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ESE - 2027

UPSC Preliminary Examination

MORE THAN

35

YEARS OF
SOLUTIONS

1991-2026

ELECTRONICS & TELECOMMUNICATION ENGINEERING

OBJECTIVE VOLUME - II

Previous Years Objective Questions with Solutions,
Subjectwise & Chapterwise

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Foreword

Dear Students

The revised pattern of Engineering Services Examination (ESE) from 2017 consists of

1. Prelims examination (objective) and
2. Mains examination (conventional).



The Prelims examination consists of two objective papers. Paper-I is of General Studies & Engineering Aptitude for 200 marks and 2 hours duration. Paper-II is of Electronics & Telecommunication of 300 Marks and 3 hours duration.

In Mains examination, the technical syllabus is divided into two papers. Accordingly, we have divided the objective questions into two volumes. The subjects included in this volume-II are:

- | | | |
|---|----------------------|-------------------------|
| 1. Analog & Digital Communication Systems | 2. Control systems | 3. Signals & Systems |
| 4. Computer Organization & Architecture | 5. Electro Magnetism | 6. Advanced Electronics |
| 7. Advanced Communication | | |

Keeping in view of the above topics, the present Volume-II for prelims of new pattern is redesigned using the previous questions from 1991 onwards.

The style, quality and content of the solutions for previous ESE Questions of Electronics & Telecommunication Engineering, will encourage the reader, especially the student whether above average, average or below average to learn the concept and answer the questions in the subject without any difficulty. However, it is the reader who should confirm this. Any comments and suggestions would be pleasantly received by the Academy for further improvement of this booklet.

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 the 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 1991 onwards are provided in this booklet. The questions which appeared in 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 the others. Evaluate yourself, in which case, these other options are correct. With this approach, you yourself can develop four questions out of the 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 possible answer and verify the answer with the final key such as (a), (b), (c), (d), then go through the hints to clarify the answer. The student is advised to have a standard text book ready for reference to strengthen the related concepts, if necessary. The student is also advised not to write the solution steps in the space around the question. By doing so, the student 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 Electronics & Telecommunication Engineering (EC)

Basic Electronics Engineering

Basics of semiconductors: Diode/Transistor basics and characteristics; Diodes for different uses; Junction & Field Effect Transistors (BJTs, JFETs, MOSFETs); Transistor amplifiers of different types, oscillators and other circuits: Basics of integrated circuits (ICs); Bipolar, MOS and CMOS ICs; Basics of linear ICs, operational amplifiers and their applications-linear/non-linear; Optical sources/detectors; Basics of Opto electronics and its applications.

Basic Electrical Engineering

DC circuits-Ohm's & Kirchoff's laws, mesh and nodal analysis, circuit theorems; Electro-magnetism, Faraday's & Lenz's laws, induced EMF and its uses; Single-phase AC circuits; Transformers, efficiency; Basics-DC machines, induction machines, and synchronous machines; Electrical power sources basics: hydroelectric, thermal, nuclear, wind, solar; Basics of batteries and their uses.

Materials Science

Electrical Engineering materials; Crystal structure & defects: Ceramic materials-structures, composites, processing and uses; Insulating laminates for electronics, structures, properties and uses; Magnetic materials, basics, classification, ferrites, ferro/para-magnetic materials and components; Nano materials-basics, preparation, purification, sintering, nano particles and uses; Nano-optical/magnetic/electronic materials and uses; Superconductivity, uses.

Electronic Measurements and Instrumentation

Principles of measurement, accuracy, precision and standards; Analog and Digital systems for measurement, measuring instruments for different applications; Static/dynamic characteristics of measurement systems, errors, statistical analysis and curve fitting; Measurement systems for non-electrical quantities; Basics of telemetry; Different types of transducers and displays; Data acquisition system basics.

Network Theory

Network graphs & matrices; Wye-Delta transformation; Linear constant coefficient differential equations- time domain analysis of RLC circuits; Solution of network equations using Laplace transformers- frequency domain analysis of RLC circuits; 2-port network parameters-driving point & transfer functions; State equations for networks; Steady state sinusoidal analysis.

Analog Circuits

Small signal equivalent circuits of diodes, BJTS and FETs; Diode circuits for different uses; Biasing & stability of BJT and JFET amplifier circuits; Analysis/design of amplifier- single/multi-stage; Feedback & uses; Active filters, timers, multipliers, wave shaping, A/D-D/A converters;

Digital Circuits

Boolean Algebra & uses; Logic gates, Digital IC families, Combinational/sequential circuits; Basics of multiplexers, counters/registers/ memories/microprocessors, design & applications

Microprocessors

Microprocessors, design & applications.

Analog & Digital Communication Systems

Random signals, noise, probability theory, information theory; Analog versus digital communication & applications: Systems - AM, FM, transmitters/receivers, theory/practice/ standards, SNR comparison; Digital communication basics: Sampling, quantizing, coding, PCM, DPCM, multiplexing-audio/video; Digital modulation: ASK, FSK, PSK; Multiple access: TDMA, FDMA, CDMA; Optical communication: fiber optics, theory, practice/standards.

Control systems

Signal flow graphs, Routh-Hurwitz criteria, root loci, Nyquist/Bode plots; Feedback systems-open & close loop types, stability analysis, steady state, transient and frequency response analysis; Design of control systems, compensators, elements of lead/lag compensation, PID and industrial controllers.

Signals & Systems

Extracted from the subject Control Systems

Classification of signals and systems; Application of signal and system theory; System realization; Transforms& their applications

Computer Organization & Architecture

Basic architecture, CPU, I/O organisation, memory organisation, peripheral devices, trends; Hardware /software issues; Data representation& Programming; Operating systems-basics, processes, characteristics, applications; Memory management, virtual memory, file systems, protection & security; Data bases, different types, characteristics and design; Transactions and concurrency control; Elements of programming languages, typical examples.

Electro Magnetics

Elements of vector calculus, Maxwell's equations-basic concepts; Gauss', Stokes' theorems; Wave propagation through different media; Transmission Lines-different types, basics, Smith's chart, impedance matching/transformation, S-parameters, pulse excitation, uses; Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-radiation pattern, monopoles/dipoles, gain, arrays-active/passive, theory, uses.

Advanced Electronics

VLSI technology: Processing, lithography, interconnects, packaging, testing; VLSI design: Principles, MUX/ROM/PLA-based design, Moore & Mealy circuit design; Pipeline concepts & functions; Design for testability, examples; DSP: Discrete time signals/systems, uses; Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses; Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; controllers & uses; Embedded systems.

Advanced Communication

Communication networks: Principles /practices /technologies /uses /OSI model/security; Basic packet multiplexed streams/scheduling; Cellular networks, types, analysis, protocols (TCP/TCP/IP); Microwave & satellite communication: Terrestrial/space type LOS systems, block schematics link calculations, system design; Communication satellites, orbits, characteristics, systems, uses; Fibre-optic communication systems, block schematics, link calculations, system design.

Weightage of Subjects in Engineering Services Examination (2020 – 2026)

S.No.	Name of the Subject	2020	2021	2022	2023	2024	2025	2026
01	Analog & Digital Communication Systems	13	12	11	14	12	9	15
02	Control Systems	12	6	11	13	10	9	10
03	Signals & Systems	11	13	5	5	11	10	7
04	Computer organization & Architecture	15	11	12	14	14	14	11
05	Electro Magnetics	11	14	12	22	12	11	13
06	Advanced Electronics Topics	3	3	9	5	4	7	4
07	Advanced Communication Topics	12	14	16	2	11	19	11
08	Basic Electronics Engineering	2	8	8	15	13	5	7
09	Basic Electrical Engineering	10	3	9	5	5	10	8
10	Materials Science	10	14	12	6	8	12	13
11	Electronic Measurements & Instrumentation	11	12	11	7	14	16	14
12	Network Theory	17	21	17	18	4	9	16
13	Analog and Digital Circuits	11+12	11+8	5+12	8+16	13+19	12+7	10+11
Total No. of Questions		150	150	150	150	150	150	150

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