

CHENNAI PORT AUTHORITY

Competitive Examination for the Post of Assistant Executive Engineer (Electronics & Communications) Examination Syllabus

1. QUESTIONS RELATING TO SPECIALIZATION

A. Circuit Analysis

- Node and mesh analysis
- Superposition theorem, Thevenin's theorem, Norton's theorem
- Reciprocity theorem
- Sinusoidal steady state analysis: Phasors, complex power, maximum power transfer
- Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits
- Solution of network equations using Laplace transform
- Linear 2-port network parameters
- Wye-delta transformation

B. Signals and Systems

Continuous-time Signals

- Fourier series and Fourier transform
- Sampling theorem and applications

Discrete-time Signals

- DTFT (Discrete-Time Fourier Transform)
- DFT (Discrete Fourier Transform)
- Z-transform
- Discrete-time processing of continuous-time signals

LTI Systems

- Definition and properties
- Causality and stability
- Impulse response and convolution
- Poles and zeroes
- Frequency response
- Group delay and phase delay

C. Electronic Devices

Semiconductor Fundamentals

- Energy bands in intrinsic and extrinsic semiconductors
- Equilibrium carrier concentration
- Direct and indirect band-gap semiconductors

Carrier Transport

- Diffusion current and drift current
- Mobility and resistivity
- Generation and recombination of carriers
- Poisson and continuity equations

Electronic Components

- P-N junction

- Zener diode
- BJT (Bipolar Junction Transistor)
- MOS capacitor and MOSFET
- LED, photodiode, and solar cell

D. Analog Circuits

Diode Circuits

- Clipping circuits
- Clamping circuits
- Rectifiers

BJT and MOSFET Amplifiers

- Biasing techniques
- AC coupling
- Small signal analysis
- Frequency response
- Current mirrors
- Differential amplifiers

Op-amp Circuits

- Amplifier configurations
- Summers
- Differentiators and integrators
- Active filters
- Schmitt triggers
- Oscillators

E. Digital Circuits

Number Representations

- Binary number systems
- Integer representations

- Floating-point numbers

Combinatorial Circuits

- Boolean algebra
- Minimization of functions using Boolean identities and Karnaugh map
- Logic gates and their static CMOS implementations
- Arithmetic circuits
- Code converters
- Multiplexers and decoders

Sequential Circuits

- Latches and flip-flops
- Counters
- Shift-registers
- Finite state machines
- Propagation delay
- Setup and hold time
- Critical path delay

Data Converters

- Sample and hold circuits
- ADCs (Analog-to-Digital Converters)
- DACs (Digital-to-Analog Converters)

Semiconductor Memories

- ROM (Read-Only Memory)
- SRAM (Static RAM)
- DRAM (Dynamic RAM)

Computer Organization

- Machine instructions and addressing modes
- ALU (Arithmetic Logic Unit)
- Data-path and control unit
- Instruction pipelining

- Amplitude modulation and demodulation
- Angle modulation and demodulation
- Spectra of AM and FM
- Super heterodyne receivers

F. Control Systems

- Basic control system components
- Feedback principle
- Transfer function
- Block diagram representation
- Signal flow graph
- Transient and steady-state analysis of LTI systems
- Frequency response
- Routh-Hurwitz and Nyquist stability criteria
- Bode and root locus plots
- Lag, lead and lag-lead compensation
- State variable model and solution of state equation of LTI systems

Information Theory

- Entropy
- Mutual information
- Channel capacity theorem

Digital Communications

- PCM (Pulse Code Modulation) and DPCM
- Digital modulation schemes: ASK, PSK, FSK, QAM
- Bandwidth and inter-symbol interference
- MAP and ML detection
- Matched filter receiver
- SNR and BER analysis
- Fundamentals of error correction
- Hamming codes
- CRC (Cyclic Redundancy Check)

G. Communications

Random Processes

- Auto correlation and power spectral density
- Properties of white noise
- Filtering of random signals through LTI systems

Analog Communications

H. Electromagnetics

Maxwell's Equations

- Differential and integral forms and their interpretation
- Boundary conditions
- Wave equation
- Poynting vector

Plane Waves and Properties

- Reflection and refraction
- Polarization
- Phase and group velocity
- Propagation through various media
- Skin depth

Transmission Lines and Waveguides

- Transmission line equations
- Characteristic impedance
- Impedance matching and transformation
- S-parameters
- Smith chart
- Rectangular and circular waveguides
- Light propagation in optical fibers
- Dipole and monopole antennas
- Linear antenna array

2. TEST OF REASONING

Logical Reasoning

- Statement and Conclusion
- Statement and Assumptions
- Statement and Arguments
- Statement and Course of Action
- Cause and Effect
- Analytical Decision Making
- Critical Reasoning

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
- Comparison-Based Puzzles

Blood Relations

- Family Tree and Relationship Chains
- Coded Relationships
- Multi-generational relationships

Syllogisms

- Categorical Syllogisms
- Advanced Syllogisms
- Venn Diagram Applications

Coding-Decoding

- Alphanumeric Coding

- Letter Coding
- Number Coding
- Symbol-Based Coding
- Mixed Patterns

- Missing Number Series
- Wrong Number Series
- Pattern Recognition

Direction Sense Test

- Cardinal Directions (North, South, East, West)
- Complex Directions with Turning and Distances
- Shortest distance calculations

Input-Output

- Machine input-output problems
- Step-wise arrangement of words/numbers

3. QUANTITATIVE APTITUDE

Data Interpretation

- Tabular Data Interpretation
- Line Graph Analysis
- Bar Graph (Simple, Stacked, Grouped)
- Pie Chart Calculations
- Caselets and Data Sufficiency
- Mixed Graphs
- Radar/Spider Charts

Number Series

Simplification and Approximation

- BODMAS applications
- Surds and Indices
- Approximation techniques

Arithmetic

- Percentages, Profit and Loss
- Simple Interest and Compound Interest
- Ratio and Proportion
- Averages and Weighted Averages
- Time and Work
- Time, Speed, and Distance
- Boats and Streams
- Trains and Platforms
- Mixtures and Alligations
- Partnerships
- Mensuration (2D and 3D)
- Probability and Statistics
- Permutation and Combination

Algebra

- Quadratic Equations
- Linear Equations
- Inequalities

Advanced Topics

- Set Theory and Venn Diagrams
- Logarithms
- Progressions (AP, GP)

- Medieval India: Sultanate and Mughal period
- Modern India: Freedom struggle, post-independence developments

4. GENERAL AWARENESS

Current Affairs

- National and international events
- Awards and Honors
- Sports events and achievements
- Government schemes and policies
- Economic and business news
- Important summits and conferences
- Books and authors
- Important days and themes

Indian and World Geography

- Physical Geography: Landforms, climate, natural resources
- Indian Geography: States, capitals, rivers, mountains, ports
- World Geography: Continents, oceans, major ports
- Economic geography and trade routes

Indian History

- Ancient India: Civilizations, empires, culture

Indian Polity and Governance

- Constitutional Framework
- Fundamental Rights and Duties
- Directive Principles of State Policy
- Union and State Government structures
- Important constitutional amendments
- Judiciary and legal system
- Panchayati Raj and local governance

Economics

- Basic economic concepts
- Indian Economy: Sectors, reforms, policies
- Banking and Finance: RBI, monetary policy
- Union Budget highlights
- International trade and organizations (WTO, IMF, World Bank)

Science and Technology

- General Science: Physics, Chemistry, Biology
- Computer Awareness
- Space research and developments
- Recent scientific innovations

- Digital India initiatives

Environment and Ecology

- Biodiversity and conservation
- Climate change and global warming
- Pollution and environmental issues
- International environmental agreements
- Renewable energy

Maritime and Port Sector

- Major and minor ports in India
- Recent developments in shipping industry
- Maritime India Vision 2030
- International maritime organizations (IMO, UNCTAD)
- Port modernization projects
- Coastal shipping developments

5. ENGLISH LANGUAGE

Reading Comprehension

- Passage-based questions on themes, main ideas
- Inference and critical analysis
- Vocabulary in context
- Tone and author's perspective

Grammar and Usage

- Error Spotting (Subject-verb agreement, tenses, prepositions, articles)
- Sentence Correction
- Fill in the Blanks (Single and Double)
- Cloze Test
- Phrase Replacement

Vocabulary

- Synonyms and Antonyms
- One-word substitution
- Idioms and Phrases
- Word usage and meaning

Sentence and Paragraph Organization

- Para Jumbles (Sentence Rearrangement)
- Paragraph Completion
- Sentence Improvement
- Coherence and logical flow

Advanced English

- Active and Passive Voice
- Direct and Indirect Speech
- Spotting errors in sentence structure
- Word association and analogy

Business Correspondence

- Formal letter writing principles
- Email etiquette

- Professional communication standards

- Technical report writing basics
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