

TRANSMISSION AND DISTRIBUTION

BRANCH:- EE / EEE

SEMESTER – THIRD

These important questions have been prepared using your previous exam papers (PYQs), verified concepts, and additional reference from trusted online academic sources. For deeper understanding, please refer to your class notes as well.

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1 HIGH & LONG IMPORTANT QUESTIONS (90–95% Pattern Match)

These questions require long, descriptive answers, often involving derivations or detailed diagrams (though the diagrams themselves are omitted here per your request).

1. (a) Derive the expression for Sending End Voltage (V_S) and Percentage Voltage Regulation of a short transmission line with a lagging power factor load.
(b) Solve a Numerical Problem to calculate the Sending End Voltage and Transmission Efficiency given line parameters (R and X_L) and load details.
2. (a) What is Corona? Explain the factors affecting corona formation (e.g., atmospheric conditions, conductor size, line voltage).
(b) Define Disruptive Critical Voltage and Visual Critical Voltage. State the advantages and disadvantages of Corona.
3. (a) Explain the concept of Transposition of Conductors and state its necessity in high-voltage lines.
(b) Describe the Ferranti Effect that occurs in long or medium transmission lines under no-load or lightly loaded conditions.
4. **Explain the Single Line Diagram (SLD) of a typical 66/11 kV Substation.** List the functions of its major components (e.g., Circuit Breakers, Isolators, Transformers).
5. (a) Differentiate clearly between Feeder, Distributor, and Service Mains in a power distribution system.
(b) Sketch and explain the Ring Main Distribution System. State its advantages over the Radial Distribution System.
6. Detail the procedure and **list the schedule of materials required for the erection of an 11 kV Single Circuit HT Line** for rural electrification.
7. **Classify the different types of Transmission Line Towers** based on their use. Discuss the relationship between **Voltage Level and the Number of Disc Insulators** in a suspension string.

2 IMPORTANT & SHORT QUESTIONS (50–70% Probability)

These questions require conceptual, short, or comparative answers.

8. Compare **HVAC and HVDC Transmission Systems** on any six major technical points (e.g., cost, stability, components, distance).
9. What is **Skin Effect**? How can it be practically reduced in conductors?
10. (a) List the main components of an overhead transmission line.
(b) Compare the characteristics and applications of ACSR, AAC, and AAAC conductors.
11. Explain the **General Construction of a single-core Underground (UG) Cable** and label its parts. State the advantages of UG cables over O.H. lines.
12. **Compare Outdoor and Indoor Substations** on four technical parameters (e.g., space, cost, voltage level, safety).
13. Solve a **Simple Numerical** on a DC 2-wire distributor to calculate the voltage drop at a specified point when loads are tapped at different distances.
14. Briefly explain any two **methods of laying underground cables** (e.g., Direct Laying, Draw-in System) and mention common **Faults in UG cables**.
15. State the **advantages and disadvantages of using Aerial Bundled (AB) Cables** for Low Tension (LT) distribution lines.
16. Explain the difference between **Inspection, Preventive Maintenance, and Overhaul** for a Distribution Transformer.

3 “AA BHI SAKTA HAI” QUESTIONS (Low Probability but Smart Picks)

These are less frequent but high-value, "smart pick" questions.

17. Why are **Capacitor Banks** used in a substation? Explain the factors considered during the selection of a capacitor bank.
18. Write a short note on the **Trivector Energy Meter** and the functions of a **Distributed Digital Fault Recorder (DDFR)**.
19. Explain the meaning of **Brownout and Blackout**. Describe the procedure of **Black Start Restoration** in a power grid.
20. Write a short note on the **Demand Side Management (DSM)** concept.
21. Define **Active Power, Reactive Power, Apparent Power, and Power Factor**. Explain the significance of maintaining a high power factor.
22. Explain the process of calculating **Voltage Regulation (VR)** for both HT and LT lines during the estimation of an electrification project.

QUICK REVISE

Unit 1: AC Fundamentals & Theorems

1. **Active Power (P):** The actual power consumed or utilized in an AC circuit, responsible for performing useful work (measured in Watts or kW).

2. **Reactive Power (Q):** The power that merely flows back and forth between the source and the reactive components (inductors and capacitors), necessary to establish magnetic and electric fields (measured in VAR or kVAR).
 3. **Apparent Power (S):** The total power delivered to the circuit, which is the vector sum of active power and reactive power (measured in VA or kVA).
 4. **Thevenin's Theorem:** A linear two-terminal electrical network can be replaced by an equivalent circuit consisting of a single voltage source in series with a single resistor
 5. **Superposition Theorem:** In any linear circuit containing multiple sources, the current or voltage at any point is the algebraic sum of the currents or voltages produced by each source acting independently while all other sources are deactivated.
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Unit 2: Transmission Line Performance

6. **Transmission Line:** An electrical system designed to efficiently transfer electric power from a generating station (source) to a distributing station (load).
 7. **Short Transmission Line:** A transmission line typically under 50 km in length where the effects of shunt capacitance are negligible, and only series resistance and inductance are considered.
 8. **Voltage Regulation:** The measure of voltage change at the receiving end of a transmission line from no-load to full-load conditions, expressed as a percentage of the full-load voltage.
 9. **Transmission Efficiency:** The ratio of the power received at the receiving end of the line to the power sent from the sending end, expressed as a percentage.
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Unit 3: T-Line Effects & Transposition

10. **Corona:** The visible glow, hissing noise, and production of ozone that occur when the electric field intensity at the surface of a high-voltage conductor exceeds the critical disruptive voltage of the surrounding air.
 11. **Disruptive Critical Voltage (\$V_{c}\$):** The minimum phase-to-neutral voltage at which the corona phenomenon begins to occur.
 12. **Ferranti Effect:** The phenomenon in long or medium-length transmission lines where the receiving-end voltage is higher than the sending-end voltage, particularly under light-load or no-load conditions.
 13. **Skin Effect:** The tendency of an alternating current (AC) to concentrate its flow near the surface of an electrical conductor, rather than distributing uniformly throughout its cross-section.
 14. **Transposition:** The periodic interchanging of conductor positions along a transmission line route to ensure that each conductor occupies the same average position over the total length, thus balancing line parameters.
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Unit 4: OH Line Components

15. **Overhead Line:** An electrical transmission or distribution line typically supported by poles or towers above the ground using insulators.
 16. **Insulator:** A non-conducting material used to electrically isolate the conductor from the support structure (pole or tower).
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Unit 5 & 6: Underground Cables & Maintenance

17. **Underground Cable:** An electrical conductor insulated and protected by layers of material, designed to be buried directly in the ground or laid in conduits for power transfer.
 18. **Sheath:** A non-ferrous metallic covering surrounding the cable insulation to prevent the ingress of moisture, gases, or chemicals.
 19. **Armouring:** A layer of steel wire or tape wrapped around the cable to protect it from mechanical injury during laying and subsequent handling.
 20. **Direct Laying:** A method of laying underground cables where the cable is buried directly in a trench and covered with protective materials like bricks or tiles.
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Unit 7: Substations

21. **Substation:** An assembly of apparatuses used to switch, change, or regulate the voltage, frequency, or other characteristics of electrical power.
 22. **Bus Bar:** A conductor or set of conductors in a substation or power plant to which several circuits are connected, serving as a common electrical junction point.
 23. **Load Dispatch Station:** A central control center responsible for monitoring, controlling, and coordinating the power flow within a large regional or national electrical grid to ensure stability and efficiency.
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Unit 8: Metering & Monitoring

24. **Trivector Energy Meter:** An advanced energy meter capable of measuring and recording three components of power: active energy (kWh), reactive energy (kVARh), and apparent energy (kVAh).
 25. **Distributed Digital Fault Recorder (DDFR):** A device used to record high-speed, high-fidelity electrical data during power system disturbances (faults) to assist in root cause analysis.
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Unit 9 & 10: Distribution System

26. **Distribution System:** The part of the power system that distributes electrical energy to end-users (consumers) from the primary substation.

- 27. **Feeder:** A conductor that connects a substation to a distribution area; it carries bulk current and generally has no intermediate tapping points.
 - 28. **Distributor:** A conductor from which various consumers are tapped off; it is designed based on the permissible voltage drop rather than current-carrying capacity alone.
 - 29. **Service Mains:** A small set of conductors that connects the distributor line to the consumer's energy meter at their premises.
 - 30. **Aerial Bundled (AB) Cables:** A power cable system using several insulated phase conductors bundled tightly together with a bare neutral conductor for low voltage overhead distribution.
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Unit 11, 12, & 13: Maintenance & Estimation

- 31. **Preventive Maintenance:** Scheduled maintenance performed regularly on equipment (like transformers or lines) to reduce the likelihood of failure and ensure peak operating efficiency.
- 32. **Estimation:** The process of calculating the quantity of materials, labor, and associated costs required for an electrical installation project (e.g., erecting an 11 kV line).
- 33. **Voltage Regulation (VR) Calculation (in Estimation):** The process of predicting the maximum voltage drop that will occur from the source to the furthest consumer in a proposed distribution line to ensure it meets acceptable statutory limits.

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