Tech syllabi for Basic Electrical Engineering, including AKTU and universities that follow the AICTE model curriculum. They are **not verified past papers**, and we do not claim that any question will appear in your exam. Unit numbers and topic order differ between universities, so first match each unit below with your own university syllabus. For real previous papers, use your university's official archive. AKTU students can download them from the AKTU old question paper page.

Each unit lists key definitions, derivations or theory questions, numericals with short answer outlines, and long-answer questions. Use the outlines to check your method, then write full solutions yourself.

Unit 1: DC Circuits

Key definitions: active and passive elements, ideal and practical sources, dependent sources, KCL and KVL, star-delta transformation, linear and bilateral networks.

Theorems to state, prove or apply: superposition, Thevenin's, Norton's and maximum power transfer theorems.

Numericals (answer outline):

- Find the current through a load resistor using Thevenin's theorem. Outline: remove the load, find Vth (open-circuit voltage) and Rth (sources replaced by internal resistance), then I = Vth/(Rth + RL).
- Maximum power transfer: load = Rth, and Pmax = $V_{th}^2/(4R_{th})$.
- Convert a delta of three 30 Ω resistors to star. Answer: each star resistor = (30 x 30)/90 = 10 Ω.
- Solve a two-loop circuit by mesh analysis and check the answer with nodal analysis.

Long-answer questions: Prove the maximum power transfer theorem. Apply superposition to a circuit with one voltage and one current source.

Unit 2: Single-phase and Three-phase AC Circuits

Key definitions: RMS and average value, form factor, peak factor, phasor, impedance, reactance, power factor, active, reactive and apparent power, resonance, Q-factor, bandwidth.

Numericals (answer outline):

- Find the RMS value, average value and form factor of a sine wave. Answer: $V_m/\sqrt{2}$, $2V_m/\pi$, form factor 1.11.
- An RLC series circuit has given R, L and C. Find the resonant frequency $f_0 = 1/(2\pi\sqrt{LC})$, the current at resonance (V/R) and the Q-factor.
- Find the power factor and power consumed by an R-L series circuit across 230 V, 50 Hz.
- Three-phase star connection: $V_L = \sqrt{3}\, V_{ph}$, $I_L = I_{ph}$. Delta: $V_L = V_{ph}$, $I_L = \sqrt{3}\, I_{ph}$. Power $P = \sqrt{3}\, V_L I_L \cos\varphi$.
- Two-wattmeter method: find power and power factor from W1 and W2, using $\tan\varphi = \sqrt{3}(W1 - W2)/(W1 + W2)$.

Long-answer questions: Derive the RMS value of a sinusoid. Draw phasor diagrams for R-L, R-C and R-L-C series circuits. Prove that two wattmeters can measure three-phase power.

Unit 3: Transformers

Key definitions: working principle, ideal transformer, turns ratio, iron and copper losses, efficiency, voltage regulation, open-circuit and short-circuit tests, auto-transformer.

Derivations:

- Derive the EMF equation: $E = 4.44\, f\, N\, \Phi_m$.
- Derive the condition for maximum efficiency: copper loss equals iron loss.

Numericals (answer outline):

- A winding has 200 turns, f = 50 Hz and Φ_m = 0.01 Wb. Find the EMF. Answer: 4.44 x 50 x 200 x 0.01 = 444 V.
- Find the efficiency of a transformer at full load and half load from OC and SC test data. Copper loss varies with the square of the load fraction.
- Find the load at which maximum efficiency occurs: $x = \sqrt{(\text{iron loss} / \text{full-load copper loss})}$.

Long-answer questions: Explain OC and SC tests with circuit diagrams. Draw the phasor diagram of a practical transformer on load.

Unit 4: Electrical Machines

Key definitions: DC generator and motor, back EMF, types of DC machines, rotating magnetic field, synchronous speed, slip, single-phase induction motor starting methods, synchronous machine basics.

Numericals (answer outline):

- EMF of a DC generator: E = PΦNZ/(60A). Use A = P for lap winding and A = 2 for wave winding.
- A 4-pole, 50 Hz induction motor runs at 1440 rpm. Find the slip. Outline: Ns = 120f/P = 1500 rpm, s = (1500 - 1440)/1500 = 0.04.
- Find the back EMF and torque of a DC shunt motor from supply voltage, armature current and armature resistance: Eb = V - IaRa.

Long-answer questions: Explain the construction and working of a three-phase induction motor and why it cannot run at synchronous speed. Explain why a single-phase induction motor is not self-starting and how capacitor-start motors solve it.

Unit 5: Electrical Installations

Key definitions: switch fuse unit, MCB, MCCB, ELCB and RCCB, fuse, earthing, types of wires and cables, batteries, power factor improvement, energy consumption.

Numericals (answer outline):

- Five 60 W lamps are used 6 hours a day for 30 days. Find the energy used. Answer: 5 x 60 x 6 x 30 = 54,000 Wh = 54 kWh (units).
- Find the electricity bill for a set of appliances at a given rate per unit.

Long-answer questions: Explain pipe and plate earthing with diagrams and why earthing is needed. Compare a fuse and an MCB. Explain the working of an RCCB.

How to score well in Basic Electrical Engineering

- Draw a neat circuit diagram before every numerical and mark current directions and node voltages.
- Keep a formula sheet for each unit: theorem steps, AC relations, star-delta, transformer and machine formulas.
- Always draw phasor diagrams for AC and transformer questions. Many marks are given for them.
- Practise unit conversions: kW, kVA, kVAR, mWb and rpm.

Short-answer (2-mark) questions for Basic Electrical Engineering

Short questions test definitions and one-line results. Practise answering each in two to four lines:

1. State Kirchhoff's current and voltage laws.
2. Differentiate between ideal and practical voltage sources.
3. State Thevenin's theorem.
4. Define form factor and peak factor of a sine wave.
5. What is power factor, and why is a low power factor undesirable?
6. Define Q-factor of a series RLC circuit.
7. Write the relation between line and phase values in star and delta.
8. Why is the transformer core laminated?
9. What is voltage regulation of a transformer?
10. Why is a starter needed for a DC motor?
11. Define slip of an induction motor.
12. What is the function of an RCCB?

A 7-day revision plan for Basic Electrical Engineering

Use this plan in the last week before the exam. Adjust it to the units and weightage in your own syllabus.

- **Day 1 (Unit 1, DC Circuits):** revise the definitions, then solve the numericals and one long answer from this unit without notes.
- **Day 2 (Unit 2, Single-phase and Three-phase AC Circuits):** revise the definitions, then solve the numericals and one long answer from this unit without notes.
- **Day 3 (Unit 3, Transformers):** revise the definitions, then solve the numericals and one long answer from this unit without notes.
- **Day 4 (Unit 4, Electrical Machines):** revise the definitions, then solve the numericals and one long answer from this unit without notes.
- **Day 5 (Unit 5, Electrical Installations):** revise the definitions, then solve the numericals and one long answer from this unit without notes.
- **Day 6:** attempt one full three-hour practice paper made from these questions, or an official previous paper from your university archive.
- **Day 7:** go through your formula sheet, the short-answer list and every question you got wrong in the practice paper.

Frequently asked questions

Which network theorem is asked most in Basic Electrical Engineering?

Thevenin's theorem is the most common, followed by superposition, Norton's and maximum power transfer. Practise circuits that have both voltage and current sources.

How do I solve two-wattmeter method numericals?

Add the two readings to get total power. Use $\tan \varphi = \sqrt{3}(W1 - W2)/(W1 + W2)$ to find the phase angle and then the power factor. If one wattmeter reads negative, use the negative sign in the formula.

What is the condition for maximum efficiency of a transformer?

Maximum efficiency occurs when copper loss equals iron loss. The load fraction at that point is the square root of iron loss divided by full-load copper loss.

Are these questions from real past papers?

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