



অসম লোকসেৱা আয়োগ

ASSAM PUBLIC SERVICE COMMISSION

Jawaharnagar, Khanapara, Guwahati-781022.

S Y L L A B U S

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

Paper-I

Instrumentation

(Multiple Choice Question Type)  
(Diploma Course Standard)

**Full Marks:** 100 Marks

**Time:** 2-00 hours

**Electrical Circuits:** Voltage and current sources; independent; dependent; ideal and practical; v-i relationships of resistor, inductor, mutual inductor and capacitor; transient analysis of RLC circuits with dc excitation. Kirchoff's laws, mesh and nodal analysis, superposition, Thevenin, Norton, maximum power transfer and reciprocity theorems. Peak, average and rms values of ac quantities; apparent, active and reactive powers; phasor analysis, impedance and admittance; series and parallel resonance, locus diagrams, realization of basic filters with R, L and C elements. One-port and two-port networks, driving point impedance and admittance, open, and short circuit parameters.

**Signals and Systems:** Periodic, aperiodic and impulse signals; Laplace, Fourier and z-transforms; transfer function, frequency response of first and second order linear time invariant systems, impulse response of systems; convolution, correlation; Discrete time system; impulse response, frequency response, pulse transfer function; DFT and FFT; basics of IIR and FIR filters.

**Control Systems:** Feedback principles, signal flow graphs, transient response, steady-state-errors, Bode plot, phase and gain margins, Routh and Nyquist criteria, root loci, design of lead, lag and lead-lag compensators, state-space representation of systems; time-delay systems; mechanical, hydraulic and pneumatic system components, synchro pair, servo and stepper motors, servo valves; on-off, P, P-I, P-I-D, cascade, feedforward, and ratio controllers.

**Analog Electronics:** Characteristics and applications of diode, Zener diode, BJT and MOSFET; small signal analysis of transistor circuits, feedback amplifiers, Characteristics of operational amplifiers; applications of opamps; difference amplifier, adder, subtractor, integrator,



differentiator, instrumentation amplifier, precision rectifier, active filters and other circuits, Oscillators, signal generators, voltage controlled oscillators and phase locked loop.

**Digital Electronics:** Combinational logic circuits, minimization of Boolean functions, IC families; TTL and CMOS, Arithmetic circuits, comparators, Schmitt trigger, multi-vibrators, sequential circuits, flip-flops, shift registers, timers and counters; sample and hold circuit, multiplexer, analog to digital (successive approximation, integrating, flash and sigma-delta) and digital to analog converters (Weighted R, R-2R ladder and current steering logic), characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time); basics of number systems, 8-bit microprocessor and microcontroller; applications, memory and input-output interfacing; basics of data acquisition systems.

**Measurements:** SI units, systematic and random errors in measurement, expression of uncertainty – accuracy and precision index, propagation of errors, PMMC, MI and dynamometer type instruments; dc potentiometer; bridges for measurement of R, L and C, Q-meter, Measurement of voltage, current and power in single and three phase circuits, ac and dc current probes; true rms meters, voltage and current scaling, instrument transformers, timer/counter, time, phase and frequency measurements, digital voltmeter, digital multimeter; oscilloscope, shielding and grounding.

**Sensors and Industrial Instrumentation:** Resistive, capacitive, inductive, piezoelectric, Hall effect sensors and associated signal conditioning circuits; transducers for industrial instrumentation; displacement (linear and angular), velocity, acceleration, force, torque, vibration, shock, pressure (including low pressure), flow (differential pressure, variable area, electromagnetic, ultrasonic, turbine and open channel flow meters) temperature (thermocouple, bolometer, RTD (3/4 wire), thermistor, pyrometer and semiconductor); liquid level, pH, conductivity and viscosity measurement.

**Communication and Optical Instrumentation:** Amplitude and frequency, modulation and demodulation; Shannon's sampling theorem, pulse code modulation; frequency and time division multiplexing, amplitude, phase, frequency, pulse shift keying for digital modulation; optical sources and detectors; LED, laser, photo-diode, light dependent resistor and their characteristics; interferometer; applications in metrology; basics of fiber optic sensing.



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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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