RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SCHEME & SYLLABUS FOR THE POST OF ASSISTANT CONSERVATOR FOREST & FOREST RANGE OFFICER GRADE Ist COMPETITIVE EXAMINATION, 2018 FOREST DEPARTMENT

OPTIONAL SUBJECT - ELECTRICAL ENGINEERING

1.   Electrical Circuits : Circuit elements and their characteristics, steady state analysis of DC and AC network, network theorems, network functions, Laplace transforms and their applications, Response of networks to standard input signals, Steady state response with sinusoidal input, network graphs, poly phase circuits, two port network, network synthesis, transient response: Transient analysis of RL, RC and RLC circuits, inductively coupled circuits, Resonant circuits and applications.

2.   Electrical Machines: Basic concept of rotating machines- e.m.f and torque equation, principle of energy conversion. DC Machines- characteristics, armature reaction, commutation, speed control of DC Motor, testing of DC Machine. Single phase and three phase transformers- phasor diagram, losses, regulation and efficiency, parallel operation of transformer, poly phase connection of transformers, Three phase induction machine- torque slip characteristics, efficiency, tests, applications, single phase induction motor- principle, starting methods, characteristics, applications, special machines. Synchronous machine - phasor diagram, voltage regulation, V-curves, synchronizing power, starting of synchronous motor, parallel operation and application.

3.   Power Electronics: Power semiconductor devices, Thyristor, triac, GTO, MOSFET, Static characteristics and triggering circuits. A.C. to D.C. Converters, choppers. Controlled and uncontrolled power rectifiers, Bridge converters.

4.   Control System: Open and closed loop systems. Block diagrams and signal flow graphs. transfer function, transient and steady state response, time domain analysis, frequency domain analysis; steady state error analysis. Root locus technique, bode plots, Routh-Hurwitz, and Nyquist criteria of stability, Compensating network, State variable representation and analysis of control systems.

5.   Power systems: conventional and non conventional generating plants, Supply system, modelling of transmission lines, Distribution system, Neutral earthing. Underground Cables, Corona, power system stability, Line insulators, introduction to HVDC transmission, protective devices and schemes for power system equipment, per unit quantities, Symmetrical components, fault analysis, bus admittance and impedance matrix, load flow study, voltage control and power factor correction, economic operation of power system, grid substation.

6.   Microprocessor systems and computer: Microprocessor architectures, Instruction set and simple assembly language programming, interfacing memory and I/O devices. Applications of microprocessors. Basic layout of digital computers, input-output devices, memory organisations, algorithms, flowcharts, Basic concepts of C++ programming.

7.   Electronics and Communication: Solid state (semi conductor devices): Diodes, Zener diodes. Transistors (Bipolar, BJT, JFET, MOSFET). Biasing and their applications. Analysis of electronic circuits, equivalent circuit. Rectifier, filter and voltage regulators. Single stage and multistage amplifiers-gain and frequency response. Multivibrators, flip-flops and their applications.
Digital Electronics: Switching circuits and Boolean algebra and logic gates. Memories sample and hold circuits, A/D and D/A converters. Logic circuits including DTL, TTL, ECL, MOS, CMOS, digital IC's (circuits).
Communication: generation and detection of AM and FM noise behaviour of AM and FM systems.

8.   Electrical Measurement and Instrumentation: General principles of measurement: Unit and dimensions. Standards error analysis, Basic methods of measurement, Measurement of circuit parameters by bridge methods. Measuring Instrument: Indicating Instruments, Integrating Instruments, Recording instruments. Measurement of voltage, current, power, power factor, energy, resistance, inductance, capacitance and frequency. Transducers: strain gauge, LVDT, resistance thermometers, thermisters, piezoelectric. Measurement of non-electrical quantities (Pressure, temperature, flow rate, displacement, velocity, acceleration, strain etc.) Digital measurements: Digital voltmeters, frequency counter, distortion meter. Telemetry and data transmission: Data recording and display, Data acquisition.

9.   Field Theory: Electrostatic and Magnetostatics : Electrostatics and electrical fields, Magnetostatics and magnetic fields, Field in conductors and in magnetic materials, field in dielectrics, Maxwell's equations and time varying fields. Electromagnetic wave equations. Plane wave propagation in conducting and dielectric media.

10.   Electrical Materials: Classification of materials on the basis of permanent magnetic dipoles, Electrical and electronic behaviour of materials, classification on the basis of conductivity. Behaviour of dielectrics in static and alternating fields. Phenomenon of polarization. Super conductivity. Applications of magnetic, conducting, dielectric and insulating materials.

Note :- **Pattern of Question Paper**
  1. Objective type paper
  2. Maximum Marks : 200
  3. Number of Questions : 120
  4. Duration of Paper : Three Hours
  5. All questions carry equal marks.
  6. There will be Negative Marking.