



NITC/13-3(II)/2022-RO

Dated: 06 November 2023

**Gp B & C (01/2023) - Syllabus of Examinations for non-teaching positions  
in NIT Calicut**

(For the posts of Superintendent, Senior Technician, Senior Assistant, Junior Assistant, Technician, Office Attendant, Lab Attendant)

The Syllabus is suggestive and indicative in nature having only broader areas for reference. The Candidate is expected to have the holistic and expanded knowledge of the subject/syllabus.

**POST: Office Attendant**

**General Awareness:** Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc. , questions related to the NIT structure and statutes etc.

**Reasoning:** Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetic reasoning, verbal & figure classification, arithmetical number series etc.

**Mathematics:** Includes questions relating to simplification, decimals, fractions, LCM, HCF, ratio & proportion, percentage, average, profit & loss, discount, simple & compound interest, mensuration, time & work, time & distance, tables & graphs, solving equations.

**Test of English:** General English, finding errors, Idioms, Phrases, Direct/indirect speech, Sentence improvement, Synonyms and antonyms, Word substitution, spotting of errors in sentences, spelling error, Grammar – noun, pronoun, adjectives, verbs, prepositions, conjunctions, use of ‘a’ ‘an’ and ‘the’, idioms and phrases.

**Computer Awareness:** Includes questions on Operating System, MS Office, MS Word, MS Excel, Power Point, Internet, E-mail, Antivirus and various online tools used in day- to-day office work.

**POST: Lab Attendant:**

**General Awareness and General Science:** Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc, questions related to the NIT structure and statutes etc. Questions related to general science will be given adequate weightage.



**Reasoning:** Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc.

**Mathematics:** Includes questions relating to Simplification, Decimals, Fractions, L.C.M., H.C.F., Ratio & Proportion, Percentage, Average, Profit & Loss, Discount, Simple & Compound Interest, Mensuration, Time & Work, Time & Distance, Tables & Graphs, etc.

**Test of English:** General English, finding errors, Idioms, Phrases, Direct/indirect speech, Sentence improvement, Synonyms and antonyms, Word substitution, spotting of errors in sentences, spelling error, Grammar – noun, pronoun, adjectives, verbs, prepositions, conjunctions, use of ‘a’ ‘an’ and ‘the’, idioms and phrases.

**Computer Awareness:** Includes questions on Operating System, MS Office, MS Word, MS Excel, Power Point, Internet, E-mail, Antivirus and various online tools used in day- to-day office work.

### **POST: Junior Assistant**

**General Awareness:** Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc. , questions related to the NIT structure and statutes etc.

**Reasoning:** Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc.

**Mathematics:** Includes questions relating to Simplification, Decimals, Fractions, L.C.M., H.C.F., Ratio & Proportion, Percentage, Average, Profit & Loss, Discount, Simple & Compound Interest, Mensuration, Time & Work, Time & Distance, Tables & Graphs, etc.

**Test of English:** General English, finding errors, Idioms, Phrases, Direct/indirect speech, Sentence improvement, Synonyms and antonyms, Word substitution, spotting of errors in sentences, spelling error, Grammar – noun, pronoun, adjectives, verbs, prepositions, conjunctions, use of ‘a’ ‘an’ and ‘the’, idioms and phrases.

**Computer Awareness:** Includes questions on Operating System, MS Office, MS Word, MS Excel, Power Point, Internet, E-mail, Antivirus and various online tools used in day- to-day office work.

**General Administration:** Constitution of India, CCS Leave Rules, CCS Conduct Rules, LTC Rules, TA/DA rules and other allowances, Office Procedure, Probation, Confirmation, Rules-2017 & 2022, GeM Rules, Medical Attendance Rules & CGHS, etc.



### **POST: Senior Assistant**

**General Awareness:** Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc. , questions related to the NIT structure and statutes etc.

**Reasoning:** Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc.

**Mathematics:** Includes questions relating to Simplification, Decimals, Fractions, L.C.M., H.C.F., Ratio & Proportion, Percentage, Average, Profit & Loss, Discount, Simple & Compound Interest, Mensuration, Time & Work, Time & Distance, Tables & Graphs, etc.

**Test of English:** General English, finding errors, Idioms, Phrases, Direct/indirect speech, Sentence improvement, Synonyms and antonyms, Word substitution, spotting of errors in sentences, spelling error, Grammar – noun, pronoun, adjectives, verbs, prepositions, conjunctions, use of ‘a’ ‘an” and ‘the’, idioms and phrases.

**Computer Awareness:** Includes questions on Operating System, MS Office, MS Word, MS Excel, Power Point, Internet, E-mail, Antivirus and various online tools used in day- to-day office work.

**General Administration:** Constitution of India, CCS Leave Rules, CCS Conduct Rules, LTC Rules, TA/DA rules and other allowances, Office Procedure, Probation, Confirmation, Rules-2017 & 2022, GeM Rules, Medical Attendance Rules & CGHS, etC.

### **POST: Superintendent**

**General Awareness:** Includes questions relating to the Indian constitution, geography, economics, general policy, science & scientific research, national/ international organisations/ institutions, current events, environment etc, questions related to the NIT structure and statutes etc.

**Reasoning:** Includes questions relating to both verbal and non-verbal types, analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship, concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc.

**Mathematics:** Includes questions relating to Simplification, Decimals, Fractions, L.C.M., H.C.F., Ratio & Proportion, Percentage, Average, Profit & Loss, Discount, Simple & Compound Interest, Mensuration, Time & Work, Time & Distance, Tables & Graphs, etc.

**Test of English:** General English, finding errors, Idioms, Phrases, Direct/indirect speech, Sentence improvement, Synonyms and antonyms, Word substitution, spotting of errors in sentences, spelling error, Grammar – noun, pronoun, adjectives, verbs, prepositions, conjunctions, use of ‘a’ ‘an” and ‘the’, idioms and phrases.



**Computer Awareness:** Includes questions on Operating System, MS Office, MS Word, MS Excel, Power Point, Internet, E-mail, Antivirus and various online tools used in day- to-day office work.

**Administration & Financial Management:** Office Procedure & Office Management, FR & SR, Medical Attendance Rules, Travelling Allowances Rules, LTC Rules, Joining Time Rules, General Financial Rules- 2017, CCS (CCA) Rules, CCS (Conduct) Rules, Reservation Policy, CCS Pension Rules, New Pension Scheme, Disciplinary & Vigilance procedure, LTC Rules, TA/DA Rules and other Allowances, GPF Rules, Reservation & Concession in Services, Purchase procedure including purchase through GEM portal, Procurement of consultancy services and works, Financial Management and Auditing structure of Autonomous Bodies.

**Indian Polity & Constitution:** Features and general principles of the Constitution of India, Salient features of Indian judicial system, Conduct of Government Business with special emphasize to budget procedure, power of the Union and the States, center-state relations, Legislature at Union, State, and Local Levels, Quasi-Judicial , quasi-administrative and administrative bodies, Powers, functions and discretions, Delegated Legislation, Executive control, and supervision of autonomous bodies

**Governance & Decision Making:** Good Governance and welfare schemes of Government of India, Right to Information Act-2005, Digital Governance Initiatives of Government of India.

**POST: Senior Technician, Technician (based on specialisation):**

**Civil**

**Surveying:** Introduction, history & principles of chain survey, classification, accuracy, types of chains & tapes, direct & indirect ranging

**Compass Survey:** Instrument & its setting up, bearing & each included angle of close traverse, local attraction, magnetic declination & its true bearing, precaution in using prismatic compass

**Levelling:** Auto level, dumpy level, tilting level – introduction, definition; principle of levelling, levelling staffs, its graduation & types, temporary & permanent adjustment, procedure in setting up, level & horizontal surface, datum benchmark, focusing & parallax deduction of levels/ reduced levels, types of levelling, application of chain & levelling instrument to building construction, reciprocal levelling

**Contouring:** Definition, characteristics, direct & indirect methods, interpolation of contour, contour gradient, uses of contour plan & map, application of contouring for road project

**Theodolite Survey:** Introduction, types of theodolite, uses, methods of plotting, transit Vernier theodolite, terms of transit theodolite, fundamental line of theodolite, adjustment of theodolite

**Total Station:** Introduction, components, parts & accessories used

**GPS:** Introduction to GPS system, definition and application of remote sensing



**Water Supply:** Introduction, terms used in PHE, various types of water supply pipes & fittings, material specification, type of overhead & underground water tanks, tools & equipment used in water supply systems; basic concept, terminology & process used in water treatment plant

**Systems of Sanitation:** Systems of house drainage, plumbing, sanitary fittings etc; types of sewer appurtenance, systems of plumbing, type of sewage disposals, manholes, soak pit & septic tank; basic concept, terminology & process used in STP

## Electrical

**Engineering Mathematics:** Progressions – AP, GP, HP; binomial expansion, matrices, elementary operations of matrices, differentiation, integration, differential equations

**Engineering Physics:** Units & dimensions with dimensional analysis, Simple law of electrostatics & their use to find the E & potential

**Elements of Electrical Engineering:** Electrical & Magnetic circuits, EMF, Kirchoff's law and Faraday's laws, network theorems, AC circuit, RMS value; behavior of RIC elements; series & parallel circuits; series & parallel resonance circuits; transformers, introduction to single phase & three phase transformers; DC machines; Theory, construction & operation of three phase induction motors; power transmission & distribution, advantages of high voltages for transmission; comparison of 3 phase, single phase, 2 phase and three wire DC systems

**Elements of Electronics Engineering:** Measurements & instrumentations, errors, standards, accuracy, precision, resolution; ammeters, voltmeters, watt meters, energy meters, insulation tester, multimeter, CRO, measurement of V, I & F on CRO; low medium & high resistance measurement, AC bridges, transducers for measurement of temperature, displacement; communication systems, types of modulation, demodulation, analog electronics, semiconductor diode circuits, Zener diode & Zener diode circuits; LED, photo diode, BJT, FET and their configuration & characteristics; biasing, small signal & large signal amplifier, OP-AMPS, oscillators, regulated power supply

**Computer Literacy:** Computer organization, I/O devices, digital signature

## Mechanical

**Engineering Materials:** Crystallography; metals & alloys; heat treatment; plastics & advanced materials

**Engineering Mechanics:** Laws of forces, moment, friction, center of gravity and simple machines

**Fluid Mechanics:** Type & properties of fluids, pressure and its measurement, flow of fluids, flow through pipes





**Heat Transfer:** Modes of heat transfer, Fourier's law, steady state conduction, composite structures, natural and forced convection and thermal radiation

**IC Engines:** Working principle of 2 stroke & 4 stroke cycles, SI & CI engines, Otto cycle, Diesel cycle, Dual cycle, fuel supply & ignition systems in automobiles, cooling & lubrication of IC engines

**Machine Design:** Design definition, types of design, necessity of design, design terminology; stress, strain, factor of safety, stress concentration, fatigue, endurance limit, design failure, design of shaft, design of key, design of joins, design of flanged coupling, design of screwed joints

**Machining and Machine Tool Operations:** Cutting tools & cutting materials, Machining operations machines like lathe, boring, shaping, planning, broaching etc, jigs & fixtures, cutting fluids, pattern making, metal forming processes

**Mechanics of Materials:** Resilience, moment of inertia, bending moment & shearing forces, bending stresses, columns, torsion and springs

**Metrology and Inspection:** Linear and angular measurement, measurement of surface finish and measurements of screw threads

**Refrigeration and Air Conditioning:** Fundamentals of refrigeration, vapor compression system, refrigerants, vapor absorption system, refrigeration and air conditioning equipment

**Theory of Machines:** Simple mechanisms, friction, power transmission, flywheel, governor and balancing

**Thermodynamics:** Fundamental concepts, laws of perfect gases, laws of thermodynamics, ideal and real gases, properties of steam

**Turbo Machinery:** Introduction to turbomachines, classification, steam turbines and steam condensers, gas turbines and jet propulsion

**Vibrations:** Types – longitudinal, transverse and torsional vibrations, dampening of vibrations, causes of vibration in machines

**Computer Integrated Manufacturing:** Introduction to NC, CNC & DNC, construction and tooling, part programming, system devices

**Automobile Engineering:** Classification of automobiles, transmission system, steering system, braking systems, dynamo and alternator, exhaust emissions

**Metallurgy:** Ferrous Metallurgy, Principle of Extractive metallurgy, Sponge Iron & Ferro Alloys, Heat Transfer Fluid Flow & Furnace, Heat Treatment Technology, Foundry Technology, Non-Ferrous Metallurgy, Mechanical Metallurgy, Industrial Metallurgy



## Electronics

**Basic Concepts:** Concepts of resistance, inductance, capacitance and factors affecting them; Concepts of current, voltage, power, energy and their units; Kirchhoff's law, simple circuit solution using network theorems, concepts of flux, mmf, reluctance; magnetic calculations for conductors of different configurations eg. Straight, circular, solenoidal etc.; electromagnetic induction, self and mutual induction; instantaneous, peak, RMS and average values of alternating waves; representation of sinusoidal wave form, simple series and parallel AC circuits consisting of RL and C resonance; tank circuit, star & delta connections, 3 phase power, DC and sinusoidal response of R-L and R-C circuits

**Fundamentals of Electronics Engineering:** Semi conductor diode, PN junction, basic principles of operation & VI characteristics of PN junction diode, static & dynamic resistance of a diode, applications of diodes, use of diode in rectifiers, half wave, full wave and bridge rectifier with shunt capacitor filter, Zener diode and its applications, LED, transistor – introduction to transistor, working of PNP and NPN transistor, input & output characteristics, transistor configurations

**Digital Electronics:** Number systems, binary addition, subtraction, multiplication & division including binary points; Logic gates & families; Concept of negative & positive logic; definition, symbols and truth tables of gates; construction of NOT, AND & OR gates from NAND & NOR gates; logic simplification; postulates of Boolean algebra, De Morgan's theorems

**Power Electronics:** Thyristors & other power electronic devices, SCR – different methods of SCR triggering, different communication circuits for SCR; Construction & working principle of DIAC, TRIAC & their VI characteristics; controlled rectifiers

**Electrical Machines:** DC machine- construction, basic principles of DC motors & generators; 1 phase & 3 phase transformers – construction, principles of operation, equivalent circuit, tests, losses & efficiency; 3 phase induction motors- rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics

**Units and Measurement:** Classification, fundamental and derived units, systems of units – FPS, CGS, MKS, etc; unit of physical quantities, symbols, conversion factors, measurements of mechanical and electrical quantities

**Work, Power and Energy:** Definition, work and its units, measurement of work, concept of power and its units, calculations of power

**Measurement and Measuring Instruments:** Measurement of 1 phase & 3 phase power (active & reactive), energy, wattmeter method of 3 phase power measurement, measurement of frequency and phase angle; Ammeter and voltmeter (moving coil and moving iron types), extension of range of wattmeter; multimeters, megger, energy meter, AC bridge; use of CRO, signal generator; CT, PT and their uses

**Sensors and Industrial Instrumentation:** Resistive capacity, inductive, piezometric, half effect sensors and associated signal conditioning circuits, transducers for industrial instrumentation, displacement (linear and angular)



## Computer

**Computer Organization, Architecture & Hardware:** Binary representation, registers, instruction set, timing & control, CPU, instruction cycle, addressing modes, CISC, RISC, synchronization, interrupt & exception, privileged & non-privileged instruction, hierarchical memory organization, memory mapping, cache memory, coherence, consistency, virtual memory, interleaving, DMA, signed number, fixed & floating point numbers, control unit design, arithmetic & instruction pipelining, throughput, speedup, branch prediction, hazards; computer & networking hardware

**Programming, Data Structures, Algorithms, and Theory of Computation:** Programming in C/ Python, pointers, basic data structures, array, string, stack, queue, recursion, linear & non-linear data structures, searching and sorting algorithms, complexity and asymptotic analysis, Mealy and Moore machine, finite automata, determinism and non-determinism, regular expressions, minimization of deterministic finite automata PDA, regular grammar, CFG, Chomsky's hierarchy, closure properties, pumping lemma, Turing machine, halting problem

**Operating System and Database Systems:** Basics of popular OS (Linux & Windows), file and directory management, purpose of database systems, data models, ER model, introduction to UML, keys, integrity rules, Relational database design, normalization, null values, SQL queries, nested sub queries, joined relations, ACID properties, serializability and concurrency control, lock based concurrency control (2PL, deadlocks), time stamping methods

**Computer Networks and Web Technologies:** LAN, WAN, OSI reference model, TCP/IP model, sliding window protocol, channel allocation problem, Ethernet, Wireless LAN, Broadband wireless, routing algorithms, congestion control algorithms, IPv4 & IPv6, QoS, UDP, TCP, DNS, email, WWW- architectural overview, dynamic web document and http, FTP, SMTP, Telnet; Concept of Internet, applications of internet, search engines; firewalls, ACL, HTML, CSS, Java Script, Information security vulnerabilities, DoS/ DDoS attacks etc.

## Chemistry

**Basic Concepts:** Nature of matter, properties of matter and their measurement, uncertainty in measurement, laws of chemical combinations, Dalton's atomic theory, atomic & molecular masses, Mole concept & Molar masses, percentage composition, Stoichiometry and stoichiometric calculations

**Structure of Atom:** Discovery of sub-atomic particles, atomic models, developments leading to the Bohr's model of atom, Bohr's model for Hydrogen atom, towards quantum mechanical model of the atom, Quantum mechanical model of atom,

**Classification of Elements and Periodicity in Properties:** Need to classify elements, genesis of periodic classifications, modern periodic law and the present form of the periodic table, nomenclature of elements with atomic number  $> 100$ , electronic configurations of elements and the periodic table, s-,p-,d-,f- blocks, periodic trends in properties of elements

**Chemical Bonding and Molecular Structure:** Kossel-Lewis approach to chemical bonding,





ionic or electrovalent bonds, bond parameters, VSEPR theory, valence bond theory, hybridization, molecular orbital theory, bonding in some homonuclear diatomic molecules, hydrogen bonding

**Thermodynamics:** Thermodynamic terms, applications, measurement of  $\Delta U$  and  $\Delta H$ , calorimetry, enthalpy change,  $\Delta_r H$  of a reaction, reaction enthalpy, spontaneous Gibbs energy change and equilibrium

**Equilibrium:** Equilibrium in physical & chemical processes, dynamic equilibrium, law of chemical equilibrium and equilibrium constant, homogenous equilibria, heterogenous equilibria, applications of equilibrium constants, relationship between equilibrium constant  $K$ , reaction quotient  $Q$  and Gibbs energy  $G$ , factors affecting equilibria, ionic equilibrium in solution, acids, bases and salts; ionization of acids & bases; buffers solutions, solubility equilibria of sparingly soluble salts

**Redox Reactions:** Classical idea of redox reactions, redox reactions in terms of electron transfer reactions, oxidation number, redox reactions & electrode processes

**Organic Chemistry:** General introduction, tetravalence of Carbon, Organic compounds - shapes, structural representations, classification & nomenclature, isomerism, fundamental concepts in reaction mechanism, methods of purification compounds, qualitative & quantitative analysis

**Hydrocarbons:** Classification, alkanes, alkenes, alkynes, aromatic, carcinogenicity & toxicity

**Solutions:** Types, expressing concentration, solubility, vapor pressure of liquid solutions, ideal & non-ideal solutions, colligative properties & determination of Molar mass, abnormal Molar masses

**Electrochemistry:** Electrochemical cells, galvanic cells, Nernst equation, conductance of electrolytic solutions, electrolytic cells & electrolysis, batteries, fuel cells, corrosion

**Chemical Kinetics:** Rate of a chemical reaction, factors influencing rate of reaction, integrated rate equations, temperature dependence of rate of reaction, collision theory of chemical reactions

**The d- and f- block elements:** Position in periodic table, electronic configurations of the d-block elements, general properties of the transition elements (d-Block), some important compounds of transition elements, The Lanthanoids, The Actinoids

**Coordination Compounds:** Werner's theory of coordination compounds, definitions of terms, nomenclature, Isomerism, Bonding, importance & applications, Bonding in metal carbonyls

**Haloalkanes and Haloarenes:** Classification, nomenclature, nature of C-X bond, methods of preparation of Haloalkanes & Haloarenes, Physical properties, chemical reactions, Polyhalogen compounds

**Alcohols, Phenols and Ethers:** Classification, nomenclature, structures of functional groups, Alcohols & Phenols, Commercially important alcohols, Ethers



**Aldehydes, Ketones and Carboxylic Acids:** Nomenclature & structure of carbonyl group, preparation of Aldehydes & ketones - physical & chemical properties, chemical reactions, uses; Nomenclature & structure of carboxyl group, Carboxylic acids – methods of preparation, physical & chemical properties, uses

**Amines:** Nomenclature, structure & classification, physical properties, chemical reactions; Diazonium salts – method of preparation, physical properties, chemical reactions, importance in synthesis of aromatic compounds

**Biomolecules:** Carbohydrates, Proteins, Enzymes, Vitamins, Nucleic acids, hormones

### Chemical Engineering

Distance & displacement; scalar & vector quantities; speed & velocity; motion, mass & weight; momentum, impulse, laws of motion, conservation of momentum; work, power & energy; conservation of energy; laws of reflection & refraction; refraction through a glass slab & prism, Ohm's law, resistances in series & parallel, electric power

Atomic & molecular mass; Mole concept; Avogadro's number; Avogadro's law, ideal gas, gas laws, diffusion, isotopes & isobars, Bohr's theory, periodic classification of elements and gradation of properties; electrovalent, covalent & coordinate bonds; chemical kinetics, electrochemistry, surface chemistry, phase rule, distribution law, true solution, colloids & suspension, strong & weak electrolytes, acids bases & salts, pH of a solution, rate of reaction & factors affecting the rate of reaction, oxidation & reduction, IUPAC nomenclature, aliphatic compounds, aromatic compounds, carbohydrates & polymers.

Introduction & concept of mechanical operations, particulate solids, screen analysis, size reduction, sedimentation, filtration

General introduction & concept of safety, chemical & fire hazards and their control, other hazards & occupational diseases, personal protective devices, introduction to pollution, air pollution, water pollution, solid waste disposal

Steady state heat transfer by conduction, convection & radiation; heat exchangers, evaporation, diffusion, absorption, distillation, humidification & dehumidification, drying, leaching, extraction

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