

**सांकेतिक पाठ्यक्रम/ INDICATIVE SYLLABUS**

**FOR THE POST OF: SUPERVISOR (TECH- Mechanical/Electrical/Metallurgy/Assay)**

**1) General Arithmetic:**

Problems relating to Integers and Whole Numbers, LCM and HCF, Decimals and Fractions, Relationship between numbers, Fundamental Arithmetic Operations and BODMAS, Percentage, Ratio and Proportions, Work and Time, Direct and inverse Proportions, Averages, Simple Interest, Profit and Loss, Discount, Area and Perimeter of Basic Geometric Figures, Distance and Time, Lines and Angles, Interpretation of simple Graphs and Data, Square and Square roots etc.

**2) Logical Reasoning :**

The questions will be broadly based on Alpha-Numeric Series, Coding and Decoding, Analogy, Following Directions, Similarities and Differences, Jumbling, Problem Solving and Analysis, Non-verbal Reasoning based on diagrams, age Calculations, Calendar and Clock, etc.

**3) Technical/Professional knowledge in relevant trade:**

[THE QUESTIONS SHALL BE COMMENSURATE TO DIPLOMA LEVEL]

**For Mechanical Stream's Supervisor:**

*Mechanical Engineering:*

- a) **Theory of Machines and Machine Design-** Concept of simple machine, Four bar linkage and link motion, Flywheels and fluctuation of energy, Power transmission by belts – V-belts and Flat belts, Clutches – Plate and Conical clutch, Gears – Type of gears, gear profile and gear ratio calculation, Governors – Principles and classification, Riveted joint, Cams, Bearings, Friction in collars and pivots.
- b) **Engineering Mechanics and Strength of Materials-** Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, Bending moments and shear force diagram, Stress in composite bars, Torsion of circular shafts, Thin walled pressure vessels, Hardness scales & testing of material
- c) **Thermodynamics, Refrigeration & Air-conditioning-** 1st Law of Thermodynamics, 2nd Law of Thermodynamics; Thermal Efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin – Planck & Clausius Statements of 2nd Law of Thermodynamics, Absolute or Thermodynamic Scale of temperature, Clausius Integral, Entropy, Properties of Pure Substances: p-v & P-T diagrams of pure substance like H<sub>2</sub>O, Heat treatment of steel
- d) **Automobile/IC engine** - Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S Planes; Thermal Efficiency, Diesel Cycle; Plot on P-V, T-S planes; Thermal efficiency,
- e) **Air compressors** - Types of Air compressors, screw compressor, air dryers, properties & industrial application of compressed air
- f) **Fluid mechanics** – types of flow, types of water pumps, types of pipes used in industries, pipe joints, Reverse osmosis plants
- g) **Power press** – Types of power press, principles, operation, load calculation, shearing/punching force
- h) **Workshop technology & Material science** – Lathe machines, CNC machining, grinding technology, milling machines, types of measuring instruments, workplace safety techniques, types of steel, type of alloys, copper alloys
- i) **Modern industrial practice** – Lean manufacturing, 5S
- j) **Machine Maintenance techniques** – Preventive, breakdown, planned, downtime calculations, modern machine maintenance tools



### ***ELECTRICAL***

- a) Basic concepts: Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.
- b) Circuit law: Kirchoff's law, Simple Circuit solution using network theorems.
- c) Magnetic Circuit: Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.
- d) AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit.

### ***CSE/IT***

- **Computer:** History of Computer and their classification, Basic Organization, Memory – RAM, ROM, EPROM, etc, Magnetic-Floppy, Hard disks, CDROM, WORM etc, Concept of Virtual Memory and Cache Memory, Number systems, binary octal, Hexadecimal, Binary Addition, Subtraction and Multiplication, Flotation, point representation and arithmetic, Arithmetic through stacks.

### ***OTHER TECHNICAL ASPECTS***

1. ISO standards
2. Quality Management 7QC tools.
3. SPC/SQC Techniques Calibration, Gauging, Digital Measurements
4. Safety Guidelines, Factories Act.
5. Environment Aspects, Discharge and their control
6. Industry 4.0
7. Engg Math + Engg. Drawing
8. Material handling
9. BS Standards for materials & Material testing
10. Energy Efficiency.

### **For Electrical Stream's Supervisors:**

### ***ELECTRICAL ENGINEERING***

1. Basic concepts: Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.
2. Circuit law: Kirchoff's law, Simple Circuit solution using network theorems.
3. Magnetic Circuit: Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.
4. AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit.
5. Measurement and measuring instruments: Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.
6. Generation, Transmission and Distribution – Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, types of faults, short circuit current for symmetrical faults. Switchgears – rating of circuit breakers, Cable – Different type of cables, cable rating and derating factor.
7. Electrical Machine: Induction Motor, Synchronous Motor, DC machines, Three Phase Induction Motor, Single Phase Induction motor, Synchronous Machines.



### **ELECTRONICS**

- 1) Conductors, Semi-conductors, Insulators, Magnetic, Passive components, characteristics of Resistors, Capacitors and inductors. PN Junction diode, forward and reverse bias characteristics and equivalent circuits of diode, Zener diode and applications, clipping, clamping and rectifier circuits using diodes. Bipolar Junction Transistors (BJT) Field Effect Transistor (FET) and MOSFET; Biasing and stability, Emitter follower and its applications – Negative feedback Transistor as a switch, Multistage Amplifiers, Feedback, Oscillators, Multivibrators, Voltage regulation, Power amplifiers.
- 2) Introduction to Network Theorems: Kirchoff's laws, superposition, Thevenin's Norton's and Maximum power theorems. Voltage and Current relationship in the resistance, inductance and capacitance. Concept of reactance, susceptance, conductance, impedance and admittance in series and parallel RL, RC and RLC circuits – Three phase supply-star and delta connection diagrams – Relation between line and phase voltages and currents, series and parallel resonance circuits – condition of resonance, resonant frequency, Q factor and bandwidth.
- 3) Digital electronics: – Logic gates, Demorgan's theorem, Boolean algebra, frequency counters, flip-flops, shift registers, Basic concepts of Digital to Analog and Analog to Digital Converters, Timing circuits, Digital logic circuits, systems & codes Combinational logic design.
- 4) Power Electronics: Basic concepts

### **CSE/IT**

- **Computer:** History of Computer and their classification, Basic Organization, Memory – RAM, ROM, EPROM, etc, Magnetic-Floppy, Hard disks, CDROM, WORM etc, Concept of Virtual Memory and Cache Memory, Number systems, binary octal, Hexadecimal, Binary Addition, Subtraction and Multiplication, Flotation, point representation and arithmetic, Arithmetic through stacks.

### **OTHER TECHNICAL ASPECTS**

1. ISO standards
2. Quality Management 7QC tools.
3. SPC/SQC Techniques Calibration, Gauging, Digital Measurements
4. Safety Guidelines, Factories Act.
5. Environment Aspects. Discharge and their control
6. Industry 4.0
7. Engg Math + Engg. Drawing
8. Material handling
9. BS Standards for materials & Material testing
10. Energy Efficiency.

### **For Metallurgy Stream's Supervisors:**

- 1) Photo-electric effect, Einstein's photoelectric equation, working of a photoelectric cell, super conductor and superconductivity, examples of superconducting materials. concept of expansion of gases, Boyle's Law, Charles Law, absolute zero temperature, ideal gas, gas constant and Universal gas constant, Isothermal process & adiabatic process, first and second laws of thermodynamics.
- 2) Fundamental particles of an atom like electron, proton and neutron etc., concept of atomic number and mass number, Postulates of Bohr's atomic theory. Aufbau's principle, Hund's rule and Pauli's exclusion principle.-



- Postulates of Electronic theory of valency, three types of Chemical bonding, Arrhenius theory of Acids and Bases, Bronsted - Lowry theory of acids and bases. , Lewis theory of acids and bases. Sources of water- soft water and hard water, Degree of hardness, Osmosis and Reverse Osmosis (RO).
- 3) Materials classification, metal properties & classification, divisions of metallurgy. Ferrous, Non Ferrous Metals and their Alloys: Classification of steels and their applications. Need for alloying steels, different alloy steels - their properties, applications. Different cast irons - composition, properties and their applications. Important non-ferrous metals brass, bronze - their compositions, properties and applications. Properties of bearing metals.
  - 4) MANUFACTURING PROCESSES: Melting process, different furnace used for melting - cupola, reverberator, induction, arc., Definition of casting, sand casting processes - Rolling operation, different rolling mills, Principle of forging, different types of forging hammers and press ,smith forging and closed die forging .Process of extrusion by direct method and indirect method., Different drawing processes - rod drawing, wiredrawing, deep drawing., Powder metallurgy processes : production of metal powders, powder mixing ,sintering and compacting of powders into shapes., Powder metallurgy applications.
  - 5) PRINCIPLES OF EXTRACTIVE METALLURGY-PYROMETALLURGY: Types of pyro metallurgical operations- Drying, calcination and Roasting. Smelting: Types of smelting-principle of Reduction smelting & Matte smelting. Refining: Definition & purpose -Types of refining. PRINCIPLES OF EXTRACTIVE METALLURGYHYDROMETALLURGY: Leaching- properties of leachant -suitable Materials for leaching- types of leaching methods - precipitation-. PRINCIPLES OF EXTRACTIVE METALLURGY-ELECTRO METALLURGY: Electrolysis: Definition & principle- cathodic & anodic reactions of electrolysis, Faraday's laws of electrolysis - Electrolytic Refining.
  - 6) Crystal Structure: Metallic Bond, Space lattice, Unit cell , Lattice parameter, Coordination Number, Effective Number of atoms. Planar Density for different planes. Solidification of Metals and Alloys: Differentiate Metal & Alloy, types of Solid phases, Cooling curves, process of crystallization with respect to Nucleation, Grain growth & under cooling, Dendritic Growth & Coring, Homogeneous & Heterogeneous Nucleation. Allotropy Transformations in pure Iron, curie temperature, meta-stable phase, effect of Carbon on Mechanical properties of steel, Classification of Cast irons. Copper-Zinc equilibrium up to 50% Zinc, different brasses. season cracking and its remedies, Copper, Nickel alloys with composition and applications.
  - 7) Foundry as a production process, advantages and Limitation of foundry. Type of foundries, sand casting process -pattern making-core making-moulding-meltingpouring - cleaning. Patterns: Pattern and its function in a foundry. Sand moulds: Green and dry sand moulds, Properties of sand, shatter Index value, sand testing methods. Cores: Function of cores, core sands, core ingredients, core oils, core binders, Properties of core sands, Core making. Hand moulding tools and equipment. Machine moulding equipment.
  - 8) Heat treatment Furnaces: Classification and use, Continuous and Batch furnaces. Furnace Atmospheres: Types of furnace atmospheres - Exothermic and Endothermic atmosphere, Method of controlling of controlled atmospheres. Heat treatment of Nonferrous Metals: Precipitation hardening of Al-Cu alloys, Heat treatment of Brasses and Bronzes.
  - 9) Welding, weld ability, HAZ. Micro structures of welds. PWHT. Introduction, metallurgical aspects of welding, weld ability, HAZ. Micro structures of welds. PWHT.
  - 10) Corrosion principles: Electro - chemical principles of corrosion, Faraday's laws, Types of electrochemical cells, Thermodynamic principles of corrosion, Electrode potential of Metals, Nernst Equation for electrode potentials, Reversible Hydrogen electrode, Conversion of signs for electrode potentials, Electromotive series/standard electrode potentials and thermodynamic corrosion theory.
  - 11) Mechanical working of Metals: Hot working & Cold working, Necessity of annealing to cold worked metal, Recovery, Recrystallization and Grain Growth, Recrystallization Temperature, Variables influencing the recrystallization. Forging: Forging, Open die forging operations- Edging, Filleting, Swaging, Drawing down, Punching & Piercing, Rotary swaging.
  - 12) 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.

- 13) Principles of qualitative analysis Groups I to V (only  $\text{Ag}^+$ ,  $\text{Hg}_2^+$ ,  $\text{Cu}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$  and  $\text{Mg}^{2+}$ ); Nitrate, halides (excluding fluoride), sulphate and sulphide.
- 14) Standards Knowledge of Assaying Process as per IS1417:2016, IS: 1418 – 2009 for Gold and IS 2113: 2016 for Silver, Hall Marking as per IS 15820:2009.

#### For Assay Stream's Supervisors:

- 1) Measuring Instruments and Measurements
- 2) Applied Mechanics
- 3) Mechanical Operations and Solid Handling
- 4) Fluid Mechanics
- 5) Material Science
- 6) Basics of Electrical and Electronics Engineering
- 7) Chemical Technology
- 8) Chemical Engineering Thermodynamics
- 9) Process Plant Utilities
- 10) Fuel and Material Technology
- 11) Heat Transfer Operations
- 12) Mass Transfer Operations
- 13) Pollution Control and Industrial Safety
- 14) Chemical Reaction Engineering
- 15) Process Control
- 16) Process Equipment Design
- 17) Material and Energy Balance
- 18) Renewable Energy Sources
- 19) Computer Applications in Chemical Engineering
- 20) Properties of Matter Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve. Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula & numerical) & its applications.
- 21) Heat and Thermometry Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relations amongst them, coefficient of thermal conductivity, engineering applications.
- 22) Mechanical Properties of Metals such as Hardness, Toughness, Ductility, Malleability, Tensile Strength, Tenacity, Machinability, Extrusion, Forging, Castability, Weldability, Soldering.
- 23) Physical properties and applications of some commonly used metals and metalloids such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Ag, Si.
- 24) Concept of pH, pH scale, applications of pH in industry



**FOR THE POST OF ENGRAVER (SCULPTURE / METAL WORKS)/Laboratory Assistant/ Junior Technician (Fitter/Turner/Electrician/Attendant Operator - Chemical Plant / Carpentry/ Goldsmith/Melter)**

**1) General Arithmetic:**

Problems relating to Integers and Whole Numbers, LCM and HCF, Decimals and Fractions, Relationship between numbers, Fundamental Arithmetic Operations and BODMAS, Percentage, Ratio and Proportions, Work and Time, Direct and inverse Proportions, Averages, Simple Interest, Profit and Loss, Discount, Area and Perimeter of Basic Geometric Figures, Distance and Time, Lines and Angles, Interpretation of simple Graphs and Data, Square and Square roots etc.

**2) Logical Reasoning :**

The questions will be broadly based on Alpha-Numeric Series, Coding and Decoding, Analogy, Following Directions, Similarities and Differences, Jumbling, Problem Solving and Analysis, Non-verbal Reasoning based on diagrams, age Calculations, Calendar and Clock, etc.

**3) Technical/Professional knowledge in relevant trade:-**

**Technical/Professional Knowledge Questions for the post of Engraver (Sculpture/Metal Works)**

- History of Indian and Western Art
- History Of Art
- Fundamental of Art

**A) Indian Art:** Ajanta Murals, Ellora Cave Temples, Buddhist & Jain Manuscript Painting, Rajput, Kalighat Patachitras, Indus Valley Civilization-Sculpture, Terracotta & Pottery, Mauryan Sculpture, Shunga Sculpture – Sanchi, Bharahut and Bodhgaya, Amaravati Sculpture, Kushan Period – Gandhara and Mathura Sculpture, Origin of the Buddha Image, Gupta Sculpture-Hindu, Pala-Sena Sculpture, Pallava Sculpture, Khajuraho, Bhuvaneshwar and Konarak, Chola Sculpture, Pallava Sculpture

**B) Metal Sculptures of North India.**

**C) Metal Sculptures of Western India.**

**D) Metal Sculptures of East India.**

**E) Metal Sculptures of South India**

**F) Western Art:** Realism –Gustave Courbet & Mille, Impressionism—Manet, Monet, Renoir, Degas, Post Impressionism—Gauguin, Van Gogh, Seurat, Cezanne, Fauvism-Matisse, German Expressionism, Edward Munch, Modigliani, Influence of Cubism on later Modern Art, Modern Sculpture-Rodin, Brancusi, Giacometti, Henry Moore, Futurism-A brief Introduction, Dadaism- Marcel Duchamp, Egyptian Sculpture, Greek Sculpture and Painting, Roman Sculpture.

**MODELLING FROM LIFE**

- 1) Study of human figures structures with reference to anatomy of full figure and portrait study n classy $\frac{1}{2}$ ,  $\frac{3}{4}$  size clay modelling from life model I various poses as well as nude, semi-nude and draped.
- 2) Simplifications of human figure – various textural qualities to be obtained the application of the clay modelling to get various light effect, moulding an casting of  $\frac{1}{2}$ ,  $\frac{3}{4}$  size full figure model in plaster and small sketches in bronze.
- 3) Torso study in drawing and making torso in clay

**SCULPTURAL DESIGN**

- 1) Study of the development of sculptural organization observed from objective and non-objective forms in order to explore the expressive possibilities.
- 2) A segment in round and relief in clay and plaster creating structural forms through various mixed Medias and various medium such as bronze, lead wax etc.

**Wood Sculpture & Wood Carving**

- 1) Study of different woods which are permanently used in wood carving such as teak, Rosewood, Yellow wood and similar to that study of various possibilities of wood carving methods.



- 2) Study of wood carving methods also methods of joining wood treatment & wood seasoning etc. Assignment based on carving on wood block and assembling the wooden various colored pieces.

### **Ceramic Sculpture**

- 1) Preparing various bodies of clay and selecting three out of these bodies from sculptures.
- 2) Soft Body –Earthen wears, Semi stone wear, also executing sculpture either by slip, slab, and hand-built method. Making piece slip casting & surface made with various methods used in ceramics. To utilize the methods of Hand Building process and process for constructing the sculpture.
- 3) Terracotta relief & round sculpture relief & round sculpture decorated with the following methods- 1. Engobing, 2. Incising 3 Perforation, 4. Applique, 5. Coiling & 6. Impression.

### **Metal Sculpture (Welded Sculpture & Bronze Casting)**

- 1) Copper, Brass, Lead and their use in response in round and in relief,
- 2) Possibilities and limitations of metals sculptors by casting Exercise in all stages of Bronze casting taking mold casting, Finishing & Platination .
- 3) Hammering & Casting Techniques
- 4) Embossing & Repousse Techniques
- 5) Chasing Techniques
- 6) Engraving Techniques
- 7) Inlaying Techniques
- 8) Drawing From Cast and Figure
- 9) Enamel Design
- 10) Repousse Design
- 11) Visualization Enamel Design
- 12) Visualization Repousse Design

### **Technical/Professional Knowledge Questions for the post of Laboratory Assistant**

- 1) Atomic structure and elementary quantum mechanics: Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck's radiation law, photoelectric effect, Compton effect, De Broglie's hypothesis. Heisenberg's uncertainty principle, Schrodinger's wave equation and its importance.
- 2) Gaseous State: Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO<sub>2</sub>. The van der Waal's equation and critical state. Joule Thomson effect and inversion temperature of a gas.
- 3) Liquid State: Intermolecular forces, structure of liquids. Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer.
- 4) Chemical Bonding: Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions, covalent nature of ionic bond, covalent bond, Molecular orbital theory.
- 5) Volumetric Analysis: Standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid -weak base, weak acid- strong base and weak acid -weak base.
- 6) Gravimetric analysis- Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, co-precipitation and post precipitation. Determination of Ni<sup>2+</sup> S3-G-2:
- 7) Theories of bonding in metals: Valence bond theory, Free electron theory, thermal and electrical conductivity of metals, Band theory, formation of bands. Classification of materials- classification as metals. The property of super conductivity of materials, Meisner effect and thermal properties. Composites, advanced composites and their classification.
- 8) s-block elements: General Characteristics of groups I and II elements, Diagonal relationship between Li and Mg, Be and Al.



- 9) p-block elements: Group-13, 14 & 15: Synthesis, structure, Classification, reactivity and Industrial application.
- 10) Oxides: Types of oxides, Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis. Oxy acids: Structure and acidic nature of oxyacid of B, C, N, P, S and Cl.
- 11) Anion analysis, Cation Analysis, separation and identification of group II ( $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Sb}^{2+}$ ), III ( $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ), IV ( $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ) . Application of concept of hydrolysis in group V cation analysis. Separation and identification of group V individual cations ( $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ). Theory of flame test. Identification of Group VI cations ( $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$ ).
- 12) Zero group elements: General preparation, structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides
- 13) Chemistry of d-block elements: Characteristics of d-block elements with special reference to electronic configuration variable valence, ability to form complexes, magnetic properties & catalytic properties.

**Technical/Professional Knowledge Questions for the post of Junior Technician Attendant Operator-Chemical Plant**

- 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. Equipment 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.

Q



- 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.

**Technical/Professional Knowledge Questions for the post of Junior Technician (Fitter)**

- a. 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.
- b. 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.
- c. 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  
- materials, types, cutting angles. Marking media, marking blue, Prussian blue, red lead, chalk and their special application & Description. Power Saw, band saw, Circular saw machines used for metal cutting.
- d. 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.
- e. 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.
- f. Stakes-bench types, parts, their uses. Various types of metal joints, their selection and application, tolerance for various joints, their selection& application. Wired edges. Various rivets shape and form of heads, importance of correct head size. 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.
- g. 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.
- h. 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.
- i. 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.

Q



j. 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 Gauges. Application of slip gauges for measuring, Sine Bar-Principle, application & specification.

k. 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 lapping 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.

l. 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. 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 rollers bearing. Bearing metals – types, composition and uses.

m. Vee belts and their advantages and disadvantages, use of commercial belts, dressing and resin creep and slipping, calculation. Power transmission coupling 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.

#### **FOR THE POST OF JUNIOR TECHNICIAN (GOLDSMITH)**

- 1) Knowledge of different 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 ~~and~~ 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. NC Milling for wax models. 3D Printing Technology. Laser soldering Technology .Laser Marking, Engraving.

#### **FOR THE POST OF JUNIOR TECHNICIAN (ELECTRICIAN)**

- 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. Concept of 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 of wiring 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:



4

Race ways/ cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc. Testing of various 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.

#### FOR THE POST OF JUNIOR TECHNICIAN (TURNER)

- 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.

### FOR THE POST OF JUNIOR TECHNICIAN (CARPENTRY)

- 1) Introduction to carpentry hand tools, their classification, names and the uses. Measuring, marking and testing tools, types, sizes, uses, etc Introduction to timber: growth of a trees, cross-section of an exogenous tree trunk, parts, formation. Parts of a tree. Functions and identification of timber and defects, diseases of timber VIZ. Knots, shakes, grains etc.
- 2) Saw and the Plane: description, types, sizes, setting, sharpening, uses, etc. Special saws - Compass saw, coping saw, Bow saw, fret saw portable circular saw. Different types of Plane : description, types, sizes, setting, sharpening, uses, etc. Special planes: - Compass plane Moulding plane, Rebate plane, Grooving plane etc. - description, type, size, use, care and maintenance. Portable power planer machine and its uses.
- 3) Hand tools (paring tools); Different types of the chisels, description, sizes, uses. Grinding, sharpening & honing etc. Striking tools - Hammers, mallets etc. Workshop appliances: work bench, bench vice, bench hook, bench stop shooting board, MITRE board etc. - types, sizes, uses etc.
- 4) Classification and grading of timbers as per ISI. types of the grains. Joineries: Classification of joint (framing, Angle broadening and the lengthening) Framing Joints: - Halving, Mortise and tenon joints, Bridle joints- description, types and uses. Angle joint: - Description, types size, uses etc. Seasoning of Timber: Types, advantages and disadvantages, stacking (vertical and horizontal) Moisture content in timber and its effect on timber, moisture meter and oven method. Characteristics of wood, Physical and mechanical properties of wood, qualities of good timber. Broadening joints - description, types, and uses. Adhesives - types, uses etc. Lengthening joints: Different types of scarf joints – Description and types of Table scarf, bevel scarf, tension scarf etc.
- 5) Preservation of timber: Chemical treatment of timber - types, process etc. and preservatives used. Files: Types, grades, uses, care and maintenance. Uses of electrical portable jig saw, portable disc sander, portable electrical drill machine.
- 6) Boring tools: Description and types Country drill, hand drill, ratchet brace, breast drill – parts, functions, size and use. Portable electric drilling machine - description, uses etc. Drill bits - type, size and uses. Calculation of timber required for stool. Prepare cutting list from drawing (sawn size and finish size). Hand augur – description, size & uses.
- 7) Description of timbers used in furniture making work: - Teak, Sal, Deodar and other wood as available in the local market. Conversion of timber: Parallel sawing, radial sawing, quarter sawing, tangential sawing etc. Design of Furniture's for different purpose: - Bed room, dining Hall, Library, Office, Work-shop, Class room.
- 8) Tools required for carving ornamental works. Properties of wood. Preparation of bill of materials and simple estimation. Wood working machines: Description, types, sizes, parts, functions, operations. Safety precautions, care and maintenance. Oiling, greasing etc. of the following machines: A) Band Saw B) Circular saw C) Planning machine D) Wood Turning Lathe with Turning tools. Market form of timber. Conversion of timber method, advantages, disadvantages.
- 9) Description, types, sizes, parts, functions, operations, safety precautions, care and maintenance etc. of the following machines) Drilling Machine. B) Grinding Machine. C) Mortiser Machine. D) Universal wood working Machine.
- 10) Calculation of timber – weight, area, volume etc. Introduction to pattern making Hand tools. Contraction rule and different allowances. Shrinkage, drafting, machine allowances. Different types of timbers used in pattern making. Reading of blue print. Layout board and its use. Types of pattern and their uses. Split patterns -Types and uses. Dowel- types, size and uses in pattern making work. Core and core prints: Types & uses. Colour code as per IS specifications. Use of paints on pattern core, core box, core prints etc. Estimate volume of wood and other requirements for pattern making box.



- 11) Introduction about carpentry work involved in building construction. Types of doorframes, door shutters- description, sizes, uses, advantages and disadvantages etc. Fittings used in door. Types of panels used in panel shutter, glazed shutter. Familiarization with the materials which is used in industries as substitute of wood. Characteristics of material, Mechanical properties, durability, Applications, etc. Types of window frame and window shutters. Protection bars: types and uses. Roof trusses: King post, queen post etc. related terms, sizes construction etc.
- 12) Basic principle of repairing work and repairing technique of furniture, door, window, rack etc. Use of Nails, screws angle plate, bracket, nuts, bolts etc. for repairing work. Packing case: -Types, material and tools used. Types of hanging plates, corner plates etc. used in carpentry work. Economic factors and material estimate.

**FOR THE POST OF JUNIOR TECHNICIAN (Melter)**

- 1) Importance of trade training, List of tools & Machinery used in the trade.
- 2) Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE).
- 3) First Aid Method and basic training.
- 4) Safe disposal of waste materials like cotton waste, metal chips/burrs etc.
- 5) Hazard identification and avoidance.
- 6) Safety signs for Danger, Warning, caution & personal safety message.
- 7) Preventive measures for electrical accidents & steps to be taken in such accidents.
- 8) Use of Fire extinguishers.
- 9) Practice and understand precautions to be followed while working in fitting jobs.
- 10) Safe use of tools and equipment used in the trade.
- 11) Identify each and every tools & equipment as per desired specification.
- 12) PPT show of various raw materials used in foundry.
- 13) Identify each raw materials used in foundry.
- 14) Finding out clay content of sand.
- 15) Finding out permeability test of green sand with permeability tester.
- 16) Finding out strength test with universal testing machine.
- 17) Finding out grain fineness no. of moulding sand with sieve shaker tester.
- 18) Ramming practice in moulding boxes with hand rammers to obtain desire green hardness such as 70,80, 90 by green hardness tester.
- 19) Cut channel on rammed boxed with cross section such as trapezoid & triangular and finish with cleaner & double ender etc.
- 20) Prepare unit sand and prepare mould for block such as square, Rectangular and round and preparation of various types of moulds related to foundry.
- 21) Prepare simple pattern & wooden patterns & core boxes.
- 22) Metal working - Marking and sawing on straight line - chipping and filling to desired size on different metals.
- 23) Grinding the metals to desire size by pedestal grinder and flexible shaft grinder.
- 24) Drilling on various metals.
- 25) Prepare induction furnace for charging, prepare charges for charging, operate and melt aluminium and pour aluminum into the mould and identify defects.



**FOR THE POST OF Jr. Office Assistant/ Jr. Bullion Assistant AND Jr. HINDI TYPIST at B-3 LEVEL**

**1) General Awareness:**

- a) Current Affairs
- b) Indian Polity
- c) Modern Indian History

**2) Computer Knowledge:**

Computer Knowledge including MS Office, MS Excel, MS Power Point and MS Access.

**• English Language Skills:**

- a) Fill in the Blanks
- b) Error Recognition
- c) Articles
- d) Verbs
- e) Preposition
- f) Spelling Test
- g) Vocabulary
- h) Grammar
- i) Synonyms
- j) Sentence Structure
- k) Antonyms
- l) Sentence Completion
- m) Correct use of words
- n) Phrases and Idioms

**• Numerical Aptitude:**

Problems relating to Integers and Whole Numbers, LCM and HCF, Decimals and Fractions, Relationship between numbers, Fundamental Arithmetic Operations and BODMAS, Percentage, Ratio and Proportions, Work and Time, Direct and inverse Proportions, Averages, Simple Interest, Profit and Loss, Discount, Area and Perimeter of Basic Geometric Figures, Distance and Time, Lines and Angles, Interpretation of simple Graphs and Data, Square and Square roots etc.

**• Reasoning Aptitude:**

The questions will be broadly based on Alpha-Numeric Series, Coding and Decoding, Analogy, Following Directions, Similarities and Differences, Jumbling, Problem Solving and Analysis, Nonverbal Reasoning based on diagrams, age Calculations, Calendar and Clock, etc.



*(Handwritten signature)*

GUIDELINES FOR EVALUATION OF TYPING TEST (ENGLISH/HINDI) FOR THE POSTS OF JUNIOR OFFICE ASSISTANT,  
/Junior Bullion ASSISTANT AND JUNIOR HINDI TYPIST at B-3 LEVEL

**I. Duration of typing test:** 10 minutes

**II. Speed criteria:** 40 w.p.m. in English and 30 w.p.m. in Hindi

**III. Nature of Mistakes:-**

**A. Full Mistakes:** The following errors are treated as full mistakes: -

- For every omission of a word/figure.
- For every substitution of a wrong word/figure, except transposition of words.
- For every addition of a word/figure not found in the passage.
- For every spelling error committed by way of repetition, or addition, or omission, or substitution of a letter/letters, e.g. the word "spelling" typed as seeplings; seplling; speling; seepling; etc.
- For repetition of word/figure, e.g. "I shall shall be grateful ....."
- Incomplete words (half typed words will be treated as mistake).

**B. Half Mistakes:** The following errors are treated as half mistakes:-

- Spacing Errors:** Where no space is provided between two words, e.g. „Ihope", or undesired space is provided between the words or letters of a word e.g. "I have", "I h ave" (space left between a word).
- Wrong Capitalisation:** Wrong typing of a capital letter for small letter or vice-versa. (This does not apply in respect of Hindi Typewriting scripts)
- Punctuation Errors:** Where the punctuation mark is omitted or added or substituted by another.
- Transposition Errors:** Where words are transposed, e.g. the words "I hope" typed as "hope I".
- Paragraphic Errors:** Half mistake shall be treated for each irrational para, where the space given before starting of any paragraph is not uniform, i.e paragraph given manual spaces; without pressing the **Tab Key**, will be treated half-mistake.

**NOTE:**

Any corrections made by pen or pencil will be treated as a Mistake.

**Enclosures:** Instructions to the Candidates (**Annexure - III**).

**IV. Criteria for Calculation of Typing Speed and Error:-**

**A. The Criteria for evaluation of typing speed is illustrated below as -**

Note: 1 word = 5 key strokes, 1 error = 5 key strokes.

**Net Speed (WPM) = [(Gross Strokes - Error Hits) / 5] / Total Test Time (Min).**

Duration: 10 min.

Gross Strokes = Total Stokes Typed in 10 Min. e.g. 2000.

Words Typed = (2000/5) = 400.

**Gross Speed = 400/10 = 40 WPM.**

**B. Criteria for Calculation of Error**

Mistakes / Error Stokes = 250.

Error Words = 250/5= 50.

Net Errors = 50/10 = 5 WPM.

**Net Speed = 40 - 5 = 35 WPM.**

**Percentage of Error allowed -**

- Relaxation of 5% error for UR Category
- Relaxation of 7% error for other categories



*(Handwritten signature)*

**INSTRUCTIONS TO THE CANDIDATES**

- i. The candidates are expected to type the words/figures and numerical/years in the manner as given in the Question Paper (both in English & Hindi). Mistake will be treated if a candidate types differently or in other language. This applies for both in English & Hindi Mediums.
- ii. The candidate is required to type the Test Passage in the Medium opted by him, e.g. if he opts for English Medium, he is required to type in English language and vice-versa. No credit will be given if a candidate types in the Medium not opted by him.
- iii. Candidates are required to use **Tab Key** for beginning of any Para; rather than giving spaces manually. Every Para, where the space given without pressing the **Tab Key**, will be treated as a half-mistake.
- iv. Candidates are **Not** required to repeat the passage, if he/she has completed the passage once and has time in his/her disposal, however they are allowed to revise and correct their mistakes and inaccuracies, if any, during the prescribed time.
- i. After every Punctuation mark, only **One** space is to be inserted, e.g. after comma, full stop, mark of interrogation etc. However, candidates are advised to follow the Question paper scrupulously in this regard.
- ii. Any irrelevant matter/numerical typed will be treated as a mistake.
- iii. Any incomplete word arising due to any reason will be treated as one full mistake.



4