



অসম লোকসেৱা আয়োগ

ASSAM PUBLIC SERVICE COMMISSION

Jawaharnagar, Khanapara, Guwahati-781022.

S Y L L A B U S

**Junior Manager (Mechanical) in Assam Power Generation Corporation Limited (APGCL)**  
**(ADVT. NO. 12/2023 dated 25<sup>th</sup> April, 2023)**

Paper-I

**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, streamline 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 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, Joule-Brayton cycle; Air standard cycles; Ortho 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 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 mechanism; 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.



Controller of Examinations  
Assam Public Service Commission  
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## SYLLABUS

**Recruitment to the post of Junior Manager (Electrical / Mechanical / IT / Instrumentation) under Assam Power Generation Corporation Limited (APGCL)**

(Advt. No. 12/2023 dated 25/04/2023)

### PAPER – II 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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