Annexure I

DETAILED SYLLABUS OF PART A

Particulars	Syllabus - General (Part A)
General Knowledge	• Facts about India and other countries: Basic facts / Geography / Tourism / Transport systems / Personalities / Places / History / Constitution / Economy / Writers / Literatures / Indian States & Union Territories / International Organizations. • General Science : Branches of studies / Scientific instruments and appliances / Physics / Chemistry / Biology • Sports & Games • Important Events/ Movements / Leaders / Places / Years • Writers – Authors – Biography - Autobiography • Abbreviations
General English	• Spotting Errors / Vocabulary usage / Sentence Completion / Synonyms / Antonyms / Reconstruction of sentences / One word substitution / Idioms & Phrases / Grammar / Correct usage of Articles / Prepositions / Singular and Plural
Reasoning	• Analogy / Classification / Series Completion / Coding-Decoding / Blood Relation / Direction Sense Test / Alphabet Test / Number and Ranking / Puzzle Test / Odd Man out / General Intelligence
Quantitative Aptitude	• Number system / Fraction and Decimals / Simplification / Volume and surface areas / Square roots and Cube roots / Problems based on numbers, Speed, Time and Distance, Simple Interest / Compound Interest / Boats and Streams / Problems on Trains / Percentage - Interest / HCF and LCM / Average / Ratio and Proportion / Time and Work / Problems based on ages / Profit, Loss and Discount, Statistics / Permutations & Combinations / Probability.

DETAILED SYLLABUS OF PART B

Sl. No	Name of Post	Syllabus – Trade/Discipline related (Part B)
1.	**Senior Ship Draftsman (Mechanical)**	**Basic Mechanical Engineering:** • Importance of IC Engines – Classification, working, two stroke engines, four stroke engines, petrol & diesel engines. • Various power plants: classification, working of Hydro and Thermal power plants **Engineering Graphics:** • Importance of engineering graphics – Development of Engineering graphics and CAD • Drawing Standards: Drawing sheet size, types of lines • Dimensioning: Dimensioning standards, notations used in engineering drawing • Geometric construction – principles of Geometric construction • Projections of Points, Lines and planes • Orthographic projections – Principles of orthographic projections • Sectional Views • Pictorial views • Development of surfaces **Machine Drawing:** • Fastening devices – Different types of Screw threads, Riveted joints, foundation bolts. • Assembly and detailed drawing of coupling joints, bearing and machine parts • Welded joints and piping layout **Production drawing:** • Limits fits and tolerance • Surface roughness • Interpretation of drawings - Shop floor drawings • Process chart **Manufacturing Process:** • Properties, testing and inspection of engineering materials – Destructive testing, NDT, Fatigue & Creep test. • Measuring instruments, gauges and comparators – • Welding: types of welding, advantages and limitations of welding, welding joints, various types of electrodes and its coatings, gas welding, TIG, MIG, Welding defects, testing and inspection of weld joints, soldering and brazing. **Metallurgy and machine tools:** • Manufacturing of metals and alloys: ferrous and non-ferrous metals, types of cast iron, pig iron – blast furnace, cast iron – cupola furnace, chemical composition in steels, alloying elements. • Heat Treatment process: Need of heat treatment, various heat treatment process • Machine tools: Lathe, Drilling, Milling, Grinding etc. • Press tools and their operations – Piercing, blanking etc. • Importance of Jigs and fixtures

- Non-conventional machining
- Numerically controlled machines

Refrigeration & Air Conditioning

- Principles of refrigeration - Sensible heat, Latent heat, Dew point temp, DBT, WBT, Sp. Humidity, Relative humidity, COP, Carnot cycle
- Different type of heat exchangers
- Refrigerants
- Air conditioning system: Factors governing designing of room air Conditioners

Strength of Materials

- Mechanical properties – Hardness, ductility, Malleability, toughness etc
- Heat treatment process – Annealing, hardening, tempering
- Stress, Strain
- Creep, Fatigue
- SFD & BMD
- Different types of beams and loadings
- Elongation due to Temperature difference
- Moment of Inertia for geometrical shapes
- Section modulus
- Relation with Torque and power
- Comparison with solid and hollow shaft transmitting same power
- Working load, Factor of safety
- Springs
- Gears – Module, Addendum, gear ratio etc.
- Pulleys, Flanges, Key joints, weld joints etc.
- Column & struts Fluid Mechanics:
- Bernoulli's equation
- Reynolds number
- Hydraulic machines
- Venturimeter, orifice meter, pitot tube
- Co-efficient of Discharge
- Head loss due to frictions
- Different types of Flow
- Pipes sizes , material , nomenclature
- Different types of Pumps
- Velocity triangle
- Water hammer

Computer Aided Engineering Drawing

Introduction to Computer Aided Drawing

Standard menus/toolbars, navigational tools, Co-ordinate systems. Selection of drawing size and scale, creation of line using draw commands, co-ordinate points draw commands-line, ray, spline, arc, circle, ellipse, polygons, rectangle, polyline, text editing commands-erase, copy, move, offset, mirror, rotate, trim, extend, , break, chamfer, fillet etc

Dimensioning systems

Method of dimensioning diameters, radii, chords, arc and angles, surface symbols. Aligned and uni-directional system, Dimension-commands (Standard drawings to be supplied, draw and dimension using various systems) Four quadrants, principal planes, projectors, objects, profile plane,

		designation of views, projection of a point in all quadrants, projection of straight lines and true lengths, projection of laminas like triangular, square, pentagonal, hexagonal and circular in different positions. **Isometric Projections** Isometric scale, isometric projection of regular objects like cube, prism, pyramids, cone, cylinders and sphere. Isometric projection of step block, v-block, cross, sphere above the frustum of a cone and built up solids. **Fasteners** Temporary fastenings - screw threads, bolts and nuts Screw threads - conventional symbols for representation of internal and external threads-metric threads - left hand and right hand - multi starts threads
2.	**Senior Ship Draftsman (Electrical)**	**Basic Electrical –** Ohm's law, Kirchhoff's laws – solution of series and parallel circuits Magnetic circuits: Flux, MMF, reluctance, electromagnetic induction, Faraday's laws, Lenz's law, statically and dynamically induced emfs, self and mutual induction, coefficient of coupling. Network theorems – Thevenin, reciprocity, superposition, reciprocity, Maximum power transfer theorems AC Principles -Principle of generation of alternating current – waveforms – frequency, Amplitude, Cycle, period, average and rms values, form factor, Peak factor, power , power factor Generation of 3 phase ac voltage, star and delta connections, voltage & current relationships in star and delta. **Measuring Instruments** - Ammeter and voltmeters-M.I instruments, Moving coil and Induction type - construction, operation, range, errors, advantages & disadvantages, applications. Wattmeter, Energy meter, Galvanometer Range extension of meters, CT and PT principle of operation and application Transducers – different types , working and applications Secondary cells and batteries, earthing: Meaning of earthing, its necessity and importance. Types of earthing. Materials used and their specifications. Points need to be earthed. **Electrical Machines** DC generators – Working principle of D.C. generator, construction and types, windings, Armature reaction, commutation, characteristics, efficiency and voltage regulation DC Motors – Construction and working principle of D.C. motor, types, torque, characteristic, speed control, starting devices Alternators- Construction and working principle, armature winding, EMF equation, Armature reaction, voltage regulation, excitation systems, parallel operations, hunting, cooling Transformers – Working principle, EMF equation, Operation on No load and on load, regulation and efficiency, three phase transformer, cooling , Autotransformer, parallel operation Induction Motors- Working principle, types, torque-slip curves, power output, starting: necessity and types, speed control, induction generators Synchronous motors- Working principle, characteristics, hunting, starting methods, application

		Protection Circuit breakers – Principle of Arc extinction, Types, rating Fuses, Protection of transformer, Alternator, bus bar **Electronics** Semiconductors, diodes, transistors, half wave rectifier, full wave rectifier, oscillators, OPAMP, flip flops, shift register, counters, encorder, decoder, Multiplexer, de multiplexer, D/A and A/D convertors **Computer Aided Engineering Drawing** **Introduction to Computer Aided Drawing:** standard menus/toolbars, navigational tools, Co-ordinate systems. Selection of drawing size and scale, creation of line using draw commands, co-ordinate points draw commands-line, ray, spline, arc, circle, ellipse, polygons, rectangle, polyline, text editing commands-erase, copy, move, offset, mirror, rotate, trim, extend, break, chamfer, fillet etc **Dimensioning systems** Method of dimensioning diameters, radii, chords, arc and angles, surface symbols. Aligned and uni-directional system, Dimension-commands (Standard drawings to be supplied, draw and dimension using various systems) **Orthographic Projections** Four quadrants, principal planes, projectors, objects, profile plane, designation of views, projection of a point in all quadrants, projection of straight lines and true lengths, projection of laminas like triangular, square, pentagonal, hexagonal and circular in different positions. **Isometric Projections** Isometric scale, isometric projection of regular objects like cube, prism, pyramids, cone, cylinders and sphere. Isometric projection of step block, v-block, cross, sphere above the frustrum of a cone and built up solids. Electrical symbols of components, measuring instruments, electrical machines and semiconductor devices
3.	**Senior Ship Draftsman (Electronics)**	**Basic Electrical Engineering-** AC and DC fundamentals, Basic working of AC and DC motors, Transformers, AC/ DC motor starting & speed control techniques, Basic working principle of Generators, Alternators, basic power electronics, Generation of electrical power, Transmission and distribution, Protection and safety devices. **Basic Electronics &communications systems –**Semiconductors & solid-state physics, Active & passive devices, Integrated circuits & logic gates, Amplifier & oscillators, Linear integrated circuits, Digital circuits, microprocessors, microcontrollers. Wave propagation, antennas, modulation techniques, Radio transmitters & receivers, optic fibre communication, Industrial electronics.

<table>
<tr><td></td><td></td><td><u>Basic Instrumentation Theory</u>- Analog and digital transducers, Oscilloscope, Multimeters, signal analysers, data recorders, open loop <u>and</u> close loop systems, telemetry.
<u>Basic Computer Applications</u>- Hardware and software, Operating systems and applications, Internet, Networking
<u>Computer Aided Engineering Drawing</u>- Introduction to Computer Aided Drawing, Dimensioning systems, Projections- Orthographic, Isometric, IEC/IEEE symbols for electronic components, communication systems.</td></tr>
<tr><td>4.</td><td>Senior Ship Draftsman (Instrumentation)</td><td><u>Basic Electrical Engineering-</u> AC and DC fundamentals, Basic working of AC and DC motors, Transformers, AC/ DC motor starting & speed control techniques, Basic working principle of Generators, Alternators, basic power electronics, Generation of electrical power, Transmission and distribution, Protection and safety devices.
<u>Basic Electronics</u> - Semiconductors & solid-state physics, Active & passive devices, Integrated circuits & logic gates, Amplifier & oscillators, Boolean algebra, Digital circuits, microprocessors, microcontrollers.
<u>Basic Instrumentation Theory-</u> Measurement of temperature, pressure, humidity, velocity, flow, level, pH, viscosity, acceleration, various types of transducers, introduction to hydraulics & pneumatics system and components, measurement of electrical parameters.
<u>Basic Control Theory</u>- Closed loop & open loop systems, servos, synchros, stepper motors, PID controllers, PLC, DCS, SCADA
<u>Basic Computer Applications</u>- Hardware and software, Operating systems and applications, Internet, Networking Computer Aided Engineering Drawing - Introduction to Computer Aided Drawing, Dimensioning systems, ProjectionsOrthographic, Isometric, ISA symbols of instrumentation & automation components, measuring instruments, electrical machines and hydraulic and pneumatic components.</td></tr>
<tr><td>5.</td><td>Junior Technical Assistant (Mechanical)</td><td>
<table>
<tr><td>1.</td><td>Manufacturing Processes</td><td>(a) Casting
(b) Forging
(c) Rolling
(d) Extrusion
(e) Machining including surface finishing</td></tr>
<tr><td>2.</td><td>Welding</td><td>(a) Types of welding
(b) welding defects
(c) Testing of welds
(d) Brazing and soldering</td></tr>
<tr><td>3.</td><td>Theory of Machines and Machine Design</td><td>(a) Fundamentals and types of machines
(b) Common mechanisms
(c) Cams and followers
(d) Common transmissions
(e) Flywheels and governors
(f) Brakes, dynamometers, clutches and bearings
(g) Balancing and vibration</td></tr>
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		4.	Thermal Engineering	Energy sources Fundamentals of thermodynamics Ideal gasses Steam turbines and condensers Heat Transfer
		5.	Applied Mechanics	(a) Forces and moments (b) Friction (c) Centroid and Centre of Gravity (d) Simple machines, pulleys, blocks and wheels (e) Kinetics (f) Kinematics (g) Work, power, energy
		6.	Metallurgy and Material Properties	(a) Physical, Mechanical, Thermal, Electrical, Magnetic Properties etc (b) Effect of heat treatment (c) Surface hardness and hardening (d) Corrosion (e) Testing of metals (f) Lubricants and their properties
		7.	Strength of Materials	(a) Stress and strain (b) Bending and shear forces (c) Bending and shear stress (d) Moment of Inertia (e) Torsion
		8.	Fluid Mechanics	(a) Properties of liquids (b) Fluid dynamics (c) Classification of fluids (d) Laws related with fluid flow and dynamics (e) Turbines
		9.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet
		10.	Basics of Electrical Engineering and Power Generation	(a) Electrical power generation, transmission and distribution (b) AC fundamentals (c) Measuring instruments (d) DC motors (e) AC appliances (f) Utilisation of electrical energy (g) Electrical safety
		11.	Industrial Management	(a) Management process (b) Organisational Management (c) Human resource management (d) Material Management

		12.	Metrology and Instrumentation	(a) Classification of instruments - range and span, accuracy and precision, reliability, calibration, hysterisis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity, speed of response, fidelity and dynamic errors, overshoot. (b) Measurement of error- classification of errors, environmental errors, signal transmission errors, observation errors, operational errors. (c) Transducers : Classification of transducers- active and passive, resistive, inductive, capacitive, piezo, resistive, thermo resistive (d) Specification, selection and application for pressure, temperature, flow, humidity, displacement, velocity, force, strain, sound. (e) Control Systems (f) Measurement of displacement, flow, temperature, strain, miscellaneous. (g) Limits, fits, tolerances and gauges (h) Screw thread measurement (i) Surface finish measurement
		13.	Construction and functioning of various machines	(a) Pumps (b) Compressors (c) Boilers (d) Turbines (e) IC Engines (f) Purifiers and separators (g) Hydraulic machinery and lifting equipment etc
		14.	Refrigeration and Air-conditioning	(a) Basics of refrigeration (b) Refrigeration cycles (c) Refrigerants (d) Components of a refrigeration system (e) Air conditioning (f) Air conditioning Systems (g) Air Distribution Systems

6.	**Junior Technical Assistant (Electrical)**	1.	Basic electrical engineering	(a) Network theorems and laws (b) Magnetic circuits (c) AC fundamentals (d) RLC circuits
		2.	Static and rotating AC&DC machines	(a) DC generators (b) DC motors (c) Transformers (d) Synchronous generators (e) Synchronous motors (f) Induction motors (g) Single phase motors
		3.	Power system	(a) Generation of electrical power (b) Transmission and distribution (c) Circuit breakers (d) Cables
		4.	Electrical measurements	(a) Moving coil instruments (b) Moving iron instruments (c) Measurement of current, voltage, frequency and energy (d) Bridge circuits
		5.	Semiconductor Devices	(a) Semiconductors (b) Diodes and power supplies (c) Transistors
		6.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet
7.	**Junior Technical Assistant (Electronics)**	1	Circuit Fundamentals	Passive Circuit elements, Ohm's Law, Energy Sources, DC and AC Fundamentals, Tuning Circuits and Filters, Electrostatics, Faraday's Laws and Lenz's laws
		2	Solid State Physics	Conductors, Semiconductors and Insulators
		3	Active and Passive Devices in circuits, Switching circuits	Resistors, Capacitors, Diodes, Special Diodes, Transistors, FET, Thyristors, DIAC,TRIAC, Optoelectronics Devices, IGBT, switching applications
		4	Amplifiers and Oscillators	Single Stage and Multistage Amplifiers, Feedback amplifier, Sinusoidal and non-sinusoidal Oscillators
		5	Integrated Circuits and Logic Gates	Basic gates and equivalent circuits, Adders, Subtractors, Op-Amp, Flip Flops
		6	Transducers	Hall Effect, Classification/Types and working-LVDT, proximity sensors, piezoelectric transducers, working of Load cell
		7	Electronic Instruments	Analog and Digital Instruments, Multimeter, Voltmeter, Ammeter, CRO

		8	Power Supplies	Unregulated and Regulated Power Supply, Rectifiers, SMPS, UPS
		9	Number Systems, Boolean Algebra	Decimal and Binary number systems- Conversion problems, Laws of Boolean Algebra
		10	Digital Circuits and Microprocessors	Digital logic families:TTL, MOS, Combinational circuits: multiplexer/ demultiplexer, encoder/ decoder, adder/subtractor, comparator, counters and parity generators; Sequential circuits: latches and flip-flops (RS, JK, D, T, and Master Slave); Registers; Counters: ripple, ring, and shift register counters; PLC- working with sensor and actuators, PLC programming, Microprocessors: 8085 and 8086, Ladder Diagram, RAM, ROM, Choppers , Inverters and Cycloconverters.
		11	Principles of Communication	Modulation and De-modulation types, FSK, PSK, TDMA, FDMA, CDMA. Electromagnetic Spectra, Basic principles of Fibre Optic communication
		12	AV Systems	Microphones, Loudspeakers, Stereo system, Dolby system, Tuners, IF and RF Amplifiers, Digital TV, CCTV, Frequency, Phase and Amplitude Distortion, Mixers, audio-video formats
		13	Ship Communication Equipments	GMDSS, marine VHF, RADAR, INMARSAT Equipment, Antennas in ship
		14	Basic Electricals	AC and DC fundamentals, Basic working of AC and DC motors-classification, Transformers, AC/ DC motor speed control techniques, Basic working principle of Generators, Alternator, Rectifiers and invertors, Star and delta starters
		15	Energy Conservation	Renewable sources of energy, VFD for industrial use
		16	Basic Computer Applications	Hardware and software, Operating systems and applications, Internet

8.	**Junior Technical Assistant (Civil)**	1	Surveying	Chain surveying – principles, instruments, ranging, and chaining survey lines, field work and field book, selection of survey stations, units of land area.
		2	Levelling	Levelling instruments, different types, bench mark, reduced level of points, booking of field notes, reduction of levels by height of collimation method. Modern survey – instruments – Total station, Electronics theodolite.
		3	Materials	Brick – varieties and strength, characteristics of good brick. Cement –varieties and grade of cement and its uses. Steel – types of steel for reinforcement bars, steel structural sections. Aggregates – types & requirements of good aggregates. Concrete – grades of concrete as per IS code, water cement ratio, Workability, mixing, batching, compaction and curing.
		4	Masonry	Classification-Stone masonry-Brick masonryLaterite masonry–composite masonry. Different types of stone masonry-General principles and specifications for stone masonry.
		5	Brick masonry	Different types of bonds for walls, piers and junctions of walls for equal and unequal thicknessEnglish, Flemish (Single and Double Flemish)- Specification for brick masonry as per relevant codes. Hollow block masonry, Solid block masonry and inter locking block masonry. Types and methods of construction-Advantages and Disadvantages with reference to other types of masonry.
		6	Damp proof courses	Definition of dampness–causes and effects– methods of prevention–surface treatment– internal/external water proofing courses.
		7	Form work	Functions-materials used– Requirements of good form work–Scaffolding, Shoring Definition–purpose and function–Requirements-materials used
		8	Plastering and Pointing	Materials and proportion–Functions–general specifications–types Different components of building from foundation to roof and their functions
		9	Foundations	Functions, Classification, Shallow- Deep, TypesSpread footing-raft-mat-column footing-pile foundation-well foundation, bearing capacity.
		10	Flooring	Requirements of a good floor, materials used for flooring, Floor finishes–Types Mosaic, Marble, Granite, Ceramic tiles, Vitrified tiles, Glass, Wooden, and other types of modern floor finishes
		11	Simple stresses and strains	Types of stresses–Elasticity–Hook's law–Young's modulus–Elasticity, stiffness, plasticity, toughness, brittleness, ductility, Malleability and hardness–Linear strain and lateral strain–Poisson's

				ratiovolumetric strain––Bulk modulus–modulus of rigidity
		12	Beams and bending	Classification of beams–cantilever, simply supported, fixed, overhanging and continuous. Types of loading– concentrated, uniformly distributed and uniformly varying load. Shear force and bending moment–definition and sign conventions. Calculation of SF and BM for Cantilever, simply supported and overhanging beams and sketching of SF and BM diagrams (for point load, uniformly distributed load, uniformly varying load and combinations of u.d.l and point loads) Relation between SF and BM.
		13	Carpentry	Carpentry material-timber-structure, classificationsoft wood, hard wood-carpentry tools marking and measuring tools, cutting tools, boring tools, striking tools, holding tools Carpentry processesmarking, sawing, planing and chiseling
		14	Tender and Tender notices	Necessity of tenders – sealed tenders – tender notice, tender document – Earnest money and security deposit – opening of tenders – scrutiny of tenders – comparative statements – selection of contractors – negotiation, acceptance of tender, work order – contract agreement – conditions of contract. Type and characteristics of Contracts and Tenders
		15	Measurement of Works	Measurement book – Rules to be followed in recording measurements – pre-measurements and check measurements – contractor's acceptance of measurement.
		16	Payment of Bills	Types of bills – first and final bills – preparation of bills –running account bills – modes of payment – checking of bills –recoveries to be made from bill – mobilization advance- secured advance- liquidated damages - penalty
		17	Construction Machinery	Earth moving equipments , Concrete Machinery , concrete mixers , ready mix plants, compaction machinery, vibrators ,Lifting and hoisting machineries ,pumps ,general civil engineering tools
		18	Principles of Safety in Construction	Causes, effects and prevention of accidents, safety practices in construction – Site Engineers / Supervisor's role – safety through legislation – precautions during handling of materials occupational hazards and basic guidelines for safety in construction industry.

		19	Estimation	Data Required for Preparation of an estimate, Type of Estimate, Detailed and abstract estimate, Analysis Of Rates , Detailed estimate preparation for a single/two storied building (residential and office) with Septic Tank , soak pit , RCC roof and steel roof truss. Detailed estimate of RCC beam, slab, column etc and preparation of bar bending schedule. Detailed specifications for various items of work of Earth work excavation, Foundation concrete, Masonry work, DPC, Form work, RCC, Plastering, Pointing, Flooring, Painting and Polishing.
		20	Docks and Harbours	Wharves, Jetty, Dolphins, fenders, docks, Uses of wet docks and Dry docks, break waters , aids to navigation, dredging methods, Major Ports in India, Major shipyards in India.
		21	General	Kerala building rules, computer software's in civil engineering, units, conversions, Statutory requirements for Coastal zone constructions , Pollution Control Board
		22	Basic Computer Applications	Hardware and software, Operating systems and applications, Internet
9.	**Junior Technical Assistant (Instrumentation)**	1.	Basic Circuits and Measurement Systems	a) Basic Circuits and Measurement Systems b) Transducers c) Signals d) Mechanical Measurement e) Analytical Instrumentation f) Industrial Instrumentation g) Analog and Digital Electronics h) Electrical and Electronic Measurements i) Control Systems and Process Control
		2.	Metrology	Measurements, Least Counts, Instruments etc
		3.	Quality Management System	Basic knowledge of ISO 9001:2015
		4.	Basic knowledge of Standards	ANSI, IEEE, ISA

10.	**Laboratory Assistant (Mechanical)**	1.	Production Technology	(a) Casting (b) Forging (c) Rolling (d) Extrusion
		2.	Manufacturing Processes	(a) Machining including surface finishing (b) Conventional & Non conventional machining (c) Thermal Aspects in Machining
		3.	Welding	(a) Types of welding (b) welding defects (c) Testing of welds (d) Brazing and soldering
		4.	Metallurgy and Material Properties	(a) Physical, Mechanical, Thermal, Electrical, Magnetic Properties etc (b) Effect of heat treatment (c) Surface hardness and hardening (d) Corrosion (e) Lubricants and their properties
		5.	Strength of Materials	(a) Stress, strain and deformation of solids (b) Bending and shear forces (c) Bending and shear stress (d) Moment of Inertia (e) Torsion
		6.	Metals & Alloys	(a) Classification of Steels (b) Alloy Steels & their properties (c) Cast Irons (d) Important Non ferrous metals & their composition
		7.	Material Testing	(a) Tensile Test (b) Hardness test (c) Impact Test (d) Bend Test (e) Fracture Test (f) Non Destructive Test
		8.	Fuels	(a) Solid Fuels (b) Liquid Fuels (c) Secondary Liquid Fuels (d) Gaseous Fuels (e) Combustion
		9.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet
		10.	Industrial Management	(a) Management process (b) Organisational Management (c) Human resource management (d) Material Management
		11.	Quality Management	(a) Quality Policy (b) Quality Objectives (c) Control of documents (d) Corrective & Preventive action (e) Risks & Opportunities

		12.	Metrology and Instrumentation	(a) Classification of instruments - range and span, accuracy and precision, reliability, calibration, hysterisis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity, speed of response, fidelity and dynamic errors, overshoot. (b) Measurement of error- classification of errors, environmental errors, signal transmission errors, observation errors, operational errors. (c) Transducers : Classification of transducers- active and passive, resistive, inductive, capacitive, piezo, resistive, thermo resistive (d) Specification, selection and application for pressure, temperature, flow, humidity, displacement, velocity, force, strain, sound.
11.	**Laboratory Assistant (Chemical)**	1.	Quantitative analysis	(a) Volumetric method (b) Gravimetric method (c) Normality (d) Molality (e) Molarity
		2.	Periodic Table	(a) Electropositivity (b) Electronegativity (c) Metallic character (d) Non Metallic character (e) Hydrogen bonding
		3.	Nuclear Chemistry	(a) Natural radioactivity (b) Modes of decay (c) Artificial transformation (d) Nuclear fission
		4.	Chemical Bonding	(a) Ionic Bond (b) Polarity of covalent bond (c) Metallic bonding (d) Hybridisation
		5.	Analysis of water	(a) Acidity (b) Alkalinity (c) Hardness (d) pH (e) Causes of Hardness (f) Temporary & Permanent Hardness
		6.	Metals & Alloys	(a) Classification of Steels (b) Alloy Steels & their properties (c) Cast Irons (d) Important Non ferrous metals & their composition
		7.	Instrumental methods of analysis	(a) Atomic Absorption Spectroscopy (b) Flame Emission Spectroscopy (c) Law of Spectrophotometry

		8.	Fuels	(a) Solid Fuels (b) Liquid Fuels (c) Secondary Liquid Fuels (d) Gaseous Fuels (e) Combustion
		9.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet
		10.	Quality Management	(a) Quality Policy (b) Quality Objectives (c) Control of documents (d) Corrective & Preventive action (e) Risks & Opportunities
12.	**Store Keeper**	**Theoretical and application knowledge on** A. Stores /Warehouse Management • Objectives , Functions & responsibilities of Store keeping • Types of Stores • Storage Systems & Layout • Store Management Functions - processes and procedures • Storage of hazardous materials and its management • Category Management- classification and codification • Stock Verification Methods • Material Handling Methods and Equipments • Importance of Documentation B. Inventory Management • Functions of inventory • Classification of inventory • Costs associated with inventory • Inventory control methods (like ABC, FSN, VED analysis etc) C. 5S Methodology of housekeeping • Objectives and importance • 5S in practical applications D. Computer Literacy, MS Office & E-mail (2007 & higher versions) • Windows Basics • MS Excel Basics • MS Word Basics • Email – basics and applications E. ERP – Basics • Objectives and importance • Functions • Different ERP Systems like SAP and relevant modules with reference to material procurement F. ISO 9001, 14001 & OHSAS 18001- Objectives and importance • G. Customer Relationship Management in stores – Basics, Objectives and importance, Applications	

13.	**Assistant**	• Office procedures, office correspondence, • Record keeping and maintenance of files, Act and Regulations, • Use and application of computer in office, Data entry, computer network, computer devices, operating systems, Windows, MS Word, MS Excel • Computer maintenance, • Office stationery, paperless office, • ERP, • E-commerce, • Environment, • Communicative English, • Business Communication, • Accountancy, • Desktop Publishing, • Data storage, • Cyber security