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NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL

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Indicative Syllabus for Stage-II (Advanced) and Stage-III (Trade/Skill Test) for Technical Posts

Post	Vacancy Break-up	Indicative Syllabus for Stage-II (Advanced Test)	Indicative Syllabus for Stage-III (Trade/Skill Test)
CIVIL ENGINEERING			
Technical Assistant	1 UR, 1 OBC	• Surveying: chain & compass survey, levelling, theodolite, total station, contouring • Building materials & testing: Bricks, cement, aggregates, steel, concrete mix design • Strength of Materials & structural analysis: stress-strain, SFD/BMD, beams, columns, trusses • RCC design basics: limit state method, reinforcement detailing • Fluid mechanics & hydraulics; hydrology & water resources • Water supply, sanitary & environmental engineering • Geotechnical engineering: soil classification, Index & Engineering properties, types of foundations • Estimation & costing, specifications & contracts • Transportation/highway engineering: Highway network Planning, alignment and geometric design • Basics of engineering drawing & CAD	Skill test will be conducted based on the syllabus of Advanced Tests in different laboratories of the department
Technician	1 UR	• Building materials & construction practices: bricks, cement, concrete, timber • Basic surveying & use of instruments: chain, tape, dumpy/auto level • Reading & interpreting civil engineering drawings and site plans • Estimation of quantities: basic bar-bending schedule • Concrete mix proportioning (nominal mixes), formwork & scaffolding • Basic soil types & shallow foundation types • Water supply, sanitary & environmental engineering • Safety practices at construction sites	Skill test will be conducted based on the syllabus of Advanced Tests in different laboratories of the department

COMPUTER SCIENCE & ENGINEERING			
Technical Assistant	1 UR	• Programming in C/C++: data types, control structures, functions, arrays, structure, pointers, Object-oriented programming concepts (classes, objects, inheritance, polymorphism) • Data Structures & Algorithms Basics • Database Management Systems: ER model, normalization, SQL, transaction management, Database Recovery and Security, PostgreSQL, MySQL • Java Web Development Technologies, Java Frameworks for Web Development, Python Web Development Frameworks • HTTP (Hypertext Transfer Protocol) and HTTPS (Hypertext Transfer Protocol Secure) protocols, Webservers • Operating Systems: process, memory & file management; Windows/Linux OS • Cloud configuration and maintenance • Computer Networks: OSI/TCP-IP model, routing, switching, network devices, socket programming • Cybersecurity basics: Cryptography fundamentals, network security • Data Security Standards, ISO/IEC 27001, Data privacy techniques • MS Office (Word, Excel, PowerPoint), Computer hardware & software fundamentals	• Computer hardware assembly/disassembly & component identification • OS (Windows and Linux) installation or basic troubleshooting task, Linux commands • MS Office practical task (document formatting / spreadsheet formula task) • Basic networking cable & connector identification, Installation and maintenance of LAN, Wi-Fi, Internet connectivity, Network printers, projectors • Development and implementation of smart mobile applications • Server administration, creation and maintenance user accounts/logins in computer laboratories, User authentication techniques, Cloud configuration • Monitor systems for security threats and respond to incidents • Perform regular backups of critical data and perform disaster recovery • Development of Web pages, Java Frameworks for Web Development (Spring), Python Web Development Frameworks, Webservers • Install, update, and license and open source software applications, Git and GitHub
Senior Technician	1 UR, 1 SC*(Backlog)	• Programming in C/C++: data types, control structures, functions, arrays, structure, pointers, Object-oriented programming concepts (classes, objects, inheritance, polymorphism) • Data Structures & Algorithms Basics • Database Management Systems: ER model, normalization, SQL, transaction management, Database Recovery and Security, PostgreSQL, MySQL	• Computer hardware assembly/disassembly & component identification • OS (Windows and Linux) installation or basic troubleshooting task, Linux commands • MS Office practical task (document formatting / spreadsheet formula task) • Basic networking cable & connector identification, Installation and maintenance of

		• HTTP (Hypertext Transfer Protocol) and HTTPS (Hypertext Transfer Protocol Secure) protocols, Webservers, Web development technologies • Operating Systems: process, memory & file management; Windows/Linux OS • Server configuration and maintenance • Computer Networks: OSI/TCP-IP model, routing, switching, configuration of network devices • Cybersecurity basics: Cryptography fundamentals, network security • Data Security Standards, ISO/IEC 27001, Data privacy techniques • MS Office (Word, Excel, PowerPoint), Computer hardware & software fundamentals	LAN, Wi-Fi, Internet connectivity, Network printer, projectors • Server configuration, creation and maintenance user accounts/logins in computer laboratories, User authentication techniques • Monitor systems for security threats and respond to incidents • Perform regular backups of critical data and perform disaster recovery • Development of Web pages • Install, update, and license and open source software applications, Git and GitHub
Technician	1 UR, 1 ST	• Programming in C/C++: data types, control structures, functions, arrays, structure, pointers, Object-oriented programming concepts (classes, objects, inheritance, polymorphism) • Data Structures & Algorithms Basics • Database Management Systems: ER model, normalization, SQL, transaction management, Database Recovery and Security, PostgreSQL, MySQL • HTTP (Hypertext Transfer Protocol) and HTTPS (Hypertext Transfer Protocol Secure) protocols, Webservers, Web development technologies • Operating Systems: process, memory & file management; Windows/Linux OS • Server configuration and maintenance • Computer Networks: OSI/TCP-IP model, routing, switching, configuration of network devices • Cybersecurity basics: Cryptography fundamentals, network security • Data Security Standards, ISO/IEC 27001, Data privacy techniques • MS Office (Word, Excel, PowerPoint), Computer hardware & software fundamentals	• Computer hardware assembly/disassembly & component identification • OS (Windows and Linux) installation or basic troubleshooting task, Linux commands • MS Office practical task (document formatting / spreadsheet formula task) • Basic networking cable & connector identification, Installation and maintenance of LAN, Wi-Fi, Internet connectivity, Network printer, projectors • Server configuration, creation and maintenance user accounts/logins in computer laboratories, User authentication techniques • Monitor systems for security threats and respond to incidents • Perform regular backups of critical data and perform disaster recovery • Development of Web pages • Install, update, and license and open source software applications, Git and GitHub

ELECTRICAL ENGINEERING			
Technical Assistant	1 UR	• Network solution methods: KCL, KVL, Node and Mesh analysis. Network Theorems: Thevenin's, Superposition and Maximum Power Transfer theorem. • Single-phase transformer: equivalent circuit, open circuit and short circuit tests, regulation and efficiency, Auto-transformer. Three-phase transformer -types, connections. • DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of DC motors. • Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control. • Alternators: types, regulations, EMF and ZPF methods, synchronization methods-lamp methods and synchroscope method. • Power semiconductor devices: Power Diode, SCR, TRIAC, Power MOSFET and Power IGBT- V-I characteristics and applications • Power Converters: Types of power converters-Single phase fully controlled rectifier with R and RL load- Buck, Boost and Buck-Boost DC-DC Converters- Single phase full-bridge inverter, TRIAC based AC-AC voltage controller.	The Skill Test shall be conducted based on the syllabus notified for Advanced Test
Technician	1 UR, 1 SC*(Backlog), 1 ST	• Selection of R, L, C components, meter ratings, fuse rating and various electrical apparatus. • Basic electrical concepts: Ohm's law, Kirchhoff's laws, series/parallel circuits. • Wiring connection of Starters (3-point, 4-point, DOL, Star-Delta), Motors & transformers and Basic maintenance. • Speed Control of Machines – Forward and Reverse Motoring • Single-phase transformer: equivalent circuit, open circuit and short circuit tests, regulation and efficiency	The Skill Test shall be conducted based on the syllabus notified for Advanced Test

		• Distribution boards, switches, MCBs, earthing, and House wiring practices • Single-phase and three-phase system. • Power factor and its improvement. • Basic electronics: Power Diode, SCR, TRIAC, Power MOSFET and Power IGBT. • Electrical Measurements- Digital meters, Clamp meter, Megger, Watt meter, Energy meter, CRO, etc. • Fault-finding & repair of common electrical equipment.	
PHYSICS			
Technical Assistant	1 UR, 1 SC*(Backlog)	Electromagnetic Theory Solutions of electrostatic and magneto static problems including boundary value problems; method of images; separation of variables; dielectrics and conductors; magnetic materials; multipole expansion; Maxwell's equations; scalar and vector potentials; Coulomb and Lorentz gauges; electromagnetic waves in free space, non-conducting and conducting media; reflection and transmission at normal and oblique incidences; polarization of electromagnetic waves; Pointing vector. Quantum Mechanics Postulates of quantum mechanics; uncertainty principle; Schrodinger equation; one dimensional potentials: step potential, finite rectangular well, tunnelling from a potential barrier, particle in a box, harmonic oscillator; two and three dimensional systems: concept of degeneracy; hydrogen atom; Thermodynamics and Statistical Physics Laws of thermodynamics; macrostates and microstates; phase space; ensembles; partition function, free energy, calculation of thermodynamic quantities; classical and quantum statistics; degenerate Fermi gas; black body radiation and Planck's distribution law; Bose- Einstein condensation; first and second order phase transitions, phase equilibria, critical point. Atomic and Molecular Physics Spectra of one-and many-electron atoms; spin-orbit interaction: LS and jj couplings; fine and hyperfine structures; Zeeman and Stark effects; electric dipole transitions and selection rules;	• Setting and alignments of Optics Experiments: Newton's Ring, Polarimetry, single slits, Grating • Analog and digital Electronic circuits • Setting electrical Resonant circuits, Capacitance analysis • Optoelectronics, Fiber Optics, lasers, Photo detector, Solar cells, LED, LRD based experiment • Spectroscopy : XRD, SEM Analysis • Hall effect and mechanics experiments • Basic level computer handling

		rotational and vibrational spectra of diatomic molecules; electronic transitions in diatomic molecules, Franck-Condon principle; Raman effect; EPR, NMR, ESR, X-ray spectra; lasers: Einstein coefficients, population inversion, two and three level systems. Solid State Physics Elements of crystallography; diffraction methods for structure determination; bonding in solids; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids: nearly free electron and tight binding models; metals, semiconductors and insulators; conductivity, mobility and effective mass; Optical properties of solids, dielectric properties of solid; dielectric function, polarizability, ferroelectricity; magnetic properties of solids; dia, para, ferro, antiferro and ferri- magnetism, domains and magnetic anisotropy; superconductivity: TypeI and Type II superconductors Electronics Semiconductors in Equilibrium: Electron and hole statistics in intrinsic and extrinsic semiconductors; metal-semiconductor junctions; Ohmic and rectifying contacts; PN diodes, bipolar junction transistors, field effect transistors; negative and positive feedback circuits; oscillators, operational amplifiers, active filters; basics of digital logic circuits, combinational and sequential circuits, flip-flops, timers, counters, registers Electrical Safety & Prevention of Accidents: Definition of terminology used in safety , I.E. Act & statutory regulations for safety of persons & equipment working with electrical installation , Dos & don'ts for substation operators as listed in IS. Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers	
Senior Technician	1 UR	Electric Charges and Fields Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field.	• Setting and alignments of Optics Experiments • Analog and digital Electronic circuits

		Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside). Electrostatic Potential and Capacitance Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation, formulae only). Current Electricity Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge. Magnetic Effects of Current and Magnetism: Moving Charges and Magnetism Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire. Straight solenoid (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields.Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter. Electromagnetic Induction Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Self and mutual induction.	• Setting electrical Resonant circuits, Capacitance analysis, load estimations, soldering • Handling Optoelectronic set ups, Fiber Optics, lasers, LED, LRD • Basic level computer handling

		Alternating Current, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasors only), resonance, power in AC circuits, power factor, wattless current. AC generator, Transformer. Electromagnetic waves: Electromagnetic Waves Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only). Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses. Semiconductor Electronics: Materials, Devices and Simple Circuits Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier. Introduction to Digital Electronics. Difference between analog and digital signals. Number systems (Decimal, binary, octal, Hexadecimal). BCD code, ASCII code and code conversions. Various Logic Gates and their truth tables. Electrical Safety & Prevention of Accidents: Definition of terminology used in safety , I.E. Act & statutory regulations for safety of persons & equipment working with electrical installation , Dos & don'ts for substation operators as listed in IS. Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers Electric Shock, Effects of Electrical Current on the Human Body, Electrical Emergencies- actions to be taken when an electrical emergency arises. Earthing – Necessity of earthing, types of earthing (name only), Earth resistance values, Eventualities in case of failure of earthing, Common	

		electricity rules regarding earthing (related to electrical installation of lighting & machines only).	
Technician	1 EWS	Electric Charges and Fields Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside). Electrostatic Potential and Capacitance Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation, formulae only). Current Electricity Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge. Magnetic Effects of Current and Magnetism : Moving Charges and Magnetism Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire. Straight solenoid (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields.Force on a current-carrying conductor in a uniform magnetic	• Setting and alignments of Optics Experiments • Analog and digital Electronic circuits • Setting electrical Resonant circuits, Capacitance analysis, load estimations, soldering • Handling Optoelectronic set ups, Fiber Optics, lasers, LED, LRD • Basic level computer handling

		field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter. Electromagnetic Induction Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Self and mutual induction. Alternating Current, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasors only), resonance, power in AC circuits, power factor, wattless current. AC generator, Transformer. Electromagnetic waves: Electromagnetic Waves Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only). Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses. Semiconductor Electronics: Materials, Devices and Simple Circuits Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier. Standard Norms and Specifications: Importance of Design-Estimation-Costing of electrical equipment & installations, Concept of I.E. Rules, Importance of Standards & Specifications for electrical installation and equipment. Design of Lighting circuits: Illumination level required for various applications, Factors considered for good lighting design, Determination of number of lamps & selection of lamp type, Design for placement of lamps in a room for proper & uniform illumination.	

		Design of Electrical Transformer: Single phase transformer up to 1 KVA- Core Design, Selection of stamping, winding design, window area calculation. 3-phase transformer up to 250 KVA - Basic design principles and approaches, Specification, Magnetic circuit, Output equations and Output Co-efficient, Core construction and design, Window design, Winding design, Size of tank, Winding temperature rise, Insulation classes, Cooling methods. Electrical Safety & Prevention of Accidents: Definition of terminology used in safety, I.E. Act & statutory regulations for safety of persons & equipment working with electrical installation , Dos & don'ts for substation operators as listed in IS. Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers	
CENTRE FOR DIGITAL INFRASTRUCTURE AND SERVICES (CDIS)			
Technical Assistant	1 UR, 1 ST	Programming using C, Data Structures, Computer System Organization, Algorithms, Digital Logic, Operating Systems, Introduction to DBMS, Computer Networks, Software Engineering	• Assembling of PC , Installation of Systems and troubleshooting, BIOS settings, • Installation and testing of a printer , Printer Maintenance , Scanner Installation , Webcam Installation, Making various types of cables for networking, • Installation and Maintenance of UPS Systems , • Installation and maintenance of various networking devices like Router, Switches, • Laying out Structured cabling, •installation of Firewalls and Connectivity of LAN & WAN, • Installation of Wireless network devices. Software • Debugging C/ C++ Programs, Installation and Administration of SQL, • Installation of various variants of operating systems like Windows and Linux, • Installation of Software like Visual Studio, UML, Cisco Packet tracer, • Working of MS-Office

			components like Word, Excel & PowerPoint, • Configuring and sharing internet in PCs and other devices, • Configuring firewalls &Usage of access lists, Working with Wireless Networks (Installation & Configuration)
Senior Technician	1 UR, 1 OBC	Programming using C, Data Structures, Computer System Organization, Algorithms, Digital Logic, Operating Systems, Introduction to DBMS, Computer Networks, Software Engineering	• Assembling of PC , Installation of Systems and troubleshooting, BIOS settings, • Installation and testing of a printer , Printer Maintenance , Scanner Installation , Webcam Installation, Making various types of cables for networking, • Installation and Maintenance of UPS Systems , • Installation and maintenance of various networking devices like Router, Switches, • Laying out Structured cabling, •installation of Firewalls and Connectivity of LAN & WAN, • Installation of Wireless network devices. Software • Debugging C/ C++ Programs, Installation and Administration of SQL, • Installation of various variants of operating systems like Windows and Linux, • Installation of Software like Visual Studio, UML, Cisco Packet tracer, • Working of MS-Office components like Word, Excel & PowerPoint, • Configuring and sharing internet in PCs and other devices, • Configuring firewalls &Usage of access lists, Working with Wireless Networks (Installation & Configuration)
Technician	1 UR	Programming using C, Data Structures, Computer System Organization, Algorithms, Digital Logic, Operating Systems, Introduction to DBMS, Computer Networks, Software Engineering	• Assembling of PC , Installation of Systems and troubleshooting, BIOS settings, • Installation and testing of a printer , Printer Maintenance , Scanner Installation , Webcam Installation, Making various types of cables for networking, • Installation and Maintenance of UPS Systems , • Installation and maintenance of various

			networking devices like Router, Switches, • Laying out Structured cabling, •installation of Firewalls and Connectivity of LAN & WAN, • Installation of Wireless network devices. Software • Debugging C/ C++ Programs, Installation and Administration of SQL, • Installation of various variants of operating systems like Windows and Linux, • Installation of Software like Visual Studio, UML, Cisco Packet tracer, • Working of MS-Office components like Word, Excel & PowerPoint, • Configuring and sharing internet in PCs and other devices, • Configuring firewalls &Usage of access lists, Working with Wireless Networks (Installation & Configuration) Hardware Hardware Devices and Troubleshooting • Components, tools and safety measures • Assembling a PC • Firmware upgrade, Dual BIOS & BIOS settings • Diagnose & Resolve issues related to aPC • 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 O Sand Compatibility •Windows and Linux installation • Upgrading OS •Software Installation • Working on MSWord, Excel & Power Point •MS Office troubleshooting• Different Browser setup •Backup, format & restore OS. Networking and Security Basics of computer network • OSI Model • Transmission Media • Networking devices NetworkTopology • 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.
ESTATE			
Technical Assistant	1 EWS	• Surveying: chain & compass survey, levelling, theodolite, total station, contouring • Building materials & testing: Bricks, cement, aggregates, steel, concrete mix design • Strength of Materials & structural analysis: stress-strain, SFD/BMD, beams, columns, trusses • RCC design basics: limit state method, reinforcement detailing • Fluid mechanics & hydraulics; hydrology & water resources • Water supply, sanitary & environmental engineering • Geotechnical engineering: soil classification, Index & Engineering properties, types of foundations • Estimation & costing, specifications & contracts • Transportation/highway engineering: Highway network Planning, alignment and geometric design • Basics of engineering drawing & CAD	The syllabus of Advanced Test is generic and the questions may be framed for conducting skill test as per the requirement.
Senior Technician	1 OBC	• Building materials & construction practices: bricks, cement, concrete, timber • Basic surveying & use of instruments: chain, tape, dumpy/auto level	

		• Reading & interpreting civil engineering drawings and site plans • Estimation of quantities: basic bar-bending schedule • Concrete mix proportioning (nominal mixes), formwork & scaffolding • Basic soil types & shallow foundation types • Water supply, sanitary & environmental engineering • Safety practices at construction sites	
Technician	1 SC* (Backlog)	• Workshop practice & hand tools • Fitting, filing, marking, measuring instruments (vernier caliper, micrometer) • Basic lathe / machine-tool operation • Welding & sheet-metal basics • Reading engineering/machine drawings • Preventive maintenance of machinery • Workshop safety practices	
HORTICULTURE			
Technical Assistant	1 UR	• Crop & horticultural science: fruit, vegetable & flower crops, nursery management • Soil science & plant nutrition, fertilizers, integrated nutrient management • Irrigation & water management • Plant protection: pests, diseases, Integrated Pest Management • Post-harvest technology & processing of fruits/vegetables • Landscaping & garden/campus green-cover maintenance • Basic computer applications (MS Office) for records/reporting	The syllabus of Advanced Test is generic and the questions may be framed for conducting skill test as per the requirement.
MECHANICAL ENGINEERING			
Technical Assistant	1 EWS	**1. Applied Mechanics and Structural Design** **Engineering Mechanics & Vibrations:** Free-body diagrams, friction, virtual work; free and forced vibrations of single degree of freedom systems, resonance, and mechanical vibration isolation techniques.	The Skill Test shall be conducted based on the syllabus notified for Advanced Test

		Strength of Materials: Stress-strain relationships, Mohr's circle, shear force and bending moment diagrams; bending, shear, and torsional stresses; deflection of beams, thick/thin cylinders, and column buckling. **Design of Machine Elements:** Static/dynamic failure theories, fatigue strength, S-N diagrams; design principles of shafts, gears (spur, helical), rolling element bearings, clutches, brakes, and bolted/welded joints. **2. Fluid Mechanics & Thermal Systems** **Fluid Mechanics & Turbo Machinery:** Fluid properties, manometry, continuity, momentum, and Bernoulli's equations; dimensional analysis, boundary layer concepts, pipe flow losses, and operational principles of Pelton, Francis turbines, and centrifugal pumps. **Thermodynamics & Heat Transfer:** Thermodynamic laws, properties of pure substances, ideal gas cycles; modes of heat transfer (conduction, convection, radiation), heat exchanger effectiveness (NTU method), and insulation configurations. **Thermal Power Applications:** Performance optimization of IC engines (SI & CI), steam/gas turbines, refrigeration (VCR cycles), air conditioning load estimation, and air compressor operations. **3. Manufacturing, Metrology & Advanced Materials** **Material Science:** Phase diagrams, heat treatment configurations of steels, alloy compositions, plastics, and smart/composite material parameters. **Manufacturing Processes:** Mechanics of metal casting, forming, powder metallurgy, joining (TIG/MIG/friction welding), and traditional material removal operations. **Machining and Machine Tool Operations**: Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, jigs and fixtures; abrasive machining processes; NC/CNC machines and CNC programming. **Theory of Machines**: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains;	

		flywheels and governors; balancing of reciprocating and rotating masses; gyroscope. **Advanced Automation & CIM:** Non-traditional machining (EDM, ECM, Laser), **CNC part programming (G-codes & M-codes)**, FMS, Computer-Integrated Manufacturing (CIM), and additive manufacturing (3D printing) workflows. **Metrology and Inspection:** Limits, fits, and tolerances; linear/angular precision measurements, interferometry, surface roughness metrics, and operating configurations of Coordinate Measuring Machines (CMM). **4. Computing, Instrumentation & Data Acquisition** **Data Acquisition & Systems Control:** Transducers (strain gauges, load cells, LVDT, thermocouples), signal conditioning, analog-to-digital converters (ADC), and interfacing instruments with digital controllers. **Engineering Software & Simulation:** Fundamental syntax and analytical usage of MATLAB/LabVIEW for instrumentation, and data management using CAD/CAM/CAE packages (Ansys, SolidWorks, AutoCAD). **Basic IT Infrastructure:** Operating systems (Windows/Linux administrative basics), secure storage setups for research data repositories, and networking within departmental computing clusters.	
Technician	2 UR, 1 SC	**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	The Skill Test shall be conducted based on the syllabus notified for Advanced Test

		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.	
CHEMICAL ENGINEERING			
Senior Technician	1 UR	• Programming fundamentals: C/C++, data types, control structures, functions, arrays, pointers • Object-oriented programming concepts (classes, objects, inheritance, polymorphism) • Data Structures & Algorithms basics • Database Management Systems: ER model, normalization, SQL, transactions • Operating Systems: process, memory & file management; Windows/Linux basics • Computer Networks: OSI/TCP-IP model, routing, switching, network devices	• Computer hardware assembly/disassembly & component identification; • OS installation or basic troubleshooting task; • MS Office practical task (document formatting / spreadsheet formula task); • Basic networking cable & connector identification. **Refer the note in stage II for details**

		• Cybersecurity basics: cryptography fundamentals, network security • MS Office (Word, Excel, PowerPoint); computer hardware & software fundamentals **Note: Apart from the above, Stage II and Stage III exam includes:** • Install and setup operating system and related software in a computer following safety precautions. • Create, format and edit document using word processing application software. • Create, format, edit and develop a workbook by using spreadsheet application software • Create and customize slides for presentation. • Create and manage database file using MySQL. • Install, setup/configure, troubleshoot and secure computer network including Internet. • Develop web pages using HTML and CSS. • Develop web pages using Java Script. • Create workbooks with advanced formulae, macros, charts, pivot tables and demonstrate ability to use Power tools. • Browse, select and transact using E commerce websites. • Secure information from Internet by using cyber security concept. • Explain Cloud concepts & services. • Write programs using Python / Java language	
Technician	1 UR	• Workshop practice & hand tools • Fitting, filing, marking, measuring instruments • Basic lathe / machine-tool operation • Welding, sheet-metal basics • Reading engineering/machine drawings • Preventive maintenance of machinery • Workshop safety practices **Note: Apart from the above, Stage II and Stage III exam includes:**	• Workshop tool identification & use • Basic fitting/filing exercise; • Reading a machine/engineering drawing; basic lathe or machine-tool operation demonstration. **Refer the note in Stage II for details**

		• Plan and organize the work to make job as per specification applying different types of basic fitting operations & check for dimensional accuracy following safety precautions. • Set different shaped jobs on different chuck and demonstrate conventional lathe machine operation observing standard operation practice. [Different chucks: - 3 jaws & 4 jaws, different shaped jobs: - round, hexagonal, square] • Prepare different cutting tool to produce jobs to appropriate accuracy by performing different turning operations. [Different cutting tool – V tool, side cutting, parting, thread cutting (both LH & RH), Appropriate accuracy: - ±0.06mm, Different turning operation – Plain, facing, drilling, boring (counter & stepped), grooving, Parallel Turning, Step Turning, parting, chamfering, U -cut, Reaming, internal recess, knurling. (NOS: CSC/N0110) • Test the alignment of lathe by checking different parameters and adjust the tool post. [Different parameters – Axial slip of main spindle, true running of head stock, parallelism of main spindle, alignment of both the centres.] • Set different components of machine & parameters to produce taper/ angular components and ensure proper assembly of the components. [Different component of machine: - Form tool, Compound slide, tail stock offset, taper turning attachment. Different machine parameters- Feed, speed, depth of cut.] • Set the different machining parameter & tools to prepare job by performing different boring operations. [Different machine parameter- Feed, speed & depth of cut; Different boring operation – Plain, stepped & eccentric] • Set the different machining parameters to produce different threaded components applying method/ technique and test for proper assembly of the components. [Different thread: - BSW, Metric, Square, ACME, Buttress.] • Set the different machining parameter & lathe accessories to produce components applying techniques and rules and check the accuracy. [Different machining parameters: - Speed, feed & depth of cut; Different	

		lathe accessories: - Driving Plate, Steady rest, dog carrier and different centres.] • Plan and perform basic maintenance of lathe & grinding machine and examine their functionality. • Read and apply engineering drawing for different application in the field of work. • Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. • Plan & set the machine parameter to produce precision engineering component to appropriate accuracy by performing different turning operation. [Appropriate accuracy - ±0.02mm/ (MT - 3) (proof turning); Different turning operation – Plain turning, taper turning, boring threading, knurling, grooving, chamfering etc.] • Set & Produce components on irregular shaped job using different lathe accessories. [Different Lathe accessories: - Face plate, angle plate] • Plan and set the machine using lathe attachment to produce different utility component/ item as per drawing. [Different utility component/ item – Crank shaft (single throw), stubarbour with accessories etc.] • Set the machining parameters and produce & assemble components by performing different boring operations with an appropriate accuracy. [Different boring operation –eccentric boring, stepped boring; appropriate accuracy - ±0.05mm] • Calculate to set machine setting to produce different complex threaded component and check for functionality. [Different complex threaded component- Half nut, multi start threads (BSW, Metric & Square)] • Set (both job and tool) CNC turn centre and produce components as per drawing by preparing part programme. • Manufacture and assemble components to produce utility items by performing different operations & observing principle of interchangeability and check functionality. [Utility item: - screw jack/ vice spindle/ Box nut, marking block, drill chuck, collet chuck etc.; different operations: - threading (Square, BSW, ACME, Metric), Thread on taper, different boring (Plain, stepped)]	

		• Make a process plan to produce components by performing special operations on lathe and check for accuracy. [Accuracy - ±0.02mm or proof machining & ±0.05mm bore; Special operation – Worm shaft cutting (shaft) boring, threading etc.] • Read and apply engineering drawing for different application in the field of work. • Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study	
AUDIO VISUAL (AV) SECTION			
Technician	1 OBC	**Basic Electronics:** Passive and active electronic components – series and parallel connections; dielectrics; semiconductors - semiconductor diode and applications; rectifiers – half and full wave rectification; Zener diodes - voltage regulator; Transistors (BJT, FET) – constructions, working, input/output characteristics, biasing circuits, and applications; operational amplifiers; power supplies – regulated and unregulated power supplies; oscillators – applications. **Digital Electronics**: Number systems – binary numbers; logic gates and truth-table verification; Boolean algebra; combinational logic circuits - applications; universal gates; Sequential logic gates - flip-flops; counters and registers, converters (ADC, DAC), integrated circuits (ICs). **Electrical engineering basics:** Ohm's law – relation between I-V-R; electrical power, energy and their units; Kirchhoff's laws - verification, series and parallel circuits, resonance circuit, circuit analysis, DC and AC currents and their circuits; Phase of supply – single and three phases ; transformers – construction and step-up/step-down; electrical machines; measuring instruments; LED connections or stacks; specifications of cells and batteries – series and parallel connections. **Communication systems:** Transmission and reception – modulation - modulators and demodulators; AM, FM, and PM; transmitters and receivers, antennas, and optical fiber communication, Digital data - communication; Audio Visual receiver systems - block diagram, features, decoders, amplification, and AV inputs/outputs.	• Identification of various components related to audio-visual systems. Soldering and desoldering, troubleshooting of circuits, basics of circuit analysis, • Install- interface-troubleshoot computer peripherals – monitors, CPU, keyboard and mouse, modem, RAM, routers, ethernet, graphic cards, etc.; • Install-interface-troubleshoot computer based devices (DVD, CD, and microphones, loudspeakers, home-theater systems); • Operating systems, MS office, Internet, software, Bluetooth, LAN, Wi-Fi, speed of data communication, smartphones - installation of various apps, troubleshooting the malfunctioning of various devices; computer peripherals – printers, key-boards, etc., and their uses; resources and use of various software's for AV systems. • Install- interface-troubleshoot the display modules – panel arrangements, principles, interfacing;

		Audio and video systems: Construction, working principle, and characteristics - microphones, loudspeakers, audio amplifiers, mixers, public address systems, television systems; LCD and LED display systems and interfacing; CCTV – principle and operation; projectors - construction, video switching, HDMI, SDI, VGA interfaces. Fault finding and troubleshooting – various display modules – installation and testing. **Computer fundamentals:** Operating systems, MS office, Internet, software, Bluetooth, LAN, Wi-Fi, speed of data communication, smartphones - installation of various apps, troubleshooting the malfunctioning of various devices; computer peripherals – printers, key-boards, etc., and their uses; **Microprocessors and Interfacing:** Basics of 8085/8086 microprocessors, programming, interfacing, wireless-interfacing of various devices; resources and use of various software's for AV systems. **Industrial Electronics:** construction and working of different power electronic devices (SCR, TRIAC, UJT) – applications; Basic principle and working of Inverters / UPS; Electrical protective circuits. **Test and measurements:** basics, measurements, errors, efficiency, and care and maintenance of CRO, DSO, and LCR meters – different waveforms, frequency, amplitude, power, current, wave shaping circuits, troubleshoots, and applications; Analog and digital multimeters; Function generator and signal generators – inverting, non-inverting, noise; cameras (construction and principle) – analog and digital. **Practical skills:** soldering and desoldering, PCB fabrication, breadboard circuits, troubleshooting of circuits, install-maintain-troubleshoot computer based devices (DVD, CD, and microphones, loudspeakers, hometheater systems), install-maintain-troubleshoot computer peripherals – monitors, modem, RAM, routers, ethernet, graphic cards, keyboard and mouse; install-maintain-troubleshoot display modules – panel arrangements, principles, interfacing.	• Install-interface-troubleshoot the microphones, loudspeakers, audio amplifiers, public address systems, LCD and LED displays; • Fault finding and troubleshooting – various display modules – installation and testing; • Basics, measurements, errors, efficiency, and care and maintenance of AV systems. • Analog and digital multimeters; Function generator and signal generators; • Install- interface-troubleshoot the cameras – analog and digital.