सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत
SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT
સરદાર વલ્લભભાઇ રાષ્ટ્રીય પ્રૌધોગિકી સંસ્થા, સૂરત

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Recruitment of Non-Teaching Positions
Selection process for recruitment to the post of Technical Assistant
[Advt No. Estt./2022/Gr_B1/2003 dated 17.10.2022]

Following shall be the selection process, scheme of examination, written test, syllabus, manner for final selection of candidates to the post of Technical Assistant (7th CPC Pay Level 6) by direct recruitment:

Stage	Type of Examination	Time	Maximum Marks
Stage - 1	**Multiple Choice Based Screening Test(MCQ-I) (Paper-I)** For screening the candidates for Paper-II (Stage-2)	90 Minutes	150 Marks (75 questions)
Stage - 2	**Multiple Choice Based Main Test (MCQ-II)** (domain specific of the post) (Paper-II), **Final selection based on Marks secured in Paper-II (Stage-2)**	120 Minutes	200 Marks (Part A – 20 questions Part B-80 questions)

Note: -Question papers will be in the English language only. All questions of Paper I and Paper II will be Objective type. For every wrong answer, there will be negative marking @ 1/4th marks for each wrong answer. Compensatory time for Persons with Benchmark Disabilities (Divyangjan) will be provided as per the extant orders of Government of India.

A. Scheme of Examination

Paper-I: Multiple Choice Based Written Examination of 90-minutes duration (for screening the candidates for Paper-II Examination (Stage-2), Maximum marks 150). The examination for Paper-I (stage-1) shall be conducted first. Those candidates who will qualify in Paper-I shall only be eligible to appear for Paper-II (Stage-2). All the candidates are required to asses themselves before appearing in the written test about fulfilling eligibility for the post applied for. The eligibility and document verification of candidates will be assessed after evaluation of Paper–I examination. The shortlisting of candidates for stage-2 will be subject to limit of 10 times of the available advertised posts in the respective category. If the number of candidates qualifying in Paper-1 is more than 10 times, the shortlisting of candidates for Paper-2 (Stage-2) will be restricted to 10 times of the available advertised posts in the respective category. This number may increase in case of tie in the marks of paper-1 of the respective category and may decrease as per availability of candidates with qualifying marks in respective category. The Paper-II test (Stage-2) will be held after declaration of eligible shortlisted candidates after Paper-1 (Stage-1) examination. The indicative syllabus for paper-1 examination is as under:

(a) **General Knowledge & Awareness:** Includes questions relating to History, Indian Polity & Constitution, Art & Culture, Geography, Economics, General Policy, Science & Scientific Research, National/International Organizations /Institutions, current events, environment etc.

(b) **Quantitative Aptitude**- 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.

(c) **Reasoning Ability:** 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.

(d) **General English:** Includes questions on Antonyms, Synonyms, Spelling Check, Active/Passive Voice, Spotting Errors, Sentence Improvement, One Word Substitutes, Selecting Words, Sentence Corrections, Idioms and Phrases, Common Error Detection, Ordering of Words, Verbal Analogies, Sentence Formation, Completing Statements, Change of Speech.

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

(f) **General Science:** The syllabus under this shall cover Physics, Chemistry and Life Sciences of 10th standard level.

B. **Paper-II: Multiple Choice Based Main Test (MCQ-II) (200 Marks – 120 Minutes duration, Final selection based on Marks secured in Paper-II (Stage-2)).** The minimum qualifying marks for Paper-II shall be 40% for UR & EWS, 36% for OBC, 32% for SC & ST, 28% for PwBD. Relaxed qualifying marks shall be applicable only for reserved category posts of respective category. The examination for paper-2 shall be held after declaration of result of Paper-I (Stage-1). Paper-II shall have two parts, i.e. Part A and Part B as detailed below:

INDICATIVE SYLLABUS (PAPER-II)

Part-A (20 questions)

Mathematics
- Number system, BODMAS, Decimals,
- Fractions, LCM, HCF, Ratio and Proportion,
- Percentages, Mensuration, Time and Work; Time and Distance,
- Simple and Compound Interest, Profit and Loss,
- Algebra, Geometry and Trigonometry, Elementary Statistics,
- Square Root, Age Calculations, Calendar & Clock etc.

General Intelligence and Reasoning
- Analogies, Alphabetical and Number Series,
- Coding and Decoding, Mathematical operations,
- Relationships, Syllogism, Jumbling,
- Venn Diagram, Data Interpretation and Sufficiency,
- Conclusions and decision making,
- Similarities and differences, Analytical reasoning,
- Classification, Directions, Statement – Arguments and Assumptions etc.

Basic Science and Engineering
- Engineering Drawing (Projections, Views, Drawing Instruments, Lines, Geometric figures, Symbolic Representation),
- Units, Measurements, Mass Weight and Density, Work Power and Energy, Speed and Velocity, Heat and Temperature,
- Basic Electricity, Levers and Simple Machines, Occupational Safety and Health, Environment Education, IT Literacy etc.

General Awareness on Current Affairs
- Science & Technology, Sports, Culture, Personalities, Economics, Politics and any other subjects of importance

PART-B (80 questions)

Engineering Discipline	Objective questions on relevant trade for PART B of Paper-II
Civil Engineering and combination of various streams of Civil Engineering	• **Engineering Mechanics**: The mechanical properties of engineering materials - elastic constants - Types of forces on structural members, different types of stresses and strains - the deformation of elastic bodies under simple stresses, the use and principles of composite sections; The effects of transverse forces such as shear force and bending moment in beams; determination of SF and BM in simple beams under different loading systems; Geometrical properties such as centroid and moment of inertia of sections. Determination of different types of stresses induced in beams. • **Construction Materials and Construction Practice**: Different construction materials and their properties - different types of cement - grades of cements - tests on cement and other construction materials. Types of modern building materials such as ceramic products – glass - metals and plastics. Preparation of mortar and cement concrete. Types of foundations. Classification of stone masonry - brick masonry. Types of doors – windows - lintels - stairs. Types of floors - roofs. Different methods of pointing, plastering and termite proofing. Scaffolding - shoring - underpinning - form work. Procedure of colour washing - white washing - painting - varnishing. • **Soil Mechanics and Foundation Engineering**: Development of Soil Mechanics - Soil formation - three Phase System - Index and Engineering properties. Permeability - Darcy's law. Shear strength of soil - Mohr's stress circle - Mohr-Coulomb failure theory - Shear strength test - Unconfined compression test - Optimum moisture content - Proctor's Compaction test. Soil exploration - Direct, Semi-direct and Indirect methods - Spacing and depth of test borings - Sub-Soil Sampling - Disturbed and Undisturbed samples - Seepage analysis - Head, Gradient and Potential - Hydraulic gradient - Seepage pressure. Methods of determining bearing capacity - Types of failure in soil; Rankine's analysis - Terzaghi's analysis - Effect of water table. Settlement of foundation - Plate load test. • **Surveying:** Types of Theodolites - Transit and non-transit Theodolite, Vernier and Micrometer Theodolites, Measurement of vertical angle and deflection angle – Bearing of a line – Theodolite traversing. Stadia and Tangential tacheometry –Fixed hair method of tacheometry – Measurement of distance and elevation. • **Transportation Engineering:** Development of Roads in India - Modes of transportation - Nagpur Plan, Classifications of Highways, Types of Pavement - Flexible and Rigid Pavements - Parking - Methods of parking - Road junctions (Grade intersections and Grade separators) - Traffic signals - Types of road signs. Classifications of roads - Earthen road, Gravel road, Water Bound Macadam roads, Types of Bituminous roads - Surface dressing, Methods of construction of cement concrete roads, Rail Gauges, Requirements of an ideal rail, Types of sleepers, Rail joints, Junction and Terminal stations, Methods of interlocking - Tappets and locks system. • **Fluid Mechanics/Hydraulics Engineering**: Pressure of liquid at a point - Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure – Measurement of pressure - Simple mercury barometer - Pressure measuring devices and problems - Piezometer tube - Simple U-tube manometer - Differential manometer – Micrometer. Hydrostatic pressure - Pressure on plane surfaces - Horizontal, vertical and inclined Surfaces-Total Pressure-Centre of pressure - Depth of centre of pressure. Various types of flows including Laminar and turbulent flow -

	Steady and unsteady flow – Uniform and Non-uniform flow - Bernoulli's theorem –Venturimeter – Orificemeter. Large orifice – Discharge formula –Types of mouthpieces - Losses of head in pipes - Types of notches and problems –Classification of weirs - Discharge over a rectangular weir and trapezoidal weir, End contractions of a weir. Rectangular and Trapezoidal channels – Discharge – Chezy's formula, Bazin's formula and Manning's formula - Methods of measurement of velocity. Flow through pipes. • **Environmental Engineering**: Water supply - Public water supply system and demand - types of demand - per capita demand - prediction of population. Intakes - types of intakes-description of intakes-infiltration galleries and infiltration wells in river beds - necessity of pumps - types of pumps - pipes for conveyance of water. Water treatment - sedimentation – types of sedimentation - coagulation - coagulants and their choice - types of sedimentation tanks – filtration - R.O process. Distribution system - gravity, pumping and combined system. Sanitary Engineering - estimation of storm water – minimum size and shape of sewer - materials used for sewer - joints - laying and testing - manhole - lamp hole - catch basin - street inlet - grease and oil trap -flushing tanks – drainage arrangements in buildings - sanitary fittings - sewage pumps. Sewage treatment - primary and secondary treatments - screens - skimming tanks - grit chambers - sedimentation tanks – filters - types and description of filters - activated sludge process - septic tanks - construction and working of septic tanks. methods of solid waste disposal - incineration, dumping, sanitary landfill, composting - energy from waste.
Mechanical Engineering and combination of various streams of Mechanical Engineering	• **Automobile Engineering:** Automobile and its development, Classification of automobiles, Transmission System, Steering System, Braking System, Dynamo and Alternator and Exhaust Emissions • **Computer Integrated Manufacturing:** Introduction to NC, CNC & DNC, Construction and Tooling, Part Programming, System Devices, Problems in CNC Machines, Automation and NC system • **Engineering Materials:** Scope of Material Science, Crystallography, Metals and Alloys, Heat Treatment, Plastics and Advanced Materials • **Engineering Mechanics:** Laws of Forces, Moment, Friction, Centre of Gravity and Simple Machines • **Fluid Mechanics:** Type and Properties of Fluids, Pressure and its Measurement, Flow of Fluids and Flow through Pipes • **Heat-Transfer:** Modes of Heat Transfer, Fourier's Law, Steady State Conduction, Composite Structures, Natural and Forced Convection and Thermal Radiation • **I.C. Engines:** Working principle of two stroke and four stroke cycle, SI engines and CI Engines, Otto cycle, Diesel cycle, Dual cycle, Fuel Supply and Ignition System in Petrol Engine, Fuel System of Diesel Engine, Cooling and Lubrication and Testing of IC Engines • **Machine Design**: Design-Definition, Types of design, necessity of design, Design terminology: stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit, Design Failure, Design of Shaft, Design of Key, Design of Joints, Design of Flange Coupling and Design of Screwed Joints • **Machining and Machine Tool Operations:** Cutting Tools and Cutting Materials, Lathe, Drilling, Boring, Shaping and Planning, Broaching, Jigs and Fixtures and Cutting Fluids and Lubricants, Welding, Pattern Making, Metal Forming Processes

	• **Mechanics of Materials:** Stresses and Strains, Resilience, Moment of Inertia, Bending Moment and Shearing Force, Bending Stresses, Columns, Torsion and Springs
	• **Metrology and Inspection:** Linear and Angular Measurement, Measurement of Surface Finish and Measurements of Screw threads and Gauges
	• **Refrigeration and air-conditioning:** Fundamentals of Refrigeration, Vapour Compression System, Refrigerants, Air Refrigeration System, Vapour Absorption System and Refrigeration Equipment
	• **Theory of Machines:** Simple Mechanisms, Friction, Power Transmission, Flywheel, Governor and Balancing
	• **Thermodynamics:** Fundamental Concepts, Laws of Perfect Gases, Thermodynamic Processes on Gases, Laws of Thermodynamics, Ideal and Real Gases and Properties of Steam
	• **Turbo-machinery:** Introduction to Turbomachines, Classification of Turbomachines, Steam Turbines and Steam Condensers, Gas Turbines and Jet Propulsion
	• **Vibrations:** Types-Longitudinal, Transverse and Torsional vibrations, Dampening of Vibrations, Causes of vibrations in Machines, their Harmful Effects and Remedies
Electronics, Electrical, Instrumentation Engineering (Choose any one of the engineering disciplines, i.e. Electronics Engineering or Electrical Engineering or Instrumentation Engineering)	**(i) Electronics Engineering:** • **Fundamentals of Electronics Engineering:** Classification of materials, Semiconductor Materials Active and Passive Components, Voltage and current sources, Semiconductor Diode, PN junction, basic principles of operation and VI characteristics of PN junction diode, static and dynamic resistance of a diode. Applications of Diode Use of a diode in rectifiers, half wave, full wave and bridge rectifier with shunt capacitor filter, series inductor filter, zener diode and its applications, as a voltage regulator, light emitting diode (LED), liquid crystal display (LCD). Transistor: Introduction to a transistor, working of a PNP and NPN transistor, input and output characteristics, transistor configurations. Biasing and Configuration of Transistor: Biasing of a transistor, amplifying action of a transistor, comparison of different configurations. Field effect transistor FET, JFET, MOSFET, their characteristics and applications, unijunction transistor (UJT). • **Analog Communication:** Communication, information, Message and Signals, Electromagnetic Spectrum, Classification of signal, Periodic and non-periodic signals Analog and digital signals, Deterministic and random signals, the elements of a communication system, Modulation, Definition, Types of modulation, Need for modulation. Amplitude Modulation, Generation of Amplitude Modulation, Generation of AM waves, DSB SC, SSB-SC, ISB and VSB modulation, DSBSC, SSB-SC, ISB and VSB modulation, their comparison and areas of applications, Generation of DSB and SSB signals., Frequency modulation, Comparison between types of Modulation Comparison between AM, FM and PM. • **Digital Electronics** 1. Number System. 2. Binary addition, subtraction, multiplication and division including binary points 3. Codes and Parity a) Concept of code, weighted and non-weighted codes, examples of BCD, excess-3 and Gray code. b) Concept of parity, single and double parity and error detection and correction (Hamming code) c) Alpha numeric codes: ASCII, EBCDIC and Unicode. 4. Logic Gates and Families a) Concept of negative and positive logic b) Definition, symbols and truth tables of gates. Construction of NOT, AND and OR gates from NAND and NOR gates (universal gates). (c) Introduction to TTL and CMOS logic families and their sub classification 5. Logic Simplification a) Postulates of Boolean algebra, DeMorgan's Theorems. Various identities. Formulation of truth table and

Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits 6. Arithmetic circuits 7. Decoders, Multiplexers and De-Multiplexers 8. Latches and flip flops

- **Electronic Devices and Circuits** 1. Multistage Amplifiers - Need for multistage amplifier - Gain of multistage amplifier - Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth 2. Large Signal Amplifier - Difference between voltage and power amplifiers - Importance of impedance matching in amplifiers - Class A, Class B, Class AB, and Class C amplifiers 3. Feedback in Amplifiers 4. Sinusoidal Oscillators 5. Tuned Voltage Amplifiers 6. Wave Shaping Circuits - 7. Multivibrator Circuits - IC555 as monostable and astable multi-vibrator 8. Operational Amplifiers

- **Network Filters and Transmission Lines Networks** - Two port (four terminals) network: Basic concepts of the following terms: - Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, Л network, Ladder network; Lattice network; L-network and Bridge T-network - Symmetrical Network: - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss. - T-network and Л Network - Asymmetrical Network - The half section; symmetrical T and Л sections into half sections (No Derivation) 2. Attenuators - Units of attenuation: General characteristics of attenuators - Analysis and design of simple attenuator of following types; Symmetrical T and Л type, L type. 3. Filters

- **Communication Systems** 1. AM/FM Transmitters Classification of transmitters on the basis of modulation, service, frequency and power - Block diagram of AM transmitters and working of each stage - Block diagram and working principles of reactance FET and armstrong FM transmitters 2. AM/FM Radio Receivers 3. Antennas: 4. Propagation5. Satellite Communications:

- **Power Electronics** 1. Introduction to thyristors and other Power Electronics Devices SCR - Different methods of SCR triggering. - Different commutation circuits for SCR. - Construction & working principle of DIAC, TRIAC & their V-I characteristics 2. Controlled Rectifiers 3. Inverters, Choppers, Dual Converters and Cyclo converters. Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers. - 4. Thyristorised Control of Electric drives

- **Microprocessors** 1. Evolution of Microprocessor 2. Architecture of a Microprocessor (With reference to 8085 microprocessor) Concept of Bus, bus organization of 8085 - 3. Memories and I/O interfacing (8 hrs) - Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM - Memory organization, Concept of memory mapping, partitioning of total memory space, Address decoding, concept of I/O, mapped I/O and memory mapped I/O, interfacing of memory mapped I/O devices - Concept of stack and its function 4. Programming (with respect to 8085 microprocessor) 5. Instruction Timing and Cycles 6. Interrupts

- **Optical Fiber Communication** 1. Introduction Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication Electromagnetic spectrum used, Advantages and disadvantages of optical communication. Principle of light penetration, reflection, critical angle. 2. Optical Fibers and Cables Constructional details of various optical fibers, multimode and monomode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables. Optical Fibers cable connectors and splicing techniques (Mechanical, fusion) 3. Losses in Optical Fiber Cable: a)

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Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses. b) Dispersion: Types and its effect on data rate. c) Testing of losses using OTDR (Optical Time Domain Reflectometer). 4. Optical Sources Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

- **Digital Communication** 1. Introduction: Basic block diagram of digital and data communication systems. Their comparison with analog communication systems. 2. Coding, 7 bit ASCII, ARQ, EBCDIC b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy check (CRC), Hamming code 3. Digital Modulation Techniques 4. Characteristics/working of data transmission circuits; 5. Modems

- **VLSI System Design:** 1. Overview of VLSI: Introduction to Computer-aided design tools for digital systems. Hardware-description languages, Introduction to VHDL, Introduction to behavioural, dataflow and structural models. 2. VHDL Statements: 3. Combinational Circuit Design: VHDL models and simulation of combinational circuits 4. Sequential Circuit Design: 5. Introduction to CPLDs and FPGAs

(ii) Electrical Engineering:

- **Computer awareness:** Basic knowledge of Computer Applications, viz; MS Word, MS Excel, Power Point etc. Internet, MS-DOS, Computer Generation & Development, UNIX, Windows, Lotus, SmartSuite, Data Entry, Softwares knowledge, Networking Platforms, applications of computers in electrical engineering

- **Basic concepts:** Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

- **Circuit law:** Kirchhoff 's law, Simple Circuit solution using network theorems.

- **Magnetic Circuit:** Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

- **AC Fundamentals:** Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-L and R-C circuit.

- **Measurement and measuring instruments:** Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

- **Electrical Machines:** (a): D.C. Machine – Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines. (b): 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase /3 phase transformers. Auto

transformers. (c): 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics, Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications

- **Synchronous Machines**: Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors

- **Generation, Transmission and Distribution:** Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears and Protection: Rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution

- **Estimation and costing:** Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules. Utilization of Electrical Energy: Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

- **Basic Electronics:** Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices

(iii) Instrumentation Engineering:
- **Computer awareness:** Basic knowledge of Computer Applications, viz; MS Word, MS Excel, Power Point etc. Internet, MS-DOS, Computer Generation & Development, UNIX, Windows, Lotus, SmartSuite, Data Entry, Softwares knowledge, Networking Platforms, applications of computers in Instrumentation/Electrical engineering

- **Unit and Measurement:** Definition, Classification, Fundamental and derived units, systems of units: FPS, CGS, MKS, Unit of physical quantities, symbols, Conversion factors, Measurements of mechanical quantities, electrical quantities.

- **Mass Weight and Density:** Definition, Comparison between mass and weight, Comparison between density and relative density/specific gravity, Volume of different geometries (Cube, Cylinder, Cone Sphere etc.), Related Problems

- **Work Power and Energy:** Definition, Work and its units, Measurements of Work, Work done on bodies moving on horizontal and inclined planes (Consider frictional forces also) Concept of Power and its units, Calculations of Power (Simple cases), Concept of Kinetic energy and potential energy, Expressions for P.E and K.E, Principle of Conversion of Energy.

- **Speed and Velocity:** Definition of speed, velocity, and their comparison, Scalar and Vector quantity, Average Velocity, Acceleration and Retardation, Equations of Motion, Circular Motion: Relation between circular and linear motion.

- **Heat and Temperature:** Definition, Specific heat and thermal capacity, Types of heat: Sensible Heat, Latent Heat, Difference between heat and temperature, Different temperature scales and conversions, Temperature measuring instruments: RTD, Thermistors, Thermometer, Pyrometer, and Thermocouple.

	• **Basic Electrical and Instrumentation**: DC and AC currents/Voltage, Resistance and their combinational circuit, Color coding of Resistance, Wiring Diagram of domestic and electric circuit, self-inductance (L), Mutual inductance (M), Inductors, Types of capacitor, charge, and energy stored in capacitors, Electrical Terms and Units, Ohm's Law, Kirchhoff's law, relationships between Current, volt, resistance, and Power, resistance connections, Series and Parallel connections, Insulators, Properties and Classifications, Conductors: Properties and Classifications, Semiconductors: properties and classifications, Electrical Power, Introduction of AC and DC generators, Faraday's Law, Lenz's Law, Fleming's left Hand and right hand rules, basic sensors and transducers, Troubleshooting and installation. • **Basic Electronics:** Semiconductors, Diode, PN and NP diode, Zener diode, Voltage regulators, BJT, Logic Gate, Analog and digital multimeter, CRO. • **Occupational Safety and Health:** Safety and Health, Introduction and importance of occupational safety and Health, Occupational Hazards: Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards, Occupational Health, Accident and Safety; First Aid: Care of injured and Sick at the work places, Basic provision: Idea of basic provision of safety, health, welfare under legislation of India. • **Environment Education:** Ecosystem: Introduction to Environment, Ecosystem and factors causing imbalance, Pollution and Pollutants including Liquid gaseous and hazardous waste, Energy Conservation: Conservation of Energy, Re-use and re-cycle, Global Warming: Climate change and Ozone layer depletion, ground water, Hydrological cycle, ground and surface water, conservation and harvesting of water, Environment: Right attitude towards environment, Maintenance of in-house environment. • **Sensors and Industrial Instrumentation :** Resistive Capacity , Inductive, piezometric, Half effect sensors and associated signal conditioning circuits, Transducers for industrial instrumentation, Displacement (Linear and Angular), Velocity, Acceleration, fane, torques, Vibration, Shock, Pressure, Flow (Variable Band, Variable area, Electromagnetic, Ultrasonic, Turbine and Open channel flow meters), Temperature (thermocouple, bolometer, RTD (3/4 Wire), Thermistor, Pyrometer & Semiconductor), Liquid level, pH, Conductivity and Viscosity Measurement, 4-20 mA two wire transmitter.
Chemical Engineering/ Chemistry (Choose any one of the engineering disciplines, i.e. Chemical Engineering or Chemistry)	**i. Chemical Engineering:** • Chemical Kinetics, Colloids, Electrochemistry, Surface Chemistry, Phase Rule, Distribution Law. Inorganic: Basic Concept, Atomic structure, Modern periodic table, Chemical Bonding, Chemical equilibrium, Ionic equilibrium, Solutions, Water and its treatment. Organic: Purification of organic compounds, Detection and estimation, IUPAC Nomenclature, Stereo-chemistry, Aliphatic compounds, Aromatic compound, Orientation, Carbohydrates and Polymers. • **Engineering measurements:** Introduction to Physical Quantities and Units, Linear Measurements, Precision Measurements, Measurement of Area, Measurement of Electrical Energy, Measurement of frictional coefficient, Measurement of volumetric flow rate & Mass flow rate, Measurement of pH, Measurement of hardness of water, Measurement of Specific Gravity, Measurement of Viscosity. • **Elements of Mechanical and Electrical Engineering:** Power transmission & Safety, Boilers, Prime movers, Welding, Material Handling, Fundamentals of Electrical engineering, A.C. and D.C. Circuits, Electrical Machines, Electrical Appliances.

	• **Engineering Materials:** Introduction & properties of material, Corrosion, Metals, Ceramic materials, Inorganic and other materials, Coatings and Materials for special application. • **Mechanical Operation:** Introduction and concepts of Mechanical Operations, particulate solids, Screen Analysis, Size Reduction, Sedimentation, Filtration, Agitation and Mixing. • **Chemical Process Industries:** Chlor-Alkali Industry, Cement Industries, Fertilizers, Marine chemicals, Oil & Fats Industries, Carbohydrate and polymer Industries, Pulp and Paper Industries, Pharmaceuticals, Pesticides, Dyes & Intermediates, Electrochemical Industries, petroleum refining and petrochemical technology, Fuels. • **Industrial Safety and Environmental Engineering:** General Introduction & Concept of Safety, Chemical & Fire Hazards & their Control, Other hazards & occupational diseases, Personal Protective Devices, Introduction to pollution, Air Pollution, Water pollution, Solid waste of disposal ii.**Chemistry:** • **Basic Concepts of Chemistry:** Importance and scope of chemistry. Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry. • **Environmental Chemistry:** Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants, acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming- pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategies for control of environmental pollution. • **Surface Chemistry:** Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, catalysis, homogenous and heterogeneous activity and selectivity; enzyme catalysis colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic multi-molecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation, emulsion - types of emulsions. • **Polymers:** Copolymerization, some important polymers: natural and synthetic like polythene, nylon polyesters, bakelite, rubber. Biodegradable and non-biodegradable polymers. • **Chemistry in Everyday life:** Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines. Chemicals in food-preservatives, artificial sweetening agents, elementary idea of antioxidants. Cleansing agents- soaps and detergents, cleansing action.
Computer Science and Engineering	• **Hardware:** Hardware Devices and Troubleshooting • Components, tools and safety measures • Assembling a PC • Firmware upgrade, Dual BIOS & BIOS settings • Diagnose & Resolve issues related to a PC • Laptop features, Components, tools and safety measures • Diagnose & Resolve issues related to a Laptop • Upgrading a PC or Laptop • Smartphone features and Tools & Safety • Types of printers • Installing and testing a printer • Printer Maintenance • Scanner Installation • Webcam Installation. • **Programming and Data Structure:** C Language • Object oriented Programming •functions • data type • Recursion •Arrays •Stacks • Queues • Binary Search Trees • Sorting.

• **Web Designing:** HTML and CSS • SQL • JavaScript • **Operating system:** Application & Troubleshooting • Different OS and Compatibility • Windows and Linux installation • Upgrading OS • Software Installation • Working on MS Word, Excel & PowerPoint • MS Office troubleshooting • Different Browser setup • Backup, format & restore OS. • **Networking and Security:** Basics of computer network • OSI Model • Transmission Media • Networking devices Network Topology • LAN Basics • IP Addressing • TCP/IP • Ethernet Advanced • Structured Cabling • Wireless Networking• Connecting a PC/Laptop to Internet • Installing a printer and sharing it in network • Joining a workgroup/domain • File sharing and troubleshooting • Remote Access • Basics of Wi-Fi •Internet security

C. Manner for drawing final merit list for selection:

(i) The written examination for Paper-I (stage-1) shall be conducted first. Those candidates who will qualify in Paper-I shall only be eligible to appear for Paper-II Examination (Stage-2). The venue & date of examination will be communicated in due course of time.

(ii) The final merit list shall be drawn on the basis of scores of Paper II only.

(iii) In case of tie/bunching/bracketing of candidates in the final results, the following criteria shall be adopted in the following sequential order for deciding Merit list:

(a) The candidate with higher marks in Paper-II shall be placed higher on the merit list or
(b) If (a) above is same, the candidate with less number of negative answers in Paper-II, shall be placed higher on the merit list, or
(c) If (a) & (b) above is same, the candidate with higher marks in Part B of Paper-II shall be placed higher on the merit list, or
(d) If (a), (b) & (c) above is same, the candidate senior in age shall be placed higher on the merit list, or
(e) In case option at (a), (b), (c) & (d) are exhausted, it will be decided through draw.

Note:
- **Any guidelines/instructions received from Ministry of Education, Government of India till the date of completion of Selection process will be made applicable.**
- **The Date, Time, Venue of examination will be communicated in due course of time. The candidates are requested to regularly check the institute website for all updates.**

This is issued with the approval of the Competent Authority.

-sd/-
REGISTRAR