



অসম লোকসেৱা আয়োগ

ASSAM PUBLIC SERVICE COMMISSION

Jawaharnagar, Khanapara, Guwahati-781022.

SYLLABUS

Recruitment to the post of Junior Manager (Electrical / Mechanical / Civil / IT) under
Assam Electricity Grid Corporation Limited (AEGCL)

(Advt. No. 14/2023 dated 28/04/2023)

PAPER – I

GENERAL STUDIES

(Multiple Choice Question Type)

Full Marks: 100 Marks

Time: 2-00 hours

Subject	Topics	No. of Questions	Marks
General English	Sentence Completion, sentence improvement, ordering of words in a sentence, spotting errors, synonyms and antonyms, Idioms and phrases, fill in the blanks, word groups etc.	25	25
General Aptitude & Emotional Intelligence	Time and distance; Series, Analogy, Statement, Direction; Verbal and non-verbal reasoning etc. Understanding Emotional Intelligence, Personality and EQ, The Ability Model of EI, The Trait Model of EI, The Mixed Model of Emotional Intelligence, The Bar-On Model of Emotional Social Intelligence and the Genos Model, Criticism of the Theoretical Foundation and Measures of Assessment of Emotional Intelligence, Emotional Intelligence, Personality Disorders, and Individuals on the Autism Spectrum, EQ and Personal Relationships, Emotional Intelligence in the Workplace, Improving your Emotional Intelligence.	50	50
General Knowledge	Current Affairs (National and International); Who's Who; Sports; Books and Authors; Awards and Honours; Science – Inventions and Discoveries; Abbreviations; Important Days etc.	25	25

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S Y L L A B U S

Junior Manager (Electrical) in Assam Electricity Grid Corporation Limited (AEGCL)
(ADVT. NO. 14/2023 dated 28th April, 2023)

Paper-II

Electrical Engineering

(Multiple Choice Question Type)

(Diploma Course Standard)

Full Marks: 100 Marks

Time: 2-00 hours

Basic Electrical Engineering: Laws of electricity, Ohms law, Kirchoff's law, Faraday's law, left hand rule, Thevenin's & Norton's theorems. Maximum power transfer theorem. EMF. Network analysis Loop & Node Analysis, Voltage Source, Current source. Resistance, Inductance Capacitance, Impedance and Reactance. Magnetic circuits: MMF, Flux, Reluctance Susceptance, Electromagnetic induction, Eddy currents, basics of transformer generator and motor. Electrical measuring instruments: PMMC & MI meters. Wattmeter and Energy meter, Basics of electronics: Semiconductors, Diodes and Rectifiers.

Electrical Circuits: Phasors and phasor algebra, balanced and unbalanced poly-phase circuit, Test signals, Star-Delta transformation, Network theorems, Parameters of electromagnetic circuits, resonance in R-L-C Series and Parallel circuits, Network analysis by mesh and node methods.

Electrical Engineering Materials: Conducting, Insulating materials and Magnetic materials, Properties and applications.

Electrical Instruments and Measurements: Principles of measurements: Classification, accuracy and sensitivity, damping and control forces, shunt and multiplier, Measurement of resistance: Low, medium and high. Principle and uses of DC potentiometers, AC Bridges. Indicating instruments: Multimeter, PF meters, synchroscope.

Electrical Machines: Classification of D.C. machines: Constructional features, e.m.f. torque, excitations, motor performance, speed, power, size considerations, speed control, efficiency.

Transformers: Induced e.m.f. equivalent circuits, regulation, different efficiencies. Three phase induction machines: Torque characteristics, Starting, equivalent Circuits. Three Phase Synchronous Machines: Generation, voltage regulation, parallel operation, synchronous motor, starting and V-curves, Single phase motors: type, starting characteristics.

Generation, Transmission and Distribution:

Generation: Thermal, Hydel and Nuclear Power Stations, Prime movers and alternators.

Transmission: Voltage levels, line conductors, electrical line parameters of short and medium lines, voltage regulation, corona. **Distribution:** D.C. and A.C. systems, voltage level, types of distribution feeders and distributors, voltage drop and effects, power factor improvement plant.

Substation: Different types, site selection, equipments, electrical earthing. **Switchgear:** Switches, isolators, circuit breakers and their types. **Protection:** Fault current and protective devices, fuses, relay functions, alternator, Transformer protection, thermal relays, over voltage-causes, effect and protective devices.

Electrical Estimation and Costing: Estimation of materials for industrial and residential installations. UPS and small diesel generating-set and accessories. Cost estimation of materials and selection criteria, Design and calculation of the cost of 400V/230V three phase 4 wire, 100-500 KW overhead line, Tenders.

Electrical Power Utilization: Design of lighting system. **Electrical Heating:** Resistance heating, Induction heating, Arc heating and Dielectric heating, types of electric welding **Electrochemical process:** Principles, equipment and procedure. **Electrical Drives:** Characteristics of various electric drives, speed control, starting and breaking, mechanical consideration, selection of motors.

Power Electronics: Power diodes and Darlington Pair. **Thyristor:** Principle, thyristor family, firing circuits, applications, Selenium rectifiers, uncontrolled and controlled rectification, Power MOSFETS.

Digital Electronics: Digital signals, gates, Boolean algebra, logic families, multiplexures / demultiplexure, Encoders/decoders, flip flops, registers, counters and applications of logic gates, OPAMPS in timing circuits, A/D and D/A conversion.

Computer Programming: Concept of low level and high level languages, Block-diagram, concept of flow chart, and algorithm, Assemblers, Macros, sub-routines, co-routines, loaders, linkers, editors and compilers, programming and file handling in C and C++.



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Junior Manager (Mechanical) in Assam Electricity Grid Corporation Limited (AEGCL)
(ADVT. NO. 14/2023 dated 28th April, 2023)

Paper-II

Mechanical Engineering

(Multiple Choice Question Type)

(Diploma Course Standard)

Full Marks: 100 Marks

Time: 2-00 hours

Engineering Mechanics & Strength of Materials: Vector concepts, rest and motion, Introduction to force systems (Parallel, Concurrent & Coplanar); Free Body Diagram; Equilibrium Principle; Static analysis of systems; Friction and impending motion; rolling and sliding of cylinders; Newton's law of motion and derived concepts; Centroid; Area & Mass moment of inertia, Work-Energy principle; Impulse; Collision of two bodies; Plane motion of particles and applications; Static analysis of simple structures; Method of joints and method of sections; Virtual work; combined motion of rotation and translation; Transmission of power by belt and gear drives; Stress & Strain; Shear stresses, Principal stress and strain, Mohr's circle for stress and strain analysis, Beams & columns; Shear force and bending moment diagram, Theories of Failures; Columns, Struts; Stress & strain analysis of shafts under torsion, analysis of springs.

Engineering Materials: Mechanical, thermal, chemical properties, structure of materials, alloys, Iron and its alloys, Iron carbon phase diagrams, steel and their important alloys of Iron, heat treatment processes, Elastic & plastic behaviors; Plastic deformation, Effect of various alloying elements on mechanical properties of Iron; Bearing alloys; Powder metallurgy; Fick's law, Commonly used engineering materials for tools, engineering components and household objects.

Design of Machine Element: Concepts of FOS, material selection, engineering materials, Design of Rivets, Screws, Bolts with details analysis, Cotter and Knuckle joints, shafts, keys and couplings, Springs – helical and leaf types.

Hydraulics and Hydraulic Machines: Properties of liquid, hydraulic pressure and its measurement, Forces on immersed bodies; Center of pressure; Buoyancy stability of immersed and floating bodies; Flow of liquids; 1-D, 2-D & 3-D flows; steady, unsteady, laminar and turbulent flows; continuity equation, momentum equation, and energy equation and their applications, Euler equation and Bernoulli's equation; Orifice, mouth piece and nozzles, flow through pipes and piping systems, losses in piping systems; fundamentals of channel flow, hydraulic jump; flow measurements; Dimensional analysis and associated theorems, Non dimensional numbers and their significances; Stream function and Velocity potential function, streamline, streakline and pathline; Rotational and irrotational flow, circulation and vorticity; Free and forced vortex; Basic flows like rectilinear, Source, sink, doublet etc. Different types of

pump, reciprocating and rotary pumps, operation and maintenances of pumps, Cavitation and NPSH; Characteristic curves of pumps, losses and efficiencies of pumps, Compressors, blowers and fans, Different types of turbines, Francis, Kaplan and Pelton turbines, operation and maintenance of turbines; characteristic curves, work done and efficiency of turbine, specific speed and selection of pumps and turbines. Hydraulic machinery like hydraulic ram, hydraulic coupling and torque converter, hydraulic jack, screw pump, Gear pump, Vane pump etc.

Thermal Engineering: Basic thermodynamic concepts; System and surrounding; Thermodynamic Properties; Intensive and Extensive properties; Point and path functions; Zeroth law, first and second laws of thermodynamics and associated corollaries; Concepts of absolute temperature, internal energy, enthalpy & entropy; Clausius inequality, concept of availability, Maxwell's relations, Application of thermodynamics laws, reversibility & irreversibility, Internal & External irreversibility; Pure substances and mixtures, Thermodynamic cycles; Carbon cycle, Rankine cycle, Joule-Brayton cycle; Air standard cycles; Otto cycle and Diesel cycles, Ideal gas compression and compressors, jet propulsion, gas compressors, steam generators, Fuel and combustion, I.C. engine, calculation of efficiencies, testing of IC, Engines; Open and closed gas turbine cycles, introduction to heat and mass transfer; heat exchanger; LMTD and NTU methods. Principles of refrigeration, air refrigeration system, Vapor compression refrigeration system, refrigeration cycles, use of T-S & P-H charts for refrigeration, refrigerants and their properties, Vapor absorption system, psychometric properties and charts Types of power plants; components of steam power plant; hydro-electric power plant, nuclear power plants, diesel power plant, Elementary solar and geothermal power plant.

Theory of Machines: Kinematics and kinetics; mechanisms and structure; inversions; kinematic chains; different types of mechanisms; degree of freedom & its determination; Grashof's criteria; velocity analysis; acceleration analysis; geartrains; balancing of rotating masses; brakes & dynamometer.

Production and Industrial Engineering: Fundamentals of metal cutting, tool geometry, Calculations of cutting forces and tool life; General purpose machine tool and their operations, various welding techniques like arc, gas, resistance etc. Metal forming methods like rolling, drawing, extrusion, press working; powder metallurgy, heat treatment of metals; Introduction to NC and CNC machines, basics of measuring instruments; study of transducers; static and dynamic, characteristic of instruments, Introduction to metrology; limits, fits and tolerance, Mechanical and optical comparators; Measuring instruments of angles; measurements of surface roughness and thread profiles, calibration of various measuring instruments, Production planning; Inventory control, material and wage calculation; elements of cost; network analysis; work study and estimating machining time; break even analysis; TQM & ISO 9000; shop floor management; Machines & Industrial safety.



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Junior Manager (Civil) in Assam Electricity Grid Corporation Limited (AEGCL)
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Paper-II

Civil Engineering

(Multiple Choice Question Type)

(Diploma Course Standard)

Full Marks: 100 Marks

Time: 2-00 hours

Strength of Materials & Theory of Structures: Normal stress, shearing stress, Normal strain, HOOK's Law, Stress-strain behaviour of mild steel, Poisson's Ratio, Shearing strain, Torsion of Circular Shaft, Relations among load, shear and Bending Moment, Shear and Bending – Moment Diagrams, Pure Bending, Bending of Members Made of several Materials, Shearing Stresses in a Beam, Mohr's Circle for Plane Stress, Principal Stresses, Maximum shearing stress, Euler's Formula for Pin-Ended Columns and columns with other End conditions. Equation of the Elastic curve by Double Integration Method, Slope and Deflection of Determinate Beams by Moment-Area Theorems, Deflections and Slope by Energy Method, Castigliano's Theorem, Stability and Degree of Indeterminacy, Rolling loads and Influence lines for Determinate Beams, Trusses, and Floor Girders, Cables and Three-Hinged Arch.

Water Resources Engineering: Hydrology: rainfall, stream flow measurements, runoff, hydrographs, flood studies, reservoir and channel routing, flood forecasting, flood protection measures, river training works, well hydraulics; Irrigation: Command area, duty and delta, canal outlets, crop-water requirement.

Fluid Mechanics: Properties of Fluid, Manometry, Forces on Plane and Curved surfaces, Flow classification, Continuity Equation, Momentum Equation, and Energy Equation and their Applications, Orifices, Venturimeter, Weirs and Notches, Laminar and Turbulent Flow through Pipes, Darcy Weisbach Equation, Moody Diagram, Steady Uniform Flow in Open Channels, Manning's Formula.

Geotechnical Engineering: Preliminary definitions & relationship, Determination of index properties, classification of soils, soil structure and clay mineralogy, permeability, Darcy's law, seepage analysis, compaction, one dimensional consolidation, Terzaghi's theory, shear strength, theoretical consideration and tests, shallow and deep foundations, soil exploration.

Highway and Railway Engineering: Highway Geometric Design: Cross sectional elements, Sight distances, horizontal and vertical alignments; Types and components of Pavement structures, Design of Flexible Pavements; Traffic Characteristics: Road user and vehicular characteristics, traffic volume studies, O-D studies and traffic capacity studies;

Railways: Components, construction and maintenance of rail tracks, points and crossings.

Surveying: Contouring, Theodolite and its adjustment, measurement of angles and setting out lines, Trigonometrical levelling, Tacheometry, Curves and different methods of setting out curves, Introduction to electronic Theodolites and Total Stations.

Structural Design: Working stress methods of design, singly and doubly reinforced sections, rectangular and Tee beams, shear, torsion and development length, one and two way slabs, short and long column, Design of isolated footings, Introduction of limit state design, Design for flexure, shear and compression, Design of riveted and welded connections, tension and compression members, splicing and lacing, Beam column connection, roof trusses.

Environmental Engineering: Estimation of quality of water, per capita demand, population forecasting, water quality parameters, treatment of water, distribution system, Estimation of quantity of sewage, dry weather flow and storm run off, sewer appurtenances, characteristics of sewage, treatment and disposal of sewage, sludge digestion.



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Paper-II

Information Technology

(Multiple Choice Question Type)

(Diploma Course Standard)

Full Marks: 100 Marks

Time: 2-00 hours

Object Oriented Programming in C++: Principles of Object Oriented Programming, Classes & objects, Functions, Constructors & Destructors, Inheritance, Polymorphism, Encapsulation, Pointers in C++, Array, String.

Database Management System: Database system concepts, Database Model, Types of Database, Relational Data Model, ER Diagram & Normalization, SQL, Query Processing & Transaction Processing, Concurrency, Lock Based Protocols.

Operating System: Introduction to Operating System, Evolution, Generations, Components & Services, Process Management, Scheduling Algorithms, Memory Management, I/O management, File System Management, Security & Protection.

Data Structure: Introduction to Data Structure, Principles of Programming & Analysis of Algorithms, Sorting & Searching Algorithms, Stacks, Linked Lists, Type of Lists, Queues, Trees, Tree Types & Traversal Methods, Graphs and Hashing.

Microprocessor and Assembly Language Programming: Basics of Microprocessor, 16 bit Microprocessor, Instruction set, Assembly language programming.

Data Communication & Computer Networks: Basic Network concepts, Network Topologies, Networking Devices, Transmission media, OSI Model, TCP/IP Fundamentals.


Basics of Multimedia and Web Development: Multimedia Basics, Audio Fundamentals, Image Fundamentals, Image and Graphics, World Wide Web & Its Evolution, HTML, CSS.

Computer Organization and Architecture: Software & Hardware Organization of Computers, Addressing Modes, CPU Design, Memory organization, I/O Organization, DMA Data Transfers.

Basic Electronics: Introduction to Digital Electronics, Number System, Logic Gates & Boolean Algebra, Flip-Flops, Memories, Semiconductors, Rectifiers & Filters, Transistors.

Software Development: Software Development Process, Analysis & Design Models, Software Testing Fundamentals.

Computer Hardware and Maintenance: Motherboard & its Components, Memory & Storage Devices, I/O Devices & Interface, Power Supply, Troubleshooting & Maintenance.


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