

Junior Engineer (Electrical)

Stage-I (Screening Test)

Stage-I (Screening Test): A screening test shall be conducted in the first phase in form of multiple choice written test. Written test shall be of **90 minutes'** duration comprising of **75 questions**. Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Screening test shall consist of questions on **General English**(Tenses, Active and Passive, Direct and Indirect speech, Punctuation, Correction of sentences, One word substitutes, Modals, Articles, Clauses, Synonyms, Antonyms, Idioms and Phrases); **Numerical Aptitude Arithmetic**(Simplification of Fractions, Simple and Compound Interest, Profit and Loss, Percentage, Averages, Number System, Time and Work, Problems on Trains, Calendar, Area, Problems on Numbers, Square root, Cube root, Time and Distance and Other basic Arithmetic related matters);**Reasoning and Data Interpretation** (Number Series Compilation, Missing Number finding, Pattern series, Direction Sense Test, Series Compilations, Classification, Missing Character finding, odd man out, Blood relations, Analogy, Coding and Decoding, Letter and Symbol Series, Verbal reasoning, Statement and Conclusions, Letter and Symbol Series, Logical Problems, Arithmetic reasoning, Logical Sequence of words, Pie Chart and Bar Chart).

Eligible candidates **Ten Times** of the positions in each category will be screened for the Stage-II subject to the fulfillment of all educational qualification etc. as per the Recruitment Rules-2019.

Stage-II (Skill test)

Stage-II (Skill Test): The skill test will be of qualifying nature.

Field skill test etc. as per nature of the post shall be conducted in the respective laboratories/field. Minimum qualifying marks in the skill test will be [UR:30%; EWS:27%; OBC:27%; SC:20%; ST:20%; PwD:15%].

The candidates, who will qualify the skill test, will be called for the final written test. The Candidates appearing in the written test must ensure their eligibility for the particular category of post. The documents in support of their eligibility shall be verified before the Final test. If

any candidate will not have requisite qualification etc. as per the post for which he is appearing will not be allowed to sit in the final test (Stage-III).

Stage-III (Final test)

Stage-III (Final Test): Final written test shall be of 2 hours duration comprising of 100 multiple choice questions.

Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Only those who are screened in after the Screening test [Stage –I] and qualify the Skill Test [Stage-II] will be allowed to appear in the Final Test [Stage III]. The minimum passing marks in Final test will be [UR:30%; EWS:27%; OBC:27%; SC;20%; ST:20%; PwD:15%].

The final merit list shall be drawn on the basis of the stage-III written test.

SYLLABUS FOR SKILL TEST AND FINAL WRITTEN TEST IS AS PER ANNEXURE-IV.

Junior Engineer (Electrical)

Syllabus for Skill Test (Jr. Engineer(Electrical))

1. Circuits and Principles

- a. Maintain DC circuits
- b. Maintain single-phase AC circuits
- c. Conductors: Properties and Classification
- d. Symbols and Graphical representation Overview of AC and DC
- e. Different internal wiring practices- drawing and practice
- f. Testing of electrical components and equipment

2. Installations and Testing

- a. Install single-phase incoming supply system
- b. Install lighting circuits
- c. Install power circuits
- d. Install system wiring in a control panel
- e. Earthing-Drawings, measurements of soil resistivity. Measurement of earth resistance and testing the continuity of earth conductors. Use of earth resistance tester/Megger
- f. Maintain safety and health of the individual
- g. Insulators: Properties and Classification
- h. Identification and Handling of tools & making electrical wire and cable joints. Identify different type of cable base on classification & construction.
- i. Test the underground cables for open, short circuit & ground fault and check insulation resistance

3. Machines and Control

- a. Install DC motor and controller
- b. Maintain DC motor installation
- c. Maintain electrical motor starters and control circuits
- d. Maintain electrical drive systems
- e. Install AC motor and motor controller
- f. Maintain AC motor installation
- g. Maintenance of solar power plant and streetlights.
- h. UPS, general purpose power supply and lab electrical lab equipment.

4. Drafting and Design

- a. Electrical diagrams and drawings for residential premises;
- b. Electrical diagrams and drawings for commercial and industrial premises
- c. Switch-boards/ Control Panel drawings

5. Measuring Instruments

- a. Multimeter: Working Principle and Applications of Analog and Digital Multimeter and their differences.
- b. Working principle and Application of Oscilloscope (CRO and DSO).
- c. Use of measuring instruments- using ammeter, voltmeter, tachometer and Tongue/Clamp-on meter
- d. Power and Energy measurement using Wattmeter and Energy meter

6. Electrical Safety

- a. Working and maintenance Fuses, Relays & circuit breakers
- b. Identification/ use of Fire extinguishers for different applications
- c. Identification of protective devices
- d. Stripping the cable insulation following safety procedure
- e. Tools, Equipment & Safety Measures at work site

Junior Engineer (Electrical)
Syllabus for Final written Test (Jr Engineer (Electrical))

GENERAL APTITUDE SYLLABUS

Verbal Aptitude Basic English grammar: Tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech; Basic vocabulary: words, idioms, and phrases in context Reading and comprehension Narrative sequencing.

Quantitative Aptitude: Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2 and 3 dimensional plots, maps, and tables; Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series Mensuration and geometry Elementary statistics and probability.

Analytical Aptitude: Logic: deduction and induction; Analogy Numerical relations and reasoning: **Spatial Aptitude:** Transformation of shapes: translation, rotation, scaling, mirroring, assembling, and grouping, paper folding, cutting, and patterns in 2 and 3 dimensions.

ELECTRICAL ENGINEERING SYLLABUS

Electromagnetic Fields: Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations. Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Magneto-motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

Signals and Systems: Representation of continuous and discrete time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and Z-Transform.

Electrical Machines: Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of DC motors; Single phase induction motor: Operating principle, starting, torque-speed characteristics, speed control; Three phase induction motor. principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

Power Systems: Power generation concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Sag and tension, Skin effect, Ferranti effect, Distribution systems (AC and DC), Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and frequency control,

Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion, Economic Load Dispatch (with and without considering transmission losses).

Control Systems: Mathematical modelling and representation of systems, Feedback principle, Transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

Electrical and Electronic Measurements: Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Analog and Digital Electronics: Characteristics of diodes, BJT, MOSFET; Simple diode circuits; clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Active and passive filters, Voltage-controlled oscillators, Digital Signal Oscilloscope, Timers, Combinational and Sequential logic circuits, Multiplexer, Demultiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8085 Microprocessor: Architecture, Programming and Interfacing.

Power Electronics: Characteristics of power semiconductor devices: Diode, Thyristor, TRIAC, GTO, MOSFET, IGBT; Rectifiers: Uncontrolled, Single-phase and Three-phase; DC to DC converter: Buck, Boost and Buck-Boost converters; Inverters: Single phase, Three phase, VSI, CSI and PWM; AC to AC converter: Single phase and Three phase; Line commutated thyristor based converters, Dual Converter, Bidirectional AC to DC voltage source converters, Harmonics, Power factor, Distortion factor.

COMPUTER LITERACY: Characteristics of Computer, Computer Organization, Input/output Devices, Computer Software-Relationship between Hardware and Software, Operating Systems, MS-Office(exposure of Word, Excel/spread sheet, Power point). Digital Signature, Application of information technology in Government for e-Governance, mobile/Smartphone, Information tasks.