

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 sinusoidal response; Network graphs and their applications in network analysis; Tellegen's theorem. Two port networks; Z, Y, h and transmission parameters. Combination of two ports, analysis of common two ports. Network functions: parts of network functions, obtaining a network function from a given part. Transmission criteria: delay and rise time, Elmore's and other definitions effect of cascading. Elements of network synthesis-Foster & Cauer forms etc.
- 2. Signals and System:** Classification of signals and systems: System modeling in terms of differential and difference equations; State variable representation; Fourier series; fourier representation; Fourier series; 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; LTL 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.
- 4. Electromagnetic Theory:** Analysis of electrostatic and magnetostatic fields Laplace's and Poission's equations; Boundary value problems and their solutions; Maxwell's equations; application to wave propagation in bounded and unbounded media; Transmission lines: basic theory, standing waves, matching applications, misconstrue lines Basics of wave guides and resonators; Elements of antenna theory. Radio wave propagation. Smith Charts.
- 5. Materials and Components :** Structure and properties of Electrical Engineering materials; Conductors Semiconductors and Insulators, Magnetic, Ferroelectric, Piezoelectric, Ceramic, Passive components and characteristics Resistors Capacitors and Inductors Ferrities Quartz crystal Ceramic resonators.
- 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 banding techniques. Feedback amplifiers. Tuned amplifiers. Oscillators. Rectifiers and (shunt & series) regulators. Op Amp. PLL linear integrated circuits and applications. Pulse shaping circuits and waveform generators. Comparators timers.
- 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; arithmetic circuits, code converters. multiplexers and decoders. Sequential circuits : Latches and flip-flops, counters and shift registers; minimization & implementation of state machines (Moore/Mealey). 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; analog and digital comparison, characteristics, application. 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; power control & rectifiers; Inverters & Converters speed control of DC motors and timer circuits; heating, welding & their applications.
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, 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.
13. **Microwave Engineering:** Microwave Tubes and solid state devices, Microwave generation and amplifiers, Waveguides and other Microwave Components and Circuits, Mismatch circuits, Microwave Antennas, Microwave Measurements, Masers, Lasers; Microwave propagation. Microwave Communication Systems; terrestrial and Satellite based.
14. **Computer Engineering :** Number Systems. Data representation; Programming; 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 instructions set of Microprocessors 8085 and 8086 Assembly language Programming. Microprocessor Based system design; typical examples. 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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