

# RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

## SYLLABUS FOR SCREENING TEST FOR THE POST OF JUNIOR ENGINEER(ELECTRICAL & MECHANICAL) (DEGREE HOLDERS), PUBLIC HEALTH ENGINEERING DEPARTMENT

### Part – A

- 1 प्राचीन सभ्यताएं – कालीबंगा, आहड़-बैराठ
  - 2 मुगल शासन और राजपूत राज्य (1526–1707)
  - 3 राजस्थान में स्वतंत्रता संग्राम एवं राजस्थान का एकीकरण (1857 से 1956)
- वास्तुशिल्प एवं स्थापत्य – मन्दिर, दुर्ग व हवेलियां
  - राजस्थान के भक्त एवं संत
  - राजस्थान की संस्कृति – रीति-रिवाज, मेले, त्यौहार, उत्सव, व्रत एवं उपवास
  - राजस्थान की लोक परम्पराएं – नृत्य, गीत, संगीत व कलाएं
  - राजस्थान के सन्दर्भ में समसामयिक घटनाएं
  - राज्य प्रशासन – कार्यपालिका, व्यवस्थापिका एवं न्यायपालिका
  - जिला प्रशासन – जिलाधीश, उपखण्ड अधिकारी एवं तहसीलदार – कार्य एवं भूमिका
  - स्थानीय प्रशासन – ग्रामीण एवं नगरीय
  - राजस्थान का सामान्य भूगोल – स्थिति, आकार, विस्तार, प्रशासनिक विभाजन, स्थलाकृतिक स्वरूप, जलवायु, वनस्पति, अपवाह व कृषि
  - सर्वेक्षण – तलेक्षण (लैवलिंग) सर्वेक्षण की विशेषताएं व समस्याएं
  - राजस्थान के हस्तशिल्प, लघु उद्योग, वृहद् उद्योग, राज्य में संचालित योजनाएं ।

### Part – B

#### (B-1) Electrical Engineering

Basic Electrical Engineering: Elect. Measurements, Concepts of current, voltage, resistance, power and energy, their units, Ohm's law.

Circuit Law: Kirchooff's law, Network theorems, Electro-magnetism, emf, reluctance, magnetic circuits. Electro-magnetic induction, self and mutual inductance. A.C. fundamentals, instantaneous, peak, R.M.S. and average values of alternating waves, Equation of sinusoidal wave form, series and parallel AC circuits, Resonance.

Measurement and Measuring Instruments: Analog and digital types meter, Moving coil and moving iron ammeters and voltmeters, Extension of range, Wattmeters, Multimeters, megger, transducers.

Basic Electronics: Rectifiers, clipping and clamping, zener diode and voltage regulation. Bipolar and field effect transistors, OPAMP circuits. Logic gates, multiplexers and decoder's. Latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits. Computer organization, elements of 8085-microprocessor.

Control Systems: open-loop & closed-loop systems, feed-back control system, time domain and frequency domain analysis. Routh Hurwitz criterion, root-loci, Nyquist's criterion.

Electrical Machines: Basic principles of D.C. motors, generators, their characteristics, Speed control and starting of D.C. motors, losses and efficiency of D.C. machines. 1-Phase and 3-Phase Transformers: Principles of operation, equivalent circuit, voltage regulation, open circuit and short circuit, efficiency and auto-transformers. Synchronous Machines: Generation of 3-phase emf, armature reaction, Voltage regulation, parallel operation of two alternators, synchronizing, starting and applications of synchronous motors. 3-Phase Induction Motor: rotating magnetic field, equivalent circuit, torque-speed characteristics, starting and speed control of 3-phase induction motors, Fractional kW motors, 1-phase induction motors, A.C. series motor, reluctance motor.

Power Systems: Different types of power stations, load factor, diversity factor, demand factor, cost of generation, inter-connection of power-stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults, circuit breakers, H.R.C. fuses, earth leakage, over current, Buchholz relay, Merz- Price protection of generators & transformers, protection

of feeders and bus-bars, lightning arresters, various transmission and distribution systems, conductor materials, efficiency for different systems.

Power Electronics and Electric Drives: Semiconductor power devices, triggering circuits, phase controlled rectifiers, chopper and inverter. Speed control of DC and AC motor drives. Illumination, electric heating, Electric welding, electroplating.

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## **(B-2) Mechanical Engineering**

### **UNIT #1**

Hooke's law. Elastic constants & their relations.

Fundamentals of Machine Design, Design for strength, Design of members subjected to direct Bending, torsion and eccentric loading. Design of belts. Friction: Laws of static, dynamic and rolling friction. Brakes and dynamometers. Design of flywheel, Governors: Principle & Types. Gear & Gear trains. Balancing. Free and forced vibrations.

### **UNIT #2**

Basic Concepts of Thermodynamics. Laws of Thermodynamics. Standard power cycle, Otto cycle, diesel cycle, Dual cycle, Mean effective pressure and efficiencies. Basics of I.C.Engines & Its operating systems, Properties of steam, use of steam table & mollier chart. Rankine cycle, vapour compression refrigeration cycle, Psychrometry.

Heat transfer processes, conduction, Convection and radiation. Heat exchanger: AMTD & LMTD, Effectiveness by NTU method.

### **UNIT #3**

Basics of Fluid Mechanics, Fluid Statics, continuity equation, Euler's & Bernoulli's equation, Applications of Bernoulli's equation. Flow measurement, Flow through Pipes. Laminar Flow, Turbulent Flow, the universal pipe friction laws, Aerofoils theory.

Definition of Turbo machine, Basic laws and governing equations; Euler's pump equation and Euler's turbine equation, dimensional analysis.

Hydraulic machines: various types of pumps & turbines.

### **UNIT #4**

Atomic Structure of Metals. Theories of plastic deformation. Solidification of metals and of some typical alloys: Mechanism of crystallization. Heat Treatment.

Basics of Foundry Technology, Metal Joining Processes. Metal forming; forging, extrusion, wire drawing, rolling and shaping.

General Purpose Machine tools: details of lathe, drilling, milling, shaping, grinding and planning machines. Tooling, attachments and operations performed. Basics of Modern machining methods, CNC machine tools.

### **UNIT #5**

Automobile Engineering: Frame & Body, Transmission System, Gear Boxes, two wheel and four wheel drive, steering system, suspension spring, Brakes,

### **UNIT #6**

Types & forms of Organization, theory and functions of Management, work study, plant location and layout, material handling equipments, production planning and control and its use in industrial environment, PERT & CPM.

Linear programming and its applications, inventory control, Break even analysis.

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### **Pattern of Question Papers :**

1. Objective Type Question 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**.
7. 20% Questions will be from Part-A and 80% questions from Part-B-1 & 2 each.

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