

# RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

## Syllabus for screening test for the post of **Lecturer – Electronics Engineering** Technical Education Department

- 1. Network theory:** Network analysis techniques; Network theorems, transient response, steady state Impulse, Step, Ramp and sinusoidal response; Network graphs and their applications in network analysis. Two port networks: Z, Y, h and transmission parameters. Combination of two port networks and effect of cascading, analysis of common two port network. Network functions: parts of network functions, obtaining a network function from a given part; Transmission criteria: delay and rise time. Elements of network synthesis-Foster & Cauer forms etc.
- 2. Signals and System:** Classification of signals and systems: System modeling in terms of differential/difference equations; State variable representation; Fourier series representation; Fourier transforms and their application to system analysis; Laplace transforms and their application to system analysis; Random signals and probability, Correlation functions; Spectral density; Response of linear system to random inputs.
- 3. Discrete-time Signal processing:** Representation of continuous-time and discrete time signals & systems; LTI systems; Convolution and superposition integrals and their applications; Z-transforms and their applications to the analysis and characterization of discrete time systems; impulse response; time-domain analysis of LTI systems based on convolution and differential/difference equations. Transfer function. Sampling and recovery of signals, DFT, FFT; Processing of analog signals through discrete-time systems. Filter design techniques.
- 4. Electromagnetic Theory:** Vector calculus, Gauss' and Stokes' theorem, Analysis of electrostatic and magneto static fields, Laplace's and Poisson's equations; Boundary value problems and their solutions; Maxwell's equations; application to wave propagation in bounded and unbounded media; Transmission lines: characteristics impedance and impedance transformation, basic theory, standing waves, matching applications, microstrip lines. Basics of wave guides and resonators; Elements of antenna theory; Smith Chart.
- 5. Materials and Components:** Structure and properties of Electrical Engineering materials: Dielectric, Magnetic, Ferroelectric, Piezoelectric, Ceramic, Conductors, Semiconductors and Insulators; Passive components (Resistors Capacitors and Inductors) and their characteristics; Ferrities, Quartz crystal, Ceramic resonators. Introduction of nanomaterials.
- 6. Analog Electronic Circuits:** Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET and MOSFET. Diode circuits: clipping, clamping, rectifier. Transistor biasing and stabilization, Small signal analysis; Power amplifiers; Frequency response; Wide band techniques. Feedback amplifiers. Tuned amplifiers. Oscillators. Shunt & series regulators. Op Amp and its applications. PLL and other linear integrated circuits and their applications. Pulse shaping circuits and waveform generators. Timers. Power supplies.
- 7. Digital Electronic Circuits:** Boolean algebra; minimization of Boolean functions; logic gates, digital IC logic families DTL, TTL. ECL. NMOS, PMOS and CMOS gates and their comparison; Combinational circuits; Adders and Subtractors, Code converters. Multiplexers, design of circuits by multiplexers; and decoders. Sequential circuits: Latches and flip-flops, counters and shift registers; minimization & implementation of state machines (Moore/Mealy). Sample and hold circuits, ADCs and DACs. Semiconductor memories.
- 8. Electronic Measurements and instrumentation:** Basic concepts. Standards and error analysis; Measurement of current, voltage, power, energy, power factor, resistance, inductance, capacitance and frequency; bridge measurement; Electronic measuring instruments and their principles of working. Transducers, Electronic measurements of non electrical quantities like temperature, pressure, humidity etc; Basics of telemetry for industrial use.

9. **Industrial Electronics:** Principle construction & characteristics of four/five layer devices - SCR, DIAC, TRIAC, power MOSFET, IGBT, GTO; Power control & rectifiers; Inverters & Converters, Speed control of DC motors and timer circuits; Induction and Dielectric heating, welding & their applications; SMPS
10. **Control Systems:** Transient and steady state response of control systems; Effect of feedback on stability and sensitivity; Root locus techniques; Frequency response analysis. Concepts of gain and phase margins: Constant-M and Constant-N Nichol's Chart, Approximation of transient response from Constant-N Nichol's Chart; Approximation of transient response from closed loop frequency response; Design of Control Systems, Compensators, Industrial controllers.
11. **TV & Radar Engineering:** Picture scanning composite video signal. TV signal transmission, Picture tubes, TV receiver for monochrome and color TV. Principle of RADAR, CW and Doppler RADAR, MTI & pulse Doppler RADAR, RADAR receiver & display.
12. **Analog & Digital Communication Systems:** Basic information theory; Modulation and detection in analogue and digital systems; Sampling and data reconstructions; Quantization & coding; Time division and frequency division multiplexing; Equalization; Optical Communication in free space & fiber optic; Propagation of signals at HF, VHF, UHF and microwave frequency. Satellite Communication. Concepts of mobile communication, mobile radio propagation & components of cellular systems. Multiple Access techniques and network based on these techniques.
13. **Microwave Engineering:** Microwave Tubes and solid state devices, Microwave generation and amplification, Waveguides and other Microwave Components and Circuits, Microwave Antennas, Microwave Measurements, Masers, Lasers; Microwave propagation. Microwave Communication Systems; terrestrial and Satellite based.
14. **Computer Engineering:** Number Systems. Data representation; Elements of a high level programming language C/C++; Use of basic data structures; Fundamentals of computer architecture; Processor design; Control unit design; Memory organization, I/O System Organization. Microprocessors: Architecture and instruction set of 8085 and 8086; Assembly language programming. Microprocessor Based system design; Personal computers and their typical uses.

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#### Pattern of Question Paper

1. Objective type Paper
2. Maximum Marks – 100
3. Number of Questions – 100
4. Duration of Paper : two Hours
5. All Questions carry equal Marks
6. There will be Negative Marking

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