Annexure V

INDICATIVE SYLLABUS FOR ALL THE POSTS

PART-A
(GENERAL ABILITY TEST)

General Awareness: Questions will be aimed at testing the candidate's general awareness around him and to test knowledge of current events and of such matters of day to day importance. Questions relating to India pertaining to sports, History, Culture, Geography, economy, Polity & Indian Constitution. These Questions will be such that they do not require a special study.

Basic English Language Skills: Candidates' ability to understand Basic English and his basic comprehension would be tested.

Basic Computer Knowledge: Candidates' basic ability to work with Computers is tested in these questions.

Basic Arithmetic Ability: Questions on problems relating to Number Systems, Computation of Whole Numbers, Decimals and Fractions and relationship between Numbers, Fundamental arithmetical operations, Percentages, Ratio and Proportion, Averages, Interest, Profit and Loss, Discount, Mensuration, Time and Distance, Ratio and Time, Time and Work, etc.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (FOUNDRYMAN)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Types of foundries. Different tools &equipment used in foundry. Different raw materials used in foundry Industries. Specification tools &equipment. Special casting process definition materials used composition, the process; use advantages and disadvantage of CO2 process and shell moulding process.

2) Definition of green sand Advantage and disadvantage of green sand mould, loam sand mould and cement bonded sand mould. Construction, operation and maintenance of pit furnace.

3) Moulding process – bench moulding different methods advantages, disadvantages and their application. Different types of coating on mould cores. Methods of repairing the pattern & core boxes. Various types of drill bits and drilling machine. Induction furnace types & operation. Description of dry sand mould. Brief description types, of die casting, centrifugal casting and ceramic moulding process.

4) Slush casting process, continuous casting process, permanent mould casting process; Nishiyama process (by using ferrosilicon powder). Binders - Common binders used in foundry. Classification of iron ores & its treatments. Common cost iron-alloys..

5) Properties of Gold & Silver, Applications and uses of Gold & Silver plating. Equipments for Silver plating. Various types of Gold & Silver solutions, their compositions and operating conditions, their preparation and maintenance. Processing steps of Gold & Silver plating. Various defects generally encountered in the Gold & Silver plating, causes for these defects and their remedies. Methods for the removal of Gold & Silver deposit from various metals. Applications of electroless plating in electroplating industry. Electroless plating solutions and their operating conditions of copper, silver and gold. General defects, their causes and remedies in electroless plating.

6) Sand testing different methods of moisture content test permeability test, clay content test, strength test, sand grain fineness test, refractoriness test of moulding sand. Common types of natural & synthetic moulding sand as per IS 3343-1965 properties of moulding sand. Ramming procedure of rammer and other tools used in making mould. Importance of hardness test. Different types of Gate cutting system with different tools used & repairs of gates. principle ingredients in moulding sand & their effect on physical properties special additives in moulding sand & their effect unit sand. Facing sand, baking sand Composition of various moulding sand. Types of mould- advantage and disadvantage of sand mould and metal mould.

7) Construction, operation and maintenance of pit furnace. Moulding process – bench moulding different methods advantages, disadvantages and their application. Induction furnace types, construction, operation and maintenance. Description of dry sand mould. Die casting, centrifugal casting and ceramic moulding process. Slush casting process, continuous casting process, permanent mould casting process; Nishiyama process (by using ferrosilicon powder). Common "Fluxes" used in foundry and their application. Specification. Function of chills, densers.

8) Manufacturing process of Silver. Brief information about its furnace. Brief information about blast furnace, Brief information about open hearth furnace, air furnace, paddling furnace and convertors. Heat treatment of casting. Calculation of ferro-static pressure.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (ELECTROPLATING)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Electron theory, Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current. Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Definition and properties of conductors, insulators and semi-conductors. Types of wires & cables, standard wire gauge.

2) Ohm's Law . Resistors -Law of Resistance. Series and parallel circuits & related calculation. Alternating Current -Comparison and Advantages D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.

3) Chemical effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis. Lead acid cell-description, methods of charging. Different types of lead acid cells. Sealed Maintenance free Batteries, Solar battery.

4) Introduction to electroplating, electroplating techniques, definitions of the terms used in electroplating, calculation of surface areas and volumes, specific gravity, properties of metals and non-metals, alloys-their composition and uses; effluent treatment of plating effluents, BOD and COD of effluents.

5) Fundamental particles- electron, proton & neutrons, elements, compounds and mixtures, examples; formulas and symbols; chemical reactions, types of chemical reactions, acids, bases and salts with examples, acidity of a solution, alkalility of a solution, solutions, solute, solvent, saturated solutions ,unsaturated solutions, dilute and concentrated solutions, supersaturated solutions.

6) Grinding and polishing techniques, polishing of different metals such as copper, brass, and finishing of gold and silver, barrelling purpose and methods & techniques.

7) Properties of silver, significant of Silver plating on different metals, advantages and disadvantages. Preparation of Silver solutions, Silver plating on various metals, maintenance of the plating solutions, post plating treatment Silver passivation (Silchrome). Quality tests and inspection like visual, Thickness, Corrosion resistance, Surface finish etc. defects, causes and remedies.

8) Properties of Gold, significant of Gold plating on different metals, advantages and disadvantages. Preparation of Gold solutions, Gold plating on various metals, maintenance of the plating solutions, post plating treatment like lacquering etc. Quality tests and inspection of Gold plating like visual, Thickness, Surface finish etc. Defects, causes and remedies.

9) Copper plating- properties, copper solutions, troubles of copper solutions, factors to be considered in plating, copper plating, defects and causes, application; Nickel plating, electroless nickel plating, trouble shooting application ,process control of plating solutions. Inspection of plated surfaces, visual test, BNF test, salt spray test, corrosion test.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (CHEMICAL PLANT)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Atom, molecule, Element, compound, mixture, Physical change, chemical change, Acids, bases, salts &their properties. Molecular weight, equivalent weight, atomic weight, Normality, molarity. Hard and soft water, water for industrial purposes. Technique to convert hard water to soft water. Types of solutions, saturated, unsaturated, super saturated solutions, solubility of solids, distilled and de-ionized water, melting and boiling points. Reactions of anions and cations. Exothermic and endothermic reactions. Qualitative analysis. Reactions of cations and anions. Purification processes, organic reactions, Boiling point, Melting point, Distillation

2) Ohm's Law. Series and parallel circuits & related calculation. Thermometer and hydrometer. Degree Centigrade, Fahrenheit and its conversion. Definition of pH, pH scale, Chemical effect of electric current and principle of electrolysis. Faraday's Law of electrolysis. Explanation of Anodes and cathodes. Various types of corrosions and importance of protective treatments. Principles and applications of electroplating. Safety precautions in electroplating shop. Exothermic and endothermic reactions. Chemical formulas of different acids, alkalis & cyanides. Method of mixing of electrolyte, use of hydrometer & thermometer. Hard and soft water, water for industrial purposes. Technique to convert hard water to soft water. Types of solutions, saturated, unsaturated, super saturated solutions, solubility of solids, Analysis of chemical baths with hue cell process.

3) Modes of heat transfer – conduction, convection and radiation. Determination of thermal conductivity. Temperature & expansion of solid, liquid. Volumetric analysis- titrimetric analysis. Detection of end point. Types of Titrimetric analysis. Corrosion- causes, effects and prevention. Catalyst definition types of catalysts, characteristics of catalysts and use of catalyst. Introduction to Effluent treatment plan.

4) Definition of fluid, ideal fluid, real fluid, compressible fluid, incompressible fluid. Properties of fluid, Bernoulli's theorem Steam, cooling water, chilled water, brine, instrument air, Nitrogen, vacuum, introduction of boiler, cooling tower, chilling plant, compressor, ejector. Solvent Extraction: Introduction, definition, choice of solvent, distribution coefficient. Equipments used for extraction, Packed and perforated plate towers, application of extractions. Leaching: Application and different types of equipment uses for leaching oil extraction from oil seeds.

5) Mixing: Introduction, classification of mixing equipment's and its applications, mixers for mixing solid-solid, solid-liquid, solid gas. Drying: Definition, factors affecting rate of drying, Different types of dryers,& uses. Introduction and different types of conveyors. Sedimentation & Decantation: Various type of thickeners and sedimentation operation equipment.

6) Metallurgy of: • Copper • Silver • Gold and other alloys. Elasticity, Introduction, stress and strain, modulus of elasticity, different types of stresses, Hook's Law, Young's modulus, Yield point, ultimate, stress-strain graph.

7) Water Chemistry; Use of water in various industrial application viz. Steam generation; various chemical processes; Principles of water analysis; Meaning of the terms Hardness; Turbidity TDS, TSS, pH, DO, BOD, COD Available Chlorine, Principles adopted in determination of hardness of raw water; Analysis of Boiler feed water, Boiler Blow down Water. Principles of Analysis of Sewage water.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (Die & Medal)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Bench work – Metal working hand tools and devices –Work bench – vices – files. Vernier calliper – its parts, principles, reading, uses and care. Outside micrometer – its parts, principles, reading, uses and care, vernier height gauge. Marking tools – scriber. Bevel protractor, uses and cares. Pedestal grinder, star wheel dresser, safety precautions, care and maintenance.

2) Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses, accuracy, care and maintenance. Drill, Tap, Die-types & application. Determination of tap drill size. Reamer- material, types (Hand and machine reamer). Drilling machines-types and their application.

3) Introduction about metals, difference between Metal and Non-Metal, properties of metal, Classification of metals and its applications, pig – iron, cast iron, wrought iron, steel-plain carbon steel, Low carbon steel, medium and high carbon steels, high speed steel, stainless steel, carbides, etc. Heat treatment of metals, process- such as annealing, nit riding, hardening, tempering, case hardening, carburizing, cyaniding, flame hardening, Induction hardening, purposes and its effects on the properties of steel.

4) Different types of Lathe operations - facing, turning, parting-off, grooving, chamfering, boring etc. Lathe cutting tool-different types, shapes and different angles. Milling Machine, types. Driving and feed mechanism of Milling Machine

5) Counter - sinking and Counter boring. Letter and number drill, core drill etc. Reamers-types and uses. Lubricant and coolant-types, necessity, system of distribution. Knurling meaning, necessity, types, grade, cutting speed for knurling. Driving plate. Face plate & fixed & traveling steadies construction and use. Transfer caliper-its construction and uses. Lathe centers-types and their uses. Lathe carrier function types & uses. Mandrel – Different types and its use. Magnetic stand dial indicator, it's used and care. Taper – different methods of expressing tapers, different standard tapers.

6) Grinding wheel: Abrasive, grade structures, bond, specification, use, mounting and dressing. Selection of grinding wheels. Bench grinder parts and use. Gauges. Limit gauge: Ring gauge, snap gauge, plug gauge, description and uses. Annealing and normalizing, Case hardening and carburizing and its methods, process of carburizing (solid, liquid and gas). Gauges and types of gauge commonly used in gauging finished product-Method of selective assembly „Go" system of gauges, hole plug basis of standardization. Bearing-Introduction, classification (Journal and Thrust), ball bearing: Single row, double row, description of each, and advantages of double row. Roller and needle bearings: Types of roller bearing. Bearing metals – types, composition and uses. Tool & cutter grinder.

7) Vee belts and their advantages and disadvantages, use of commercial belts, dressing and resin creep and slipping, calculation. Power transmission scoupling types-flange coupling,-Hooks coupling universal coupling and their different uses. Pulleys-types-solid, split and „V" belt pulleys, standard calculation for determining size crowning of faces -loose and fast pulleys -jockey pulley. Types of drives -open and cross belt drives.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (PRECIOUS METALS)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Knowledge of different ra w materials used in Gold Smith Industry. Steel rule – Inch and meter. Files – their types, grades, cut, convexity, specifications, their use and care. Hacksaw frames and blades – their uses. Description and Specification to different types of Hammers.

2) Knowledge of extracting pure Gold from ore. Knowledge of fired Pit furnace. Calculation of tap drill size. Tap & Dies. Drills, their size and nomenclature. Knowledge of the term carat. Different materials added with Gold to make alloy. Percentage of alloying element to make Gold of different carat (e.g. 24, 22, 20, 18 etc.). Calculation of different alloying elements according to quality of gold. Knowledge on Hallmark. Different process of melting Gold and metals used as an alloy. Melting temperature of Different materials. Assaying analysis of Gold and silver /or other metals.

3) Knowledge on different tools used to provide desired shape to wires and sheets. Knowledge of Die and Punch, Core and Cavity. Solders: - Composition of different materials in solder. Soldering Processes – Knowledge on different soldering processes. Knowledge of Brazing and different process of brazing Equipment's & tools used in soldering and brazing (e.g. Gas Burner, Blow pipe, etc.) lighter. Threads and joints used in Gold Smith trade.

4) Process of melting wax. Methods to fill molten Gold in the mould, removal of blow holes. Polishing. Necessity of jewelry filing and use of different types of jewelry files. Use of dust collector. Techniques for collection of dust during filing, scraping, etc. Precaution to be observed while working with Aqua-Regia.

5) Physical and mechanical properties of metals. Conductors and insulators. Conducting materials and their comparison. Fundamentals of electricity, definitions, units & effects of electric current. Types of electrical supply. Comparison and Advantages of DC and AC. Polarity test in DC. Resistance and specific resistance. Electrical measuring instruments such as Voltmeter, Ammeter and Ohmmeter. Ohm's Law. Magnetic terms; magnetic materials and properties of magnet. Electro magnet, Faradays laws of electromagnetic induction. Types of cells and their applications. Primary cells and secondary cells, Grouping of cells.

6) Basic electronics Semiconductor energy level, atomic structure, types of materials, P-N-junction. Doping, Intrinsic and extrinsic semiconductor, Covalent bond. PN junction diode and its characteristics.

7) Hard and soft water, water for industrial purposes. Technique to convert hard water to soft water. Types of solutions, solubility of solids, distilled and de-ionized water, melting and boiling points. Reactions of anions and cations. Exothermic and endothermic reactions Qualitative analysis. Reactions of cations and anions.

8) Definition of pH, pH scale, Chemical effect of electric current and principle of electrolysis. Faraday's Law of electrolysis. Explanation of Anodes and cathodes. Various types of corrosions and importance of protective treatments. Principles and applications of electroplating. General terms and definitions subjected to electroplating.

9) Properties of Gold & Silver, Applications and uses of Gold & Silver plating. Equipments for Silver plating. Various types of Gold & Silver solutions, their compositions and operating conditions, their preparation and maintenance. Processing steps of Gold & Silver plating. Various defects generally encountered in the Gold & Silver plating, causes for these defects and their remedies. Methods for the removal of Gold & Silver deposit from various metals. Applications of electroless plating in electroplating industry. Preparation of articles prior to electroless plating. General defects, their causes and remedies in electroless plating.

10) Electrochemical and chemical polishing.. Electroforming on metallic and non-metallic models. Electro-eroding , Gilding, Dipping . Basic Metal Work. Preparation and application of enamels. Firing and finishing. Flush and tension setting.CNC Milling for wax models. 3D Printing Technology. Laser soldering Technology .Laser Marking, Engraving.

SYLLABUS FOR THE POST OF JUNIOR TECHNICIAN (FITTER)
PART-B(CONCERNED STREAM/TECHNICAL SUBJECT)

1) Linear measurements - its units, dividers, calipers, hermaphrodite, centre punch, dot punch, prick punch their description and uses of different types of hammers. Description, use and care of „V" Blocks, marking off table. Measuring standards (English, Metric Units), angular measurements.

2) Bench vice construction, types, uses, care & maintenance, vice clamps, hacksaw frames and blades, specification, description, types and their uses, method of using hacksaws. Files - specifications, description, materials, grades, cuts, file elements, uses. Types of files, care and maintenance of files. Measuring standards (English, Metric Units), angular measurements.

3) Marking off and layout tools, dividers, scribing block, - description, classification, material, care & maintenance. Try square, ordinary depth gauge, protractor - description, uses and cares. Uses, care & maintenance of cold chisels

4) Micrometer– principle, parts graduation, reading, use and care. Micrometer depth gauge, parts, graduation, reading, use and care. Digital micrometer. Vernier calipers, principle, , graduations, reading, use and care. Vernier bevel protractor, construction, graduations, reading, use and care, dial Vernier Caliper, Digital Vernier caliper..

5) Drilling processes: common type (bench type, pillar type, radial type), gang and multiple drilling machine. Marking and measuring tools, wing compass, tin man"s square tools, snips, types and uses. Tin man"s hammers and mallets type- sheet metal tools, types, specifications, uses. Trammel- description, parts, uses. Hand grooves specifications and uses.

6) Stakes-bench types, parts, their uses. Various types of metal joints, their selection and application, tolerance for various joints, their selection& application. Rivets-Tin man"s rivets types, sizes, and selection for various works. Riveting tools, dolly snaps description and uses. Method of riveting, The spacing of rivets. Flash riveting, use of correct tools, compare hot and cold riveting.

7) Counter sink, counter bore and spot facing-tools and nomenclature, Reamer material, types (Hand and machine reamer), kinds, parts and their uses, determining hole size (or reaming), Reaming procedure. Tap wrench: material, parts, types (solid &adjustable types) and their uses removal of broken tap, studs (tap stud extractor). Drill kinds: Fraction, metric, letters and numbers, grinding of drill.

8) Grinding wheel: Abrasive, grade structures, bond, specification, use, mounting and dressing. Selection of grinding wheels. Bench grinder parts and use. Gauges-Introduction, necessity, types. Limit gauge: Ring gauge, snap gauge, plug gauge, description and uses.

9) Screws: material, designation, specifications, Property classes (e.g. 9.8 on screw head), Tools for tightening/ loosening of screw or bolts, Torque wrench, screw joint calculation uses. Power tools: its constructional features, uses &maintenance. Locking

device: Nuts- types (lock nut castle nut, slotted nuts, swam nut, grooved nut) Description and use. Various types of keys, allowable clearances& tapers, types, uses of key pullers.

10) Special files: types (pillar, Dread naught, Barrow, warding) description & their uses. Slip gauge: Necessity of using, classification & accuracy, set of blocks (English and Metric). Details of slip gauge. Applications of Slip Guages. Application of slip gauges for measuring, Sine Bar-Principle, application & specification.

12) Lapping: Application of lapping, material for lapping tools, lapping abrasives, charging of lapping tool. Surface finish importance, equipment for testing-terms relation to surface finish. Equipment for tasting surfaces quality – dimensional tolerances of surface finish. Honing: Application of honing, material for honing, tools shapes, grades, honing abrasives. Frosting- its aim and the methods of performance.

13) Annealing and normalizing, Case hardening and carburising and its methods, process of carburising (solid, liquid and gas). Tapers on keys and cotters permissible by various standards. Gauges and types of gauge commonly used in gauging finished product-Method of selective assembly „Go“ system of gauges, hole plug basis of standardization.

14) Vee belts and their advantages and disadvantages, use of commercial belts, dressing and resin creep and slipping, calculation. Power transmission scoupling types-flange coupling,-Hooks coupling universal coupling and their different uses. Pulleys-types-solid, split and „V“ belt pulleys, standard calculation for determining size crowning of faces -loose and fast pulleys -jockey pulley. Types of drives -open and cross belt drives.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT) FOR THE POST OF

Jr. Technician (Turner) at W-1

1) Measurement, line standard and end standard, steel rule different types, graduation and limitation. Hammer and chisel materials, types and uses. Prick punch and scriber. Vice – types and uses, Files different types of uses, cut, grade, shape, materials etc. Try square-different types, parts, material used etc. Calipers types and uses (firm joint). Vee – block, scribing block, straight edge and its uses. Hacksaw-their types & uses.

2) Surface plate its necessity and use. Tap - different types (Taper 2nd and bottoming) care while tapping. Dies different types and uses. Lathe with its main components, lever positions and various lubrication points as well. Definition of machine & machine tool and its classification. Classification of lathe in Function and construction of different parts of Lathe. Types of lathe drivers. Description in details-head stock- cone pulley type- all geared type construction & function. Tumbler gearset. Lathe cutting tool-different types, shapes and different angles (clearances and rake), specification of lathe tools.

3) Vernier caliper-its construction, principle graduation and reading, least count etc. Digital vernier caliper. Outside micrometer –different parts, principle, graduation, reading, construction. Digital micrometer. Cutting speed, feed depth of cut, calculation involved-speed feed R.P.M. etc. recommended for different materials. Different types of micrometer, Outside micrometer. Uses of digital measuring instruments.

4) Drills-different parts, types, size etc., different cutting angles, cutting speed for different material. Boring tool. Counter - sinking and Counter boring. Letter and number drill, core drill etc. Reamers-types and uses.

5) Knurling meaning, necessity, types, grade, cutting speed for knurling. Lathe mandrel-different types and their uses. Concept of interchangeability, Limit, Fit and tolerance as per BIS: 919-unilateral and bilateral system of limit, Fits- different types, symbols for holes and shafts. Hole basis & shaft basis etc.

6) Driving plate. Face plate & fixed & traveling steadies construction and use. Transfer caliper-its construction and uses. Lathe centers-types and their uses. Lathe carrier function types & uses. Mandrel – Different types and its use.Magnetic stand dial indicator, its used and care.

7) Taper – different methods of expressing tapers, different standard tapers. Method of taper turning, important dimensions of taper. Taper turning by swiveling compound slide, its calculation. Bevel protector & Vernier bevel protractor-its function & reading. Method of taper angle measurement. Sine bar- types and use. Slip gauges-types, uses and selection.

8) Form tools-function-types and uses, Template-purpose & use. Dial test indicator- construction & uses. Cutting tool material-H.C.S., HSS, Tungsten.

Carbide, Ceramic etc, - Constituents and their percentage. Tool life, quality of a cutting material. Cutting speed, feed, turning time, depth of cut calculation,cutting speed chart (tungsten carbide tool) etc. Basic classification of tungsten carbide tips.

9) Preventive maintenance, its necessity, frequency of lubrication. Preventive maintenance schedule., TPM (Total Productive Maintenance), EHS (Environment, health, Safety) Marking table-construction and function. Angle plate construction, eccentricity checking. Different types of attachments used in lathe. Various procedures of thread measurement thread screw pitch gauge. Screw thread micrometer, microscope etc.

10) CNC technology basics: Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Machine model, control system and specification. Axes convention of CNC machine
- Machine axes identification for CNC turn centre. Different types of programming techniques of CNC machine. Tool Nose Radius Compensation (G41/42) and its importance (TNRC). Cutting tool materials, cutting tool geometry – insert types, holder types, insert cutting edge geometry. - Describe Tooling system for turning
- Setting work and tool offsets. - Describe the tooling systems for CNC TURNING Centers. - Cutting tool materials for CNC Turning and its applications. Tool holders and inserts for radial grooving, face grooving, threading, drilling.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT) FOR THE POST OF

Jr. Technician (Welder) at W-1 Level

1) Introduction and definition of welding. - Arc and Gas Welding Equipments, tools and accessories. - Various Welding Processes and its applications. - Arc and Gas Welding terms and definitions. Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc. - Types of welding joints and its applications. Edge preparation and fit up for different thickness. - Surface Cleaning.

2) Basic electricity applicable to arc welding and related electrical terms &definitions. - Heat and temperature and its terms related to welding - Principle of arc welding. Common gases used for welding & cutting. - Types of oxy-acetylene flames and uses. - Oxy-Acetylene Cutting Equipment principle, parameters and application. Arc welding power sources: Transformer, Rectifier and Inverter type welding machines and its care &maintenance.

3) Welding positions as per EN & ASME: flat, horizontal, vertical and overhead position. - Weld slope and rotation. Arc length – types – effects of arc length. Polarity: Types and applications. - Weld quality inspection, common welding mistakes and appearance of good and defective welds - Weld gauges &its uses. Calcium carbide uses and hazard. Acetylene gas properties and flash backarrestor. Oxygen gas and its properties, uses in welding. Oxy acetylene gas welding Systems (Low pressure and High pressure).

4) Specification of pipes, various types of pipe joints, pipe welding all positions, and procedure. - Difference between pipe welding and plate welding.

5) Gas welding filler rods, specifications and sizes. - Gas welding fluxes – types and functions. Gas Brazing &Soldering : principles, types fluxes & uses - Gas welding defects, causes and remedies Electrode : types, functions of flux, coating factor, size specifications of electrode. - Effects of moisture pick up. - Storage and baking of electrodes.

6) Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature. Welding of low, medium and high carbon steel and alloy steels. - Induction welding, brazing of copper tubes, Cast iron and its properties types. Welding methods of cast iron. Aluminium properties and weldability, Welding methods - Arc cutting & gouging. Safety precautions in Gas Metal Arc Welding and Gas Tungsten Arc welding.

7) Introduction to GMAW - equipment – accessories. - Various other names of the process Advantages of GMAW welding over SMAW , limitations and applications - Process variables of GMAW. Wire feed system – types – care and maintenance. - Welding wires used in GMAW, standard diameter and codification as per AWS.

8) Heat input and techniques of controlling heat input during welding. - Heat distribution and effect of faster cooling. Pre heating & Post Weld Heat Treatment - Use of temperature indicating crayons. Submerged arc welding process – principles,

equipment, advantages and limitations. Thermit welding processtypes, principles, equipments, Thermit mixture types and applications. - Use of backing strips and backing bars. Plasma Arc Welding (PAW) and cutting (PAC) process – equipments and principles of operation.

9) Resistance welding process -types, principles, power sources and welding parameters. - Applications and limitations. Metalizing – types of metalizing principles. - Manual Oxy – acetylene powder coating processprinciples of operation and applications.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT)

FOR THE POST OF **Jr. Technician (Electrician) at W-1**

1) Fundamentals of electricity, definitions, units & effects of electric current. Conductors and insulators. Conducting materials and their comparison. Joints in electrical conductors. Techniques of soldering. Types of solders and flux.

2) Underground cables: Description, types, various joints and testing procedure. Cable insulation & voltage grades Precautions in using various types of cables.

3) Ohm"s Law; Simple electrical circuits and problems. Kirchoff"s Laws and applications. Series and parallel circuits. Open and short circuits in series and parallel networks. Laws of Resistance and various types of resistors. Wheatstone bridge; principle and its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Series and parallel combinations of resistors.

4) Magnetic terms, magnetic materials and properties of magnet. Principles and laws of electro-magnetism. Self and mutually induced EMFs. Electrostatics: Capacitor - Different types, functions, grouping and uses. Inductive and capacitive reactance, their effect on AC circuit and related vector concepts. Comparison and Advantages of DC and AC systems. Advantages of AC poly-phase system. Conceptof three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.

5) I.E. rules on electrical wiring. Types of domestic and industrial wirings. Study ofwiring accessories e.g. switches, fuses, relays, MCB, ELCB, MCCB etc. Grading of cables and current ratings. Principle of laying out of domestic wiring. PVC conduit and Casing capping wiring system. Different types of wiring - Power, control, Communication and entertainment wiring. Inspection and testing of wiring installations. Special wiring circuit e.g. godown, tunnel and Factory etc. Importance of Earthing. Plate earthing and pipe earthing methods and IEE regulations. Earth resistance and earth leakage circuit breaker.

6) Working principles and circuits of common domestic equipment and appliances. Concept of Neutral and Earth. Working principle, construction and classification of transformer. Single phase and three phase transformers. Turn ratio and E.M.F. equation. Series and parallel operation of transformer. Voltage Regulation and efficiency.

7) Study and understand Layout drawing of control cabinet, power and control circuits. Various control elements: Isolators, pushbuttons, switches, indicators,

MCB, fuses, relays, timers and limit switches etc. Wiring accessories: Race ways/ cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc. Testing ofvarious control elements and circuits.

8) Basic concept, block diagram and working of voltage stabilizer, battery charger, emergency light, inverter and UPS. Preventive and breakdown maintenance. Transmission and distribution networks. Line insulators, overhead poles and method of joining aluminum conductors.

9) Safety precautions and IE rules pertaining to domestic service connections. Various substations. Various terms like – maximum demand, average demand, load factor, diversity factor, plant utility factor etc. Types of relays and its operation. Types of circuit breakers, their applications and functioning. Production of arc and quenching.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT) FOR THE POST OF

Jr. Technician (Electronics/Instrumentation) at W-1 Level

1) Basic terms such as electric charges, Potential difference, Voltage, Current, Resistance. Basics of AC & DC. Various terms such as +ve cycle, -ve cycle, Frequency, Time period, RMS, Peak, Instantaneous value. Single phase and Three phase supply. Terms like Line and Phase voltage/ currents. Insulators, conductors and semiconductor properties. Different type of electrical cables and their Specifications.

2) Single range meters Introduction to electrical and electronic measuring instruments. Basic principle and parts of simple meters. Specifications, symbols used in dial and their meaning. Introduction to electrical measuring instruments. Importance and classification of meters. MC and MI meters. Characteristics of meters and errors in meters. Multi meter, use of meters in different circuits. Care and maintenance of meters. Use of CRO/DSO, Function generator, LCR meter.

3) Different types of soldering guns, related to Temperature and wattages, types of tips. Solder materials and their grading. Use of flux and other materials. Selection of soldering gun for specific requirement. Soldering and De-soldering stations and their specifications. Different switches, their specification and usage.

4) Ohm"s law and Kirchhoff"s Law. Resistors; types of resistors, their construction& specific use, color-coding, power rating. Principles of induction, inductive reactance. Types of inductors. Self and Mutual induction. Types of capacitors, construction, specifications and applications. Dielectric constant. Significance of Series parallel connection of capacitors.

5) Semiconductor materials, components, PN Junction, Forward and Reverse biasing of diodes. Forward current and Reverse voltage. Different diodes, Rectifier configurations, their efficiencies. Working principles of Zener diode, varactor diode, their specifications and applications. Working principle of a Transformer, construction, Specifications and types of cores used. Step-up, Step down and isolation transformers with applications.

5) Construction, working of a PNP and NPN Transistors, purpose of E, B & C Terminals. Transistor applications as switch and amplifier. Transistor input and output characteristics. Transistor power ratings & packaging styles and use of different heat sinks. Different types of biasing, various configurations of transistor (C-B, C-E & C-C), their characteristics.

6) Diode shunt clipper circuits, Clamping / limiting circuits and Zener diode as peak clipper, uses their applications. Heat Sink- Uses & purpose. Suitability of FET amplifiers in measuring device applications. Working of different power electronic components such as SCR, TRIAC, DIAC and UJT.

7) MOSFET, Power MOSFET and IGBT, their types, characteristics, switching speed, power ratings and protection Flip-Flop: Basic RS Flip Flop, edge triggered D Flip Flop, JK Flip Flop, T Flip Flop. Basic flip flop applications like data storage, data transfer and frequency division.

8) Precision Measuring Instruments, gauge blocks, sine bar, dial indicators, vernier callipers, micrometers, bevel protractor, thickness gauges. Types of tubes used for instrumentation. Basics of electrical measuring instrumentsTypes - absolute and secondary instruments. Types of secondary instruments, DC instruments- working principle, method of working.

9) Ohm meters- measuring electrical resistance. Basic construction of Ohm meter,working method of ohmmeter. Types of Ohm meter - series and shunt type of ohm meters. Megger/insulation tester, earth tester - construction working advantages and disadvantages of various types of ohm meter. AC instruments - types of AC measuring instruments -MI, electro dynamometer type, Working principle, advantages and disadvantages of MI instruments and electro dynamometer instruments. Various applications. Induction type meters - working principle construction and operation of induction type instruments. Construction and Applications - single phase and three phase energy meter, watt meter. Walt hour meter, Ampere Hour meter, power factor meter etc. Special instruments: voltage tester, continuity tester, rotation test, phase sequence indicator, synchronizing, the synchroscope, _ frequency meter. Thermocouple typeammeters.

11) Scope and necessity of instrumentation. Fundamentals of measurement systems. Calibration and calibration standards– basic standards, secondary standards, working standards. Fundamental units - The metric system, Base & supplementary units, Derived Units, Multiplying factors and standards of length, mass, time & frequency.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT) FOR THE POST OF

Jr. Technician (Plumber) at W-1 Level

1) Plumber's common hand tools • Description, types and uses of holding device, hammers & cold chisels, cutting tools. Description of simple fitting operations hack sawing, punching and filing. • Types of files used commonly. • Marking instruments and their use of simple drilling machine. • Method of using drills. • Description of simple bench drilling Machine. • Description of Grinding and Chisel. • Description of different types of locking and fastening devices.

2) About different types of pipes-GI, CI, DI, PVC/ CPVC, PPR, AC and HDPE etc. • About different Types of Pipe Fittings:- Socket, Elbow, Tee, Union, Bend, Cap, Plug, Cross, Ferrule etc. • About different types of Thread cutting.

3) Purpose of Gas welding. • Method of gas welding • Safety precautions to be observed -Methods of soldering and brazing - fluxes used & Types of fluxes precautions to be observed. • Hard & soft solders -their properties, composition and uses.

4) Description of plumber tools and Equipment Ratchet brace, Threading die, Pipe wrench, Sliding wrench, Spanner set, Chain Wrench etc. and their safety. Care & use of tools. • Pipes of different kinds • Method of Pipe bending in different dia. • Plumbing Symbols and Code for Tools & Materials on water line.

5) Types of fittings for different joints & different pipes.:- CI,HCI,AC,AC Pressure, DI, GI Pipes. Joints:- Flange joint, Socket joint with lead, Detachable joint, Socket & Spigot joints etc. • Description of pipe fittings. • Methods of joining and their uses. • Precautions to be taken while fixing. Different kinds of Joints, Fittings and Materials in joining pipes: - PVC/CPVC, PPR and HDPE etc.

6) Composition of Water: - • Sources of water • Hard & Soft water, temporary hardness &permanent hardness. • Impurities of water – organic and inorganic impurities. • Water purification stages and methods. • Static water pressures and measurement of pressures. Bursting pressure, • Expansion of water on freezing and heating. • Bernoulli's principles • Pascal's law. • Pressure of water on the sides of cistern or tank. • Water hammer in pipes.

7) Use of hummed and asbestos pipes of different sizes. • Method of laying out pipes alignment and joining. Description of various pipe joints- straight, Branch, Taft and blow, Expansion joints. Solders and fluxes used in joints. Description of Plumber's materials Lead, tin, Zinc, solder, copper, red lead etc. and their uses. • Water supply system of a small town. • Description and types of pumps viz. suction pump, Centrifugal pump etc. Contamination of water in a well.

8) Description of pipe dies, their uses, care and precaution. • Metric specification of various pipes. • Standard pipe threads. • Method employed for bending, Joining and fixing PVC pipe. • Joining material for water and gas pipes. • Use of blow lamp.

9) Inspection chamber, septic tank, description of drains, cesspools, soak pits etc. • Types of traps • layout of drainage system.

10) Method of bending pipes by hot and cold process. Method of dismantling and renewal of the valves and pipes. Leaks in pipes and noises in plumbing. • Installation of water meters. Air lock in pipes and its removal. (Description of cocks & valves-their types, materials & advantages for particular work.

11) Erecting rain water and drainage pipe system, • Installation of sanitary fitting s, inspection and testing of water supply system. -Pipe alignment and slope. -Prevention of water hammer. • Storage tanks for general water supply propose. • Test for water supply pipes. • Description of sanitary fittings, • general points to be observed when choosing sanitary.

INDICATIVE SYLLABUS FOR PART-B(TECHNICAL SUBJECT) FOR THE POST OF

Jr. Technician (Machinist) at W-1 Level

1) Linear measurements- its units, steel rule dividers, callipers – types and uses, Punch – types and uses. Uses of different types of hammers. Description, use and care of marking off table. Bench vice construction, types, uses, care & maintenance, vice clamps, hacksaw frames and blades, specification, description, types and their uses, method of using hacksaws. Files- elements, types, specification and their uses. Methods of filing.

2) Pedestal grinding machine: Use, care and safety aspect. Marking off and layout tools, scribing block, care & maintenance. Try square, ordinary depth gauge, Care & maintenance of cold chisels, materials, types, cutting angles.

3) Marking media, Prussian blue, red lead, chalk and their special application, description. Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses, accuracy, care and maintenance. Drill, Tap,Die-types & application. Reamer- material, types (Hand and machine reamer), parts and their use.

4) Interchangeability: Necessity in Engg, field, Limit- Definition, types, terminology of limits and fits-basic size, actual size, deviation, high and low limit, zero line, tolerance zone, allowances.

5) Vernier calliper-its parts, principle, reading, uses & care. Outside micrometer- its parts, principle, reading, uses, Reading of Vernier Micrometer), care & maintenance. Dial test indicator-its parts, types, construction and uses.

6) Drilling machines-types &their application, construction of Pillar & Radial drilling machine. Countersunk, counter bore and spot facing-tools and nomenclature. Lathe cutting tool-different types, material, shapes and different angles (clearance, rake etc.) and their effects, specification of lathe tools, grinding process of tools. Concept of Orthogonal and Oblique Cutting. Chucks & different types of job holding devices on lathe. Mounting and dismounting of chucks. Vernier Bevel Protractor – parts, reading and uses.

7) Taper – different methods of expressing tapers, different standard tapers. Method of taper turning, important dimensions of taper. Taper turning by swiveling compound slide, its calculation. Different thread forms, their related dimensions and calculations of screw cutting in a lathe.

8) Slotter– Classification, principle, construction, Safety precaution. Job holding devices-vice, clamps, Vblock, parallel block etc. Slotting tools- types, tool angles. Milling Machine: Introduction, types, parts, construction and specification. Driving and feed mechanism of Milling Machine.

9) Jigs and Fixtures– Introduction, principle, types, use, advantages & disadvantages. Properties of metals general idea of physical, mechanical properties of metals, colour, weight, hardness toughness, malleability, ductility their effect on machinability. Heat Treatment – Introduction, necessity, types, Purposes, different methods of Heat Treatment. Heat Treatment of Plain Carbon Steel.

10) Turning of taper by taper turning attachment - advantages and disadvantages, taper calculations. Terms relating screw thread major/ minor diameter, pitch and lead of the screw, depth of thread. Simple gear train and compound gear train change gears for fractional pitches.

11) Grinding – Introduction, grinding wheel abrasive, types, bond, grade, grid, structure, standard marking system of grinding wheel, selection of the grinding wheel. Surface Grinder – Types, Parts, construction, use, methods of surface grinding, specification & safety. Cylindrical grinder: Introduction, parts, construction, types, specification, safety, different methods of cylindrical grinding. Cylindrical grinder: Introduction, parts, construction, types, specification, safety, different methods of cylindrical grinding. Various methods of cutter grinding.

12) Vertical Milling Machine- its parts. Method of boring in Vertical milling. Difference between Horizontal and Vertical Milling Machine. Helix and Spiral introduction, types and elements. Difference between helix & spiral. Difference between R.H. and L.H. helix. Reamer – types, elements and uses. Calculations for cutting Reamer.

13) CNC technology basics, Comparison between CNC and conventional lathes. Concepts of positioning accuracy, repeatability. Tool nose radius compensation (TNRC) and why it is necessary.