NATIONAL TRANSMISSION & DESPATCH COMPANY LTD.

<table>
<tr><th>Sr#</th><th>Name of Post & BPS</th><th>Proposed Areas Weightages</th><th>Course Content for Professional/ Technical Knowledge</th></tr>
<tr><td>01</td><td>Laboratory Assistant
(BPS-14)</td><td>General/ Professional/ Technical: (Total 85 Marks)

a) Islamic Studies (10 Marks)
b) Pakistan Studies, General Knowledge/ Current Affairs (15 Marks)
c) Professional/ Technical Knowledge as per their qualification and experience given in the advertisement of each category of the posts. (60 Marks)</td><td><u>Job Related Course Content (60 Marks) Must Include:</u>

<table>
<tr><td>Section A</td><td>Basic Electronics & Measuring systems.</td><td>20</td></tr>
<tr><td>Sub-Section A-i:</td><td>Basic Electronics, Rectifiers, Converter, Thyristors.</td><td>10</td></tr>
<tr><td>Sub-Section A-ii:</td><td>Resistors, Capacitors, Inductors, Measuring Units (V, A, Watt, Var) & Measuring Systems, Power Factor</td><td>10</td></tr>
<tr><td>Section B</td><td>Grid Station Equipment & Protection systems.</td><td>20</td></tr>
<tr><td>Sub-Section B-i:</td><td>Basics of Transformers (Power Transformers/Distribution Transformer)/ Transmission lines CT's PT's</td><td>10</td></tr>
<tr><td>Sub-Section B-ii:</td><td>Protection systems of Transformer and Transmission lines, Circuit Breakers, Disconnecting Switches, Bus Bars.</td><td>10</td></tr>
<tr><td>Section C</td><td>AC and DC machines fundamentals.</td><td>20</td></tr>
<tr><td>Sub-Section C-i:</td><td>DC battery, DC Machines.</td><td>10</td></tr>
<tr><td>Sub-Section C-ii:</td><td>AC Machines, Induction, Synchronous motors and Generators.</td><td>10</td></tr>
<tr><td colspan="2">Grand Total</td><td>60</td></tr>
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02	Telecom Mechanic-I (BPS-14)	**General/ Professional/ Technical: (Total 85 Marks)** a) Islamic Studies **(10 Marks)** b) Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)** a) Professional/ Technical Knowledge as per their qualification and experience given in the advertisement of each category of the posts. **(60 Marks)**	**Job Related Course Content (60 Marks) Must Include:** ***DIODES AND APPLICATIONS.*** • *Semi-Conductors.* • *Semi-Conductor doping* • *Intrinsic & extrinsic semi-conductor* • *Biasing the PN junction.* • *Depletion region, Junction barrier potential* • *Forward and reverse bias.* • *Rectifier Diode.* ***CIRCUIT DIAGRAMS OF**:* • *Half wave rectifier.* • *Full wave rectifier.* • *Common emitter amplifier.* • *Push pull power amplifier.* ***ELECTROSTATIC FIELDS*** • *Coulomb's Law and field intensity.* • *Electric Field due to continuous charge distribution formulae.* • *Electric Flux density* • *Gauss's Law and its application to a point charge* • *Electric potential* • *Relationship between E & V* • *Electric Dipole* ***TRANSMISSION LINES*** • *Introduction to Transmission Lines* • *Transmission Line Parameters* • *Transmission Line Equations* • *Input Impedance, SWR and Power* ***WAVEGUIDES*** • *Introduction to Waveguides* • *Rectangular Wave Guide* • *Rectangular Wave Guide Modes* • *Circular Waveguides* ***ANTENNAS***

			• *Hertzian Dipole* • *Half Wave Dipole Antenna* • *Quarter Wave mono pole Antenna* • *Antenna Characteristics* ***SIGNAL GENERATORS.*** • *AF generator.* • *RF generator.* • *AM generator.* • *FM generator.* • *Square and Pulse generator.* • *Function generator.* ***CALIBRATION OF MEASURING INSTRUMENTS.*** • *Standards of Calibration of Measuring Instruments.* • *The techniques of calibration of Measuring Instruments.* • *Explain the common faults in Digital Instruments with their symptoms, causes and remedies* ***MODULATION AND DEMODULATION*** • *Definition of Modulation and De-Modulation* • *Needs of Modulation and De-Modulation* • *Types of Modulation* • *AM Receiver* • *Block diagram of super-heterodyne receiver.* • *Principle of super-heterodyning.* • *Operation of each stage of super-heterodyne receiver* • *Block diagram explanation of F.M receiver.* • *AM Transmitter* • *Transmission system (Block Diagram).* • *Amplitude modulation.* • *Transmission Techniques, SSB, DSB with the help of block diagram.* • *Principles of frequency modulation.* • *System of FM modulation block diagram.* • *Merits and demerits of FM.* ***TELEPHONY.***

			• *Automatic telephone system.* • *Telephone Instruments, receiver, transmitter, bell.* • *Tone dialing, TDMF (dual tone multi-frequency).* • *Standard telephone set.* • *Automatic telephone exchange.* • *Telephone traffic & trunking principle.* • *Block diagram of digital Telephone Exchange.* • *Pulse code modulation (PCM)* • *Multiplexing, Time Division Multiplexing (TDM)* • *Digital Switching Time Switching and Space switching.* • *Data Communication.* • *Modem, Fax Machine* • *Internet Communication.* • *VoIP 4.* ***FIBER OPTICS*** • *Optical Fiber for light wave communication.* • *Propagation* • *Fiber Optics transmission system.* • *Video Telephone & Video conferencing.* • *Merits and Demerits of Fiber Optic Communication.* • *Optical Transmitting and Receiving Devices* • *Wave Division Multiplexing* ***RESONANCE.*** • *Relation between f, L and C at resonance.* • *Series resonant circuit. Impedance of series resonant circuit.* • *Current, voltage and impedance characteristic of series resonant circuit.* • *Parallel resonant circuit and its impedance* • *Characteristics of impedance, current and voltage of a parallel resonant circuit* • *Series and parallel resonance curve comparison and Bandwidth.* • ***FILTER & COUPLING CIRCUITS***

			• *Purpose and action of a filter circuit. Types of filter circuit LPF, HPF, K filter and m drive filter.* • *Band Pass filter (BPF) Band Stop filter (BSF)* • *Purpose and action of coupling circuit.* • *Type of coupling, RC, Impedance transformer coupling.* ***UNDERSTAND BATTERIES*** • *Types of D.C source* • *Types of cells (Mercury, Silver oxide, Nickel cadmium)* • *Lead acid battery* • *Solar cells* • *Cells in series and parallel of voltage and constant source of current* ***NUMBER SYSTEM.*** • *Convert Binary numbers into Decimal numbers.* • *Convert Decimal numbers into Binary numbers.* • *Convert Hexadecimal numbers into Binary numbers.* • *Convert Binary numbers into Hexadecimal numbers.* • *Convert Hexadecimal numbers into Decimal numbers.* • *Convert Decimal numbers into Hexadecimal numbers.* ***LOGIC GATES.*** • *Draw Symbols of OR gate.* • *Draw Circuit of two input OR gate.* • *Function of OR gate.* • *Describe Truth Table of OR gate.* *Describe Boolean expression for OR gate.*
03	Sub Engineer (Civil) (BPS-14)	**General/ Professional/ Technical: (Total 85 Marks)** a) Islamic Studies **(10 Marks)** b) Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)** c) Professional/ Technical Knowledge as per their qualification and experience given in	**<u>Job Related Course Content (60 Marks) Must Include:</u>** The knowledge of subject matter in the following area shall be examined. • **<u>Surveying</u>** Principle of surveying, Selection of suitable method, Scales, plans and maps, Entry into survey field books and level books, Methods

		the advertisement of each category of the posts. **(60 Marks)**	of levelling, Levelling instruments and accessories, Principles of levelling, Equipment's required for Plane Tabling, Methods of plane tabling, Theodolite and Traverse surveying, Basic difference between different theodolites, Checks in closed traverse, Contouring, characteristics of contour lines, • **Construction Materials** Stones, Formation and availability of stones in Pakistan, Methods of laying and construction with various stones, Cement, Different cements, Ingredients of cement, properties and manufacture of cement, Storage and transport of cement, Admixtures, Brick type, manufacture of brick, laying bonds, Paints and Varnishes Type and selection, Bitumen Type, Selection & Use • **Mechanics of Materials and Structures** Mechanics of Materials, Internal effects of loading, Ultimate strength and working stress of materials, Mechanics of Beams, Relation between shear force and bending moment, Thrust, shear and bending moment diagrams for statically determinate beams under various types of loading, Simple Strut Theory • **Hydraulics** Properties of fluid: mass, specific weight, density, specific volume, specific gravity, viscosity, Pressure and Pascal's law, Hydro-Kinematics and Hydro-Dynamics, Energy of flowing liquid: elevation energy, Kinetic energy, potential energy, internal energy, Measurement of Discharge, Weirs and notches, Discharge formulas, Flows, Characteristics of pipe flow and open channel flow • **Soil Mechanics**

			Soil types and classification, Unit Weight of soil mass: bulk density, saturated density, submerged density and dry density, Interrelationship between specific gravity, void ratio, porosity, degree of saturation, percentage of air voids air content and density index, Optimum moisture content • **Building Construction Technology** Foundations, Subsoil exploration, type and suitability of different foundations: Shallow, deep, Type of walls and their functions, choosing wall thickness, Height to length relation, Use of scaffolding, Damp Proofing, Constituents of cement concrete, Grading of aggregates, Concrete mixes, Water cement ratio, Factors affecting strength of concrete, Curing, Wood work, Frame and shutters of door and window, Design and construction of stairs, Flooring and Finishing • **Water Supply and Sanitation Engineering** Objectives of water supply system, Source of water and its selection: gravity and artisan springs, shallow and deep wells, Gravity Water Supply System, Determination of daily water demand, Determination of storage tank capacity, Selection of pipe, Pipe line design and hydraulic grade line, Design of Sewer, Quantity of sanitary sewage, Maximum, Minimum and self-cleaning velocity, Design of septic tank • **Highway Engineering** Road Pavement, Pavement structure and its components: subgrade, sub-base, base and surface courses, Road Machineries, Earth moving and compacting machines, Road Construction

			Technology, Road Maintenance and Repair, Type of maintenance Works • **<u>Estimating and Costing</u>** Main items of work, Units of measurement and payment of various items of work and material, Standard estimate formats of government offices, Rate Analysis. Basic general knowledge on the use of rate analysis norms prepared by Wapda and the schedule of rates prescribed by Wapda Specifications, Interpretation of specifications of Wapda, • **<u>Construction Management</u>** Responsibilities of a civil overseer, Relation between Owner, Contractor and Engineer, Preparation of site plan, Organizing labor, Measures to improve labor efficiency, Contract Procedure, Contracts, Types of contracts, Tender and tender notice, Earnest money and security deposit, Preparation before inviting tender, Agreement, Conditions of contract, Construction supervision, Admin approval and technical sanction, Familiarity with standard account keeping formats used in governmental organizations, Planning and Control, Construction schedule, Equipment and materials schedule.
04	Electrician-I (BPS-11)	**General/ Professional/ Technical: (Total 85 Marks)** a) Islamic Studies **(10 Marks)** b) Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)** c) Professional/ Technical Knowledge as per their qualification and experience given in	**<u>Job Related Course Content (60 Marks) Must Include:</u>** • Understand Basic Concepts of Electricity ○ conductor, Insulator & semi-conductor. ○ Resistance, conductance, electrical current, potential difference and state its unit. ○ Ohm`s law.

		the advertisement of each category of the posts. **(60 Marks)**	○ Explain laws of resistance and calculations. ○ effects of temperature on Resistance. ○ series and parallel circuits with their properties. ○ total resistances in series & parallel circuits. ○ division of voltage in series circuits. ○ division of current in parallel circuits. • Electrical Wiring ○ Wiring basics ○ Types and sizes of wiring cables according to voltage grade, core and strands, Insulation. ○ Wiring accessories and cables current carrying capacity. ○ Uses of technical drawing, tools and equipment's. ○ fuse, miniature circuit breaker. ○ List the parts of fuse & M.C.B. ○ Compare the advantages & disadvantages of fuse & M.C.B. ○ Different wiring tests ○ Circuits of basic life appliances like Tube lights, fan, Motors, Pumps, Distribution board ○ Working and Wiring of UPS • Single Line diagram, Types of drawings and their uses. • Electrical Instrumentation ○ Errors In Am-Meters And Voltmeters ○ Multiplier: Purpose Of Multiplier

			○ Classification Of Instruments: Absolute Instruments. Secondary Instruments. Indicating Instruments. Recording Instruments. Integrating Instruments. Digital Instruments. Analog Instruments. ○ Energy Meter Single Phase And Three Phase: Types. Construction Of Single Phase Energy Meter (Induction Type). Working Principle And Reading The Scale. ○ Instrument Transformers: Types (C.T & P.T). Working And Advantages. Theory Of C.T & P.T ○ Motor Circuit, Motor Forward And Reverse Circuit ○ Star-Delta Connection • Understand HT & L.T Power Cables – ○ Concept Of Cables (Heat Resistant, Fire Retarding, Welding Cables) ○ Joint Of Conductors And Power Cables • Grounding And Insulation: ○ Star Neutral Point ○ Necessity Of Grounding. ▪ Solid Grounding. ▪ Resistance Grounding. Reactance Grounding.

Note:

a. Papers will be objective / MCQs type (Separate paper for each category).
b. Paper for these categories will be in English Language.
c. Passing marks will be 50% for all the above-mentioned categories.
d. The purpose area / syllabus to be uploaded on the NTS website at least a week before the written test.