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ESE - 2027

UPSC Preliminary Examination

MORE THAN

34

YEARS OF
SOLUTIONS

1992-2026

ELECTRICAL ENGINEERING

OBJECTIVE VOLUME - II

Previous Years Objective Questions with Solutions,
Subjectwise & Chapterwise

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Foreword

Dear Students,

The Stage-I (Prelims) of ESE consists of two objective papers. Paper-I is of General Studies & Engineering Aptitude. Paper-II is of Electrical Engineering of 300 Marks and 3 hours duration. In stage-II (Mains), the technical syllabus is divided into two papers. The subjects included in this volume are:



- | | |
|-----------------------------------|----------------------------------|
| 1. Analog and Digital Electronics | 2. Systems and Signal Processing |
| 3. Control Systems | 4. Electrical Machines |
| 5. Power Systems | 6. Power Electronics and Drives |

Keeping in view of the above topics, the present Volume-II for prelims of new pattern is redesigned using the previous questions from 1992 onwards.

The style, quality and content of the Solutions for previous ESE Questions of Electrical Engineering, will encourage the reader, especially the student whether above average, average or below average to learn the concept and answer the question in the subject without any tension. However it is the reader who should confirm this and any comments and suggestions would be pleasantly received by the Academy.

It is observed that majority of ESE objective Questions are being asked as it is in many PSUs, state service commission, state electricity boards and even in GATE exam. Hence we strongly recommend all students who are competing for various competitive exams to use this book according to the syllabus of the exam concerned. This book can also be used by fresh Teachers in engineering colleges to improve their Concepts.

We proudly say that questions and solutions right from 1992 onwards are given in this book. The questions which appeared early 90's are most conceptual oriented and these are being repeated in the recent exams in a different way. Hence we advise the students to practice these questions compulsorily. The student is also advised to analyze why only a particular option is correct and why not others. Evaluate yourself, in which case, these other options are correct. With this approach you yourself can develop four questions out of one question. The student is advised to solve the problems without referring to the solutions. The student has to analyze the given question carefully, identify the concept on which the question is framed, recall the relevant equations, find out the desired answer, verify the answer with the final key such as (a), (b), (c), (d), then go through the hints to clarify his answer. The student is advised to have a standard text book ready for reference to strengthen the related concepts, if necessary. The student is advised not to write the solution steps in the space around the question. By doing so, he loses an opportunity of effective revision.

With best wishes to all those who wish to go through the following pages.

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 (EE)

- 1. Analog and Digital Electronics:** Operational amplifiers – characteristics and applications, combinational and sequential logic circuits, multiplexers, multi-vibrators, sample and hold circuits, A/D and D/A converters, basics of filter circuits and applications, simple active filters; Microprocessor basics- interfaces and applications, basics of linear integrated circuits; Analog communication basics, Modulation and demodulation, 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.
- 2. Systems and Signal Processing:** 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, Fourier and Laplace transforms, Z transforms, Discrete Fourier transform, FFT, linear convolution, discrete cosine transform, FIR filter, IIR filter, bilinear transformation.
- 3. Control Systems:** Principles of feedback, transfer function, block diagrams and signal flow graphs, steady-state errors, transforms and their applications; Routh-hurwitz criterion, Nyquist techniques, Bode plots, root loci, lag, lead and lead-lag compensation, stability analysis, transient and frequency response analysis, state space model, state transition matrix, controllability and observability, linear state variable feedback, PID and industrial controllers.
- 4. Electrical Machines:** Single phase transformers, three phase transformers - connections, parallel operation, auto-transformer, energy conversion principles, DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors, Induction motors - principles, types, performance characteristics, starting and speed control, Synchronous machines - performance, regulation, parallel operation of generators, motor starting, characteristics and applications, servo and stepper motors.
- 5. Power Systems:** Basic power generation concepts, steam, gas and water turbines, transmission line models and performance, cable performance, insulation, corona and radio interference, power factor correction, symmetrical components, fault analysis, principles of protection systems, basics of solid state relays and digital protection; Circuit breakers, Radial and ring-main distribution systems, Matrix representation of power systems, load flow analysis, voltage control and economic operation, System stability concepts, Swing curves and equal area criterion. HVDC transmission and FACTS concepts, Concepts of power system dynamics, distributed generation, solar and wind power, smart grid concepts, environmental implications, fundamentals of power economics.
- 6. Power Electronics and Drives:** Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation, triggering circuits, phase control rectifiers, bridge converters - fully controlled and half controlled, principles of choppers and inverters, basis concepts of adjustable speed dc and ac drives, DC-DC switched mode converters, DC-AC switched mode converters, resonant converters, high frequency inductors and transformers, power supplies.

Weightage of Subjects in Engineering Services Examination (2021 – 2026)

+=====+

S.No.	Name of the Subject	2021	2022	2023	2024	2025	2026
01	Engineering Mathematics	15	12	12	13	12	13
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03	Electric Circuits & Fields	16	11	10	13	13	12
04	Electrical & Electronic Measurements	13	12	13	12	11	14
05	Computer Fundamentals	9	13	12	12	12	11
06	Basic Electronics Engineering	11	15	15	14	12	13
07	Analog & Digital Electronics	12	10	10	13	13	13
08	Systems & Signal Processing	10	14	14	12	13	13
09	Control Systems	13	12	13	12	12	12
10	Electrical Machines	15	13	14	14	13	12
11	Power Systems	12	12	13	13	15	12
12	Power Electronics & Drives	11	12	11	13	12	12
Total No. of Questions		150	150	150	150	150	150

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