

SYLLABUS FOR TECHNICAL QUESTIONS IN ELECTRICAL ENGINEERING

[100 Marks: 50 Questions]

Electric circuits

Network elements: ideal voltage and current sources, dependent sources, R, L, C, M elements; Network solution methods: KCL, KVL, Node and Mesh analysis; Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem; Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, two port networks, balanced three phase circuits, star-delta transformation, complex power and power factor in ac circuits.

Electromagnetic Fields

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

Signals and Systems

Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Fourier series representation of continuous and discrete time periodic signals, sampling theorem, Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform. R.M.S. value, average value calculation for any general periodic waveform

Electrical Machines

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines

Power Systems

Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Economic Load Dispatch (with and without considering transmission losses), Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per- unit quantities, Bus admittance matrix, Gauss- Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential, directional and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

Control Systems

Mathematical modelling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady- state analysis of linear time invariant systems, Stability analysis using Routh- Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems

Electrical and Electronic Measurements

Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multi-meters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Analog and Digital Electronics

Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications; single stage active filters, Active Filters: Sallen Key, Butterworth, VCOs and timers, combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters.

Power Electronics

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three- phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Power factor and Distortion Factor of ac to dc converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

Test of Reasoning [15 Marks: 15 Questions]

Logical Reasoning

Statement and Conclusion, Statement and Assumptions, Statement and Arguments, Statement and Course of Action, Cause and Effect, Analytical Decision Making

Seating Arrangement

Circular Arrangement, Linear Arrangement (Single and Double Rows), Square and Rectangular Arrangements, Floor Puzzles, Box-Based Puzzles

Puzzles

Scheduling Puzzles, Blood Relations-Based Puzzles, Ranking and Order Puzzles, Age-Based Puzzles, Day/Month-Based Puzzles

Blood Relations

Family Tree and Relationship Chains, Coded Relationships.

Syllogisms

Categorical Syllogisms, Advanced Syllogisms (Reverse Syllogisms), Venn Diagram Applications in Syllogisms

Coding-Decoding

Alphanumeric Coding, Letter Coding, Number Coding, Symbol-Based Coding

Direction Sense Test

Cardinal Directions (North, South, East, West), Complex Directions with Turning and Distances

Quantitative Aptitude [15 Marks: 15 Questions]

Data Interpretation

- **Tabular Data Interpretation:** Interpretation of tables and data sets.
- **Line Graph:** Data representation and analysis using line graphs.
- **Bar Graph:** Interpretation of data presented in bar graphs.
- **Pie Chart:** Calculations based on data presented in pie charts.
- **Caselets:** Data interpretation with paragraph-based information.
- **Mixed Graphs:** Combining different types of graphs in a single question.
- **Radar Graph (Spider Web):** Less common but may appear.

Number Series

- **Missing Number Series:** Finding the missing term in a given series.
- **Wrong Number Series:** Identifying the incorrect term in a series.

Simplification and Approximation

- Questions based on basic mathematical operations to simplify expressions.
- Approximation questions require choosing the closest answer.

Quadratic Equations

- Solving quadratic equations to find roots.
- Comparison of roots between two quadratic equations.

Data Sufficiency

- Problems with multiple statements where you determine if the given data is sufficient to answer the question.

Arithmetic Topics

- **Percentages:** Basic calculations, profit and loss, and discounts.
- **Ratio and Proportion:** Problems based on direct and inverse proportions.
- **Average:** Calculating averages for different scenarios.
- **Simple Interest and Compound Interest:** Interest calculations over time.
- **Profit and Loss:** Calculation of gains, losses, and discounts.
- **Time and Work:** Problems involving work completion, efficiency, and combined efforts.
- **Time, Speed, and Distance:** Calculations with speed, distance, and time; includes boats and trains.
- **Mixtures and Alligations:** Mixing solutions, costs, and ratios.
- **Mensuration:** Basic geometry, areas, volumes of shapes, and perimeters.
- **Partnerships:** Sharing profits based on investments.
- **Probability:** Basic probability calculations and event outcomes.
- **Permutation and Combination:** Arrangement and selection problems.

Mathematical Inequalities

- Problems requiring the comparison of quantities using inequalities.

Miscellaneous Word Problems

- These cover real-life scenarios and test conceptual understanding.

General Awareness [15 Marks: 15 Questions]

Current Affairs

- Recent events of national and international importance
- Awards and Honors (Padma Awards, Nobel Prizes, etc.)
- Sports (major tournaments, winners, records)
- Government schemes and policies
- Important Summits and Conferences
- Economic and Banking Awareness (recent developments in banking and finance)
- Important Days and Themes

Indian History

- **Ancient History:** Indus Valley Civilization, Vedic Period, Maurya and Gupta Empires
- **Medieval History:** Delhi Sultanate, Mughal Empire, Bhakti and Sufi Movements
- **Modern History:** British Rule, Revolt of 1857, Indian National Movement, Independence

Geography

- **Physical Geography:** Landforms, Atmosphere, Climate, and Natural Vegetation
- **Indian Geography:** Rivers, Mountains, Plateaus, Deserts, Soil, Forests
- **World Geography:** Continents, Countries, Capitals, and prominent physical features

Indian Polity and Constitution

- **Constitutional Framework:** Preamble, Fundamental Rights and Duties, Directive Principles
- **Union and State Government:** Structure, Roles, and Functions of Executive, Legislature, and Judiciary
- **Important Amendments and Articles:** Key constitutional amendments and articles
- **Political System:** Panchayati Raj, Election Commission, Local Governance

Economics and Finance

- **Basic Concepts:** Micro and Macro Economics, Demand and Supply, National Income
- **Indian Economy:** Economic Reforms, Planning in India, Economic Terminology
- **Banking and Finance:** RBI, Money Market, Inflation, Economic Policies
- **Budget and Fiscal Policies:** Key points from the Union Budget and Economic Surveys

Science and Technology

- **Biology:** Human Body, Health and Diseases, Important Biological Terms
- **Chemistry:** Basics of Elements and Compounds, Acids and Bases, Metals and Non-Metals
- **Physics:** Laws of Motion, Work and Energy, Heat, Light, Sound, Electricity and Magnetism
- **Computer Awareness:** Basic terminology, Networking, Internet, Hardware and Software
- **Inventions and Discoveries:** Key scientific and technological developments

Environment and Ecology

- **Ecological Concepts:** Biodiversity, Conservation, Ecosystem, Food Chain
- **Environmental Issues:** Pollution, Climate Change, Global Warming, Renewable and Non-Renewable Resources
- **Important Organizations and Conventions:** UNEP, Kyoto Protocol, Paris Agreement

General Knowledge

- **Important Dams, Rivers, and National Parks**
- **Important Organizations:** UN, WHO, WTO, IMF, World Bank
- **Space Research:** Recent developments in ISRO, NASA, and space missions.

English Language [15 Marks: 15 Questions]

Reading Comprehension

- Passage comprehension with questions on main ideas, themes, and details
- Inference-based questions
- Vocabulary questions (synonyms, antonyms) based on the passage
- Tone of the passage

Grammar and Vocabulary

- **Error Spotting:** Identifying grammatical errors in sentences
- **Sentence Correction:** Correcting grammatically incorrect sentences
- **Fill in the Blanks:** Choosing the right words to complete sentences (single and double fill-in-the-blanks)
- **Cloze Test:** Passage with blanks where you choose the most suitable word for each blank
- **Phrase Replacement:** Replacing phrases in sentences to make them grammatically correct

Sentence Rearrangement (Para Jumbles)

- Arranging jumbled sentences in the correct order to form a coherent paragraph
- Identifying the correct opening and closing sentences in a set of jumbled sentences

Synonyms and Antonyms

- Questions based on commonly used synonyms and antonyms
- Word replacement questions to test vocabulary strength

Idioms and Phrases

- Understanding and applying the meaning of commonly used idioms and phrases
- Questions based on idiomatic usage in sentences

Word Association and Usage

- **Word Pairing:** Identifying relationships between pairs of words
- **Homonyms and Homophones:** Recognizing words that sound similar but have different meanings
- **Spell Check:** Questions based on identifying misspelled words

Sentence Completion and Paragraph Completion

- Choosing the most appropriate sentence or word to complete a paragraph
- Filling gaps in sentences to make logical and grammatically correct statements

Verbal Ability

- Questions based on verbal reasoning and critical thinking
- Questions on understanding of sentence meaning and logical progression