ACE®
Engineering Publications
(A Sister concern of ACE Engineering Academy, Hyderabad)

GENCO
TRANSCO | DISCOMs

ELECTRICAL ENGINEERING

(Previous years Questions with Solutions, Subjectwise & Chapterwise of Various Examinations)

PREVIOUS 29 PAPERS INCLUDED

(Useful for **SSC-JE, RRB-JE, AEE, AE, HMWSSB, SAIL, STEEL PLANT, ISRO, BARC & Other PSUs Examinations)**

Copyright © ACE Engineering Publications

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, digital, recording or otherwise, without the prior permission of the publishers.

Published at:

ACE Engineering Publications

#3rd Floor, Suryalok Complex, Rosary Convent School Road,
Gunfoundary, Basheer Bagh, Hyderabad – 500001,
Telangana, India.
Phones: 040- 40047766 / 7799996602
Website: aceengineeringpublications.com
Email: aceenggpublications@aceenggacademy.com
help@ace.online

Authors:

Subject experts of ACE Engineering Academy, Hyderabad

While every effort has been made to avoid any mistake or omission, the publishers do not owe any responsibility for any damage or loss to any person on account of error or omission in this publication. **Mistakes if any may be brought to the notice of the publishers, for further corrections in forthcoming editions, to the following Email-id.**
Email : aceenggpublications@aceenggacademy.com

First Edition : 2011
Revised Edition : 2024

Printed at:
Rowshni Graphics,
Hyderabad.

MRP : ₹. 800/-
ISBN : 978-1-64597-312-6

Foreword

Dear Students,

Securing State government job through GENCO, TRANSCO & DISCOMs is a dream for many engineering students. GENCO, TRANSCO & DISCOMs exam is considered to be one of the toughest competitive exam in India from competitive ratio point of view. Competition ratio challenges job aspirants as the jobs available are less when compared with the number of aspirants. The syllabus and pattern of exams of PSUs, in particular GENCO, TRANSCO & DISCOMS exam is different compared to the competitive exams like GATE & ESE.

We at ACE always ready to provide quality guidance to the engineering competitive exam takers so that they can achieve their goals through our guidance and aspirant's hard work. Beyond a point ACE proved it's merit in guiding aspirants for various competitive exams such as GATE, ESE , PSUs and various public service exams. The aspirants also well received the efforts of ACE and always credited the valuable guidance provided by ACE.

As an effort to guide the GENCO, TRANSCO & DISCOMs aspirants with the help of our impanelled subject matters experts, ACE has produced this master piece to encourage aspirants in their endeavor by providing comprehensive solutions to the previous examinations questions by utilising a systematic approach to the solutions. This approach definitely help aspirants to understand the theory behind, and how to use optimised way of answering questions. Categorisation of questions and solutions on the basis of Subjects and chapters is the unique characteristic of this book and we are sure that the aspirants do receive this well and will take the best benefit out of this book.

Students of EE & EC streams are eligible for GENCO & TRANSCO jobs. This book will be wholesome for students of Electrical Engineering to prepare in minimum time for GENCO, TRANSCO & DISCOMs of all states in India.

Thanks to all Professors who extended their services in the preparation of this booklet. It is believed that this volume is also a valuable aid to the students appearing for competitive exams like SSC JE, RRB-JE, SAIL, STEEL PLANT & ISRO, State and Central Commissions and other PSUs. Any suggestions by the students and teachers are solicited.

With best wishes to all the Students

Y.V. Gopala Krishna Murthy,
M Tech. MIE,
Chairman & Managing Director,
ACE Engineering Academy,
ACE Engineering Publications,
Frost Interactive Service Pvt. Ltd. (ACE ONLINE).

Syllabus for Electrical Engineering

(Combined syllabus for Genco, Transco, Discoms, TSSPDCL, TSNPDCL, AE & AEE)

1. **Engineering Mathematics :**

   Linear Algebra: Matrix Algebra, Systems of linear equations, Eigenvalues,Eigenvectors.

   Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series, Vector identities, Directional derivatives, Line integral, Surface integral, Volume integral, Stokes's theorem, Gauss's theorem, Green's theorem.

   Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's equation, Euler's equation, Initial and boundary value problems, Partial Differential Equations, Method of separation of variables.

   Complex variables: Analytic functions, Cauchy's integral theorem,Cauchy's integral formula, Taylor series, Laurent series, Residue theorem,Solution integrals.

   Probability and Statistics: Sampling theorems, Conditional probability, Mean, Median, Mode, Standard Deviation, Random variables, Discrete and Continuo us distributions, Poisson distribution, Normal distribution, Binomial distribution, Correlation analysis, Regression analysis.

   Numerical Methods: Solutions of nonlinear algebraic equations, Single andMulti-step methods for differential equations.

   Transform Theory: Fourier Transform, Laplace Transform, z-Transform.

2. **Electric Circuits:** Network graph, KCL, KVL, Node and Mesh analysis, Transient response of dc and ac networks, Sinusoidal steady-state analysis, Resonance, Passive filters, Ideal current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Two-port networks, Three phase circuits, Power and power factor in ac circuits.

3. **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.

4. **Signals and Systems:** Representation of continuous and discrete-time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and z-Transform.

5. **Electrical Machines:** Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, parallel operation; Auto-transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: 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 polemachines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

6. **Power Systems:** Power generation concepts, ac and dc transmission concepts, Models and performance of transmission lines and cables, 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 and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

7. **Control Systems:** Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

8. **Electrical and Electronic Measurements:** Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

9. **Analog and Digital Electronics:** Characteristics of diodes, BJT, MOSFET; Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Simple active filters, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, Demultiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8085 Microprocessor: Architecture, Programming and Interfacing.

10. **Communication Systems:** Analog communication basics, Modulation and de-modulation, noise and bandwidth, transmitters and receivers, signal to noise ratio, digital communication basics, sampling, quantizing, coding, frequency and time domain multiplexing, power line carrier communication systems.

11. **Power Electronics:** Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation.

12. **Power Plant Engineering:** Basic power generation concepts, Steam Power Plants with Sub-critical, critical and super critical technology, Combustion Process, Gas Turbine Plant, Direct Energy Conservation, Hydro Electric Power Plant , nuclear & Power from Non-conventional sources, Introduction to Quality management and Environmental protection. Power plant economics-Capital cost, Investment of fixed charges, operating cost, arrangements for power distribution, load curves, connected load, maximum demand, demand factor, average load, load factor, diversity factor, Environmental considerations- Effluents from Power Plants and impact of environment, Pollution and pollution standards-Methods of pollution control , Power plant componentstheir theory and design, types and applications.

13. **Thermodynamics:** Thermodynamic systems and processes; properties of pure substance; Zeroth, First and Second Laws of Thermodynamics; Entropy, Irreversibility and availability; analysis of thermodynamic cycles related to energy conversion: Rankine, modified Rankine, Otto, Diesel and Dual Cycles; ideal and real gases; compressibility factor; Gas mixtures.

Weightage of Subjects in various PSU's Examinations

(2020 – 2024)

S.No	Name of the Subject	HMWS	TGSPDCL	TGNPDCL	TGPSC-AE	TGPSPDCL	TGGENCO
		2020	2022	2022	2023	2023	2024
1	Electric Circuits	13	10	8	25	7	9
2	Electromagnetic Fields	8	3	5	-	6	3
3	Signals & Systems	-	7	5	-	4	6
4	Electrical Machines	3	7	13	54	12	12
5	Power Systems	26	10	10	37	11	9
6	Control Systems	15	10	7	-	8	8
7	Electrical & Electronic Measurements	17	7	6	8	6	6
8	Digital Electronics & Microprocessors	7	2	6	4	4	2
9	Analog Electronics	7	4	7		5	1
10	Power Electronics & Drives	19	11	3	7	8	8
11	Utilization, Estimation & Electrical Installation	14	-	-	6		-
12	Mathematics	-	9	10	-	9	-
13.	BEE & Batteries	-	-	-	9	-	-
14.	Material Science	-	-	-	-	-	7
15.	Communication Sytems	-	-	-	-	-	2
16.	Power Plant Engineering	-	-	-	-	-	6
17..	Thermodynamics	-	-	-	-	-	5
Total No. of Questions			**80**	**80**	**150**	**80**	**80**

CONTENTS