**NTDCL Approved Content**

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| --- | --- | --- | --- |
| **Sr #** | **Name of Post & BPS** | **Proposed Areas Weightages** | **Course Content for Professional/ Technical Knowledge** |
| 1 | Test Inspector (BPS-15) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**
3. 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:**

|  |  |  |
| --- | --- | --- |
| **Section****A** | **Basic Electronics & Measuring systems.** | **20** |
| Sub- SectionA-i: | Basic Electronics, Rectifiers, Converter, Thyristors. | 10 |
| Sub- SectionA-ii: | Resistors, Capacitors, Inductors, Measuring Units (V, A, Watt, Var) &Measuring Systems ,Power Factor | 10 |
| **Section B** | **Grid Station Equipment & Protection systems.** | **20** |
| Sub- SectionB-i: | Basics of Transformers (Power Transformers/DistributionTreanformer)/Transmission lines CT's PT's | 10 |
| Sub-Section B-ii: | Protection systems of Transformer andTransmission lines, Circuit Breakers, Disconnecting Switches, Bus Bars. | 10 |
| **Section****C** | **AC and DC machines fundamentals.** | 20 |
| Sub- SectionC-i: | DC battery, DC Machines. | 10 |
| Sub- SectionC-ii: | AC Machines, Induction, Synchronous motors and Generators. | 10 |
| Grand Total | 60 |

 |
| 2 | Sub Station Operator-I(BPS-15) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:*** Computer Applications
	+ Networking (LAN, WAN, Network, Internet, Browsing and Surfing)
	+ Basics of computers
	+ Input and Output Devices
	+ MS (Office - Word and Power Point) Application
* Electrical Instrumentation
	+ ERRORS IN AM-METERS AND VOLTMETERS
	+ MULTIPLIER: Purpose of multiplier, its calculations and Construction

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. Types of scales in use and reading the scale.
* INSTRUMENT TRANSFORMERS: Types (C.T & P.T). Working and advantages. Theory of C.T & P.T, Standard ratios.
* SUB-STATION.
	+ Classification of Substation
	+ Equipment installed in Sub-station and its purpose
	+ Bus Bar arrangements.
* GROUNDING AND INSULATION:
	+ star Neutral point,
	+ Necessity of grounding.
		- Solid grounding.
		- Resistance grounding.
		- Reactance grounding.
* Circuit Breaker
	+ Phenomena of arc & its effects.
	+ Magnitude of arc,
	+ Maintenance of arc (Arc quenching),
	+ Operating Principle of Oil circuit breakers, Air circuit breakers, Gas circuit breakers, Vacuum circuit breakers.
	+ Parts of Circuit breaker
* Isolators
	+ Working principle.
	+ Uses.
* Difference between CB & Isolator PROTECTIVE RELAYING:
	+ Necessity of relaying.
	+ Concept of Primary and backup Protection,
	+ Type of Faults in Power System,
	+ Symmetrical and asymmetrical faults
* TRANSFORMER OPERATION AND PROTECTION
	+ Transformer Faults and Protection relays
	+ Transformer Tap Changer
	+ Concept of Bucholz Relay
	+ Concept of Transformer Star-Delta Connection
* Transmission Line:
	+ OVERHEAD LINE CONDUCTORS: Type of conductor
	+ Concept of Sag
	+ Concept of Skin Effect, Ferranti Effect, Corona effect
	+ Difference between ACSR and AAAC
	+ Type of insulators
	+ Voltage drop in H.V. transmission lines
* Power System fundamentals:
	+ Import & Export Energy,
	+ Concept of Active and Reactive Power,
	+ Power Triangle.
* AC Machines:
	+ Working Principle of Transformer, AC Motor, Synchronous Generator, Synchronous motors,
* Tools & Plant
	+ Fundamental of Electrical Maintenance:
	+ Scheduled maintenance
	+ Minor repairs, Major repairs, overhaul
	+ Tools and Equipment used for repair work.

Understand The Operations Of Lathe And Grinders:* parts of lathe and grinder.
* functions of lathe.
* different types of threads and their measuring tools.
* Measure thread with thread gauge
* Safety rules to be observed during repair work
* Understand HT& L.T Power Cables –
	+ Concept of Cables (Heat Resistant, Fire Retarding, Welding Cables)
	+ Joint of Conductors and Power cables
 |
| 3 | Line Superintendent-I (BPS-15) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. 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:****Basic Course Contents*** Resistance, Capacitance, Inductor and their equivalence in Series and Parallel combination and Impedance calculation, Resistivity, Conductance and Conductivity, effect of Temperature on Resistance and Temperature Coefficient.
* RC, LC, RLC Circuits, Thevenin’s and Norton’s Equivalent Circuit, Maximum Power Transfer Theorem, Star-Delta Connections.
* Fundamentals of Current, Voltage, RMS value, cycle, period, frequency, amplitude, Instantaneous value.
* Ohm’s Law and Kirchhoff’s Law, Loop and Mesh Analysis.
* Generation of 2-phase, 3-phase E.M.F. and phase sequence.
* Electrical Power, types of Power (actual, apparent, reactive), Power Triangle, Power Factor, calculation of

kilowatt hour.* Electromagnetism (Lenz’s law, Faraday’s law)

**Intermediate Course Contents*** Doping in Semi-Conductors (P-type, N-Type)
* Diodes (photoelectric, Zener), Transistors (PNP, NPN, BJT, MOSFET), Thyristors, IGBTs, DIAC, TRIAC.
* Half-wave, full-wave rectification.
* Logic Gates and Flip Flops
* AC Machines (Transformers, Motors, Generators) (Synchronous and Asynchronous Machines)
* Open Circuit tests and Short Circuit Tests.
* DC Motors (Series and Shunt motors)
* Household Wiring (Earthing system, fault current, wiring tests)
* Types of Insulator (Pin, Suspension, Strain, Shackle), Material of Insulators, Flashover and Puncture Voltage.
* Corona Effect, Ferranti Effect, Skin Effect.
* Fundamentals of HVDC and HVAC Transmission Systems
* Types of Poles and Towers, Parts of Towers, Types of Conductor, Sag in Conductor Lines, Ground Clearance.
* Components of Switchyard (CT, PT, Breakers, CCVT, Wavetraps, Isolators)
* Busbar and Breaker Schemes (One and half Scheme, Single busbar single breaker, Double busbar single breaker, Double busbar double breaker etc)
* Grounding Schemes (Solid grounding, Resistance grounding)
* Fault Current Limiting Devices.

Types of Circuit Breakers (Air, Oil, SF6) (Spring, Hydraulic mechanism) and Arc Resistance* Industrial Electronics (AC, DC motor controls, A/D, D/A Converters, SCR etc)
* Hysteresis losses and Eddy current losses.
* Common types of faults on Alternator, Transformer, Busbar.
* Low-pass filters and High-pass filters

**Advance Course Contents*** Protection of Electrical Systems (Protection Schemes of Transformers, Busbars, Transmission Lines, Over- voltage/Under-voltage protection, Overcurrent Protection, Over-frequency/under-frequency protection, Earth Fault Protection, Buchholz’s Relay
* Types of Fault (Single phase, Double phase, triple phase, neutral faults, Symmetrical and Asymmetrical Faults etc)
* Methods of fault locating in overhead and underground lines.
* Distance Relays and their working
* T-Model and Pi-Model of Transmission lines
* Use of Shunt Reactors on Transmission Lines.
* Efficiency of Power Plants.
* Renewable energy sources (Working of PV cells, Working of Wind Mills etc)

Harmonics and Transients. |
| 4 | Foreman (BPS-15) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. 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:*** Tools & Plant
	+ Fundamental of Electrical Maintenance:
	+ Scheduled maintenance
	+ Minor repairs, Major repairs, overhaul
* Tools and Equipment used for repair work.
* Understand The Operations Of Lathe And Grinders:
	+ parts of lathe and grinder.
	+ functions of lathe.
	+ different types of threads and their measuring tools.
	+ Measure thread with thread gauge
* Safety rules to be observed during repair work
* Understand HT& L.T Power Cables –
	+ Concept of Cables (Heat Resistant, Fire Retarding, Welding Cables)
	+ Joint of Conductors and Power cables
* Introduction to welding process and welding equipment’s.
	+ Welding process.
	+ Welding torches. Gas cylinders.
	+ Pressure gauges.
* 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.
	+ Types of drawings and their uses.
* Computer Applications
	+ Networking (LAN, WAN, Network, Internet, Browsing and Surfing)
	+ Basics of computers
	+ Input and Output Devices
	+ MS (Office - Word and Power Point) Application
* Electrical Instrumentation

Errors In Am-Meters And Voltmeters* Multiplier: Purpose Of Multiplier, Its Calculations And Construction
* 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. Types Of Scales In Use And Reading The Scale.
* Instrument Transformers: Types (C.T & P.T). Working And Advantages. Theory Of C.T & P.T, Standard Ratios.
* Sub-Station:
	+ Classification of Substation
	+ Equipment installed in Sub-station and its purpose
	+ Bus Bar arrangements.
* Circuit Breaker:
	+ Phenomena of arc & its effects.
	+ Magnitude of arc
	+ Maintenance of arc (Arc quenching)
	+ Operating Principle of Oil circuit breakers, Air circuit breakers, Gas circuit breakers, Vacuum circuit breakers.
	+ Parts of Circuit breaker
* Isolators
	+ Working principle.
	+ Uses of Isolator
	+ Difference between CB & Isolator
* Grounding And Insulation:

star Neutral point* Necessity of grounding.
	+ Solid grounding.
	+ Resistance grounding.
	+ Reactance grounding.
* Transformer Operation And Protection
	+ Transformer Faults and Protection relays
	+ Transformer Tap Changer
	+ Concept of Bucholz Relay
	+ Concept of Transformer Star-Delta Connection
* Transmission Line:
	+ OVERHEAD LINE CONDUCTORS: Type of conductor
	+ Concept of Sag
	+ Concept of Skin Effect, Ferranti Effect, Corona effect
	+ Difference between ACSR and AAAC
	+ Type of insulators
	+ Voltage drop in H.V. transmission lines
* Power System fundamentals:
	+ Import & Export Energy,
	+ Concept of Active and Reactive Power,
	+ Power Triangle.
* AC Machines:

Working Principle of Transformer, AC Motor, Synchronous Generator, Synchronous motors |
| 5 | Telecom Supervisor (BPS-15) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies**(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs**(15 Marks)**

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 PNjunction.
* Depletion region,Junctionbarrier potential
* Forward and reverse bias.
* Rectifier Diode.

**CIRCUIT DIAGRAMS OF**: * Half wave rectifier.
* Full wave rectifier.
* Common emitteramplifier.
* Push pull power amplifier.

**ELECTROSTATIC FIELDS** * Coulomb’s Law andfield intensity.
* Electric Field due to continuous chargedistribution formulae.
* Electric Flux density
* Gauss’s Law andits application toa pointcharge
* 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 toWaveguides
* Rectangular Wave Guide
* Rectangular Wave Guide Modes
* Circular Waveguides

**ANTENNAS** * HertzianDipole
* Half Wave Dipole Antenna
* Quarter Wave mono pole Antenna
* Antenna Characteristics

**SIGNAL GENERATORS.** * AF generator.
* RF generator.
* AM generator.
* FM generator.
* Squareand Pulsegenerator.
* Function generator.

**CALIBRATION OF MEASURING INSTRUMENTS.*** Standards of Calibration of Measuring Instruments.
* The techniques ofcalibration ofMeasuringInstruments.
* Explain the common faults in DigitalInstruments withtheir symptoms, causes and remedies

**MODULATION AND DEMODULATION*** Definition ofModulation and De-Modulation
* Needs of Modulation and De-Modulation
* Types ofModulation
* AM Receiver
* Block diagram of super-heterodyne receiver.
* Principle of super-heterodyning.
* Operation of each stage ofsuper-heterodyne receiver
* Block diagram explanationof F.M receiver.
* AM Transmitter
* Transmission system (Block Diagram).
* Amplitude modulation.
* Transmission Techniques, SSB, DSB with the help of blockdiagram.
* Principles offrequency modulation.
* System of FM modulation blockdiagram.
* Merits and demerits of FM.

**TELEPHONY.*** Automatic telephone system.
* Telephone Instruments, receiver, transmitter, bell.
* Tone dialing, TDMF (dualtone 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 Opticstransmission system.
* Video Telephone & Video conferencing.
* Merits and Demerits of Fiber Optic Communication.
* Optical Transmittingand Receiving Devices
* Wave DivisionMultiplexing

**RESONANCE.** * Relationbetweenf, L and C at resonance.
* Series resonantcircuit.Impedance ofseriesresonant 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 parallelresonance curve comparison and Bandwidth.
* **FILTER & COUPLING CIRCUITS**
* Purpose and action of afilter circuit. Types offilter circuit LPF,HPF, K filter and m drive filter.
* Band Passfilter (BPF) Band Stopfilter (BSF)
* Purpose and action of couplingcircuit.
* Type of coupling, RC, Impedancetransformer coupling.

**UNDERSTAND BATTERIES** * Types of D.C source
* Types of cells (Mercury, Silver oxide, Nickel cadmium)
* Lead acid battery
* Solar cells
* Cells inseries and parallelof 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 Hexadecimalnumbers.

**LOGIC GATES.** * Draw Symbols of OR gate.
* Draw Circuit oftwo inputOR gate.
* Function of OR gate.
* Describe Truth Table of OR gate.
* Describe Boolean expression for OR gate.
 |
| 6 | Sub Station Operator-II (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. 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:*** Computer Applications
	+ Networking (LAN, WAN, Network, Internet, Browsing and Surfing)
	+ Basics of computers
	+ Input and Output Devices
	+ MS (Office - Word and Power Point) Application
* Electrical Instrumentation
	+ ERRORS IN AM-METERS AND VOLTMETERS
	+ MULTIPLIER: Purpose of multiplier, its calculations and Construction
	+ 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. Types of scales in use and reading the scale.o INSTRUMENT TRANSFORMERS: Types (C.T & P.T). Working and advantages. Theory of C.T & P.T, Standard ratios.* SUB-STATION.
	+ Classification of Substation
	+ Equipment installed in Sub-station and its purpose
	+ Bus Bar arrangements.
* GROUNDING AND INSULATION:
	+ star Neutral point,
	+ Necessity of grounding.
		- Solid grounding.
		- Resistance grounding.
		- Reactance grounding.
* Circuit Breaker
	+ Phenomena of arc & its effects.
	+ Magnitude of arc,
	+ Maintenance of arc (Arc quenching),
	+ Operating Principle of Oil circuit breakers, Air circuit breakers, Gas circuit breakers, Vacuum circuit breakers.
	+ Parts of Circuit breaker
* Isolators
	+ Working principle.
	+ Uses.
	+ Difference between CB & Isolator
* PROTECTIVE RELAYING:
	+ Necessity of relaying.
	+ Concept of Primary and backup Protection,
	+ Type of Faults in Power System,
	+ Symmetrical and asymmetrical faults

TRANSFORMER OPERATION AND PROTECTION* Transformer Faults and Protection relays
* Transformer Tap Changer
* Concept of Bucholz Relay
* Concept of Transformer Star-Delta Connection
* Transmission Line:
	+ OVERHEAD LINE CONDUCTORS: Type of conductor
	+ Concept of Sag
	+ Concept of Skin Effect, Ferranti Effect, Corona effect
	+ Difference between ACSR and AAAC
	+ Type of insulators
	+ Voltage drop in H.V. transmission lines
* Power System fundamentals:
	+ Import & Export Energy,
	+ Concept of Active and Reactive Power,
	+ Power Triangle.
* AC Machines:
	+ Working Principle of Transformer, AC Motor, Synchronous Generator, Synchronous motors,
* Tools & Plant
	+ Fundamental of Electrical Maintenance:
	+ Scheduled maintenance
	+ Minor repairs, Major repairs, overhaul
	+ Tools and Equipment used for repair work.
	+ Understand The Operations Of Lathe And Grinders:
		- parts of lathe and grinder.
		- functions of lathe.
		- different types of threads and their measuring tools.
		- Measure thread with thread gauge
* Safety rules to be observed during repair work Understand HT& L.T Power Cables –
	+ Concept of Cables (Heat Resistant, Fire Retarding, Welding Cables)
	+ Joint of Conductors and Power cables
 |
| 7 | Line Superintendent-II (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. 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:****Basic Course Contents*** Resistance, Capacitance, Inductor and their equivalence in Series and Parallel combination and Impedance calculation, Resistivity, Conductance and Conductivity, effect of Temperature on Resistance and Temperature Coefficient.
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* Fundamentals of Current, Voltage, RMS value, cycle, period, frequency, amplitude, Instantaneous value.
* Ohm’s Law and Kirchhoff’s Law, Loop and Mesh Analysis.
* Generation of 2-phase, 3-phase E.M.F. and phase sequence.
* Electrical Power, types of Power (actual, apparent, reactive), Power Triangle, Power Factor, calculation of kilowatt hour.
* Electromagnetism (Lenz’s law, Faraday’s law)

**Intermediate Course Contents*** Doping in Semi-Conductors (P-type, N-Type)

Diodes (photoelectric, Zener), Transistors (PNP, NPN, BJT, MOSFET), Thyristors, IGBTs, DIAC, TRIAC.* Half-wave, full-wave rectification.
* Logic Gates and Flip Flops
* AC Machines (Transformers, Motors, Generators) (Synchronous and Asynchronous Machines)
* Open Circuit tests and Short Circuit Tests.
* DC Motors (Series and Shunt motors)
* Household Wiring (Earthing system, fault current, wiring tests)
* Types of Insulator (Pin, Suspension, Strain, Shackle), Material of Insulators, Flashover and Puncture Voltage.
* Corona Effect, Ferranti Effect, Skin Effect.
* Fundamentals of HVDC and HVAC Transmission Systems
* Types of Poles and Towers, Parts of Towers, Types of Conductor, Sag in Conductor Lines, Ground Clearance.
* Components of Switchyard (CT, PT, Breakers, CCVT, Wavetraps, Isolators)
* Busbar and Breaker Schemes (One and half Scheme, Single busbar single breaker, Double busbar single breaker, Double busbar double breaker etc)
* Grounding Schemes (Solid grounding, Resistance grounding)
* Fault Current Limiting Devices.
* Types of Circuit Breakers (Air, Oil, SF6) (Spring, Hydraulic mechanism) and Arc Resistance
* Industrial Electronics (AC, DC motor controls, A/D, D/A Converters, SCR etc)
* Hysteresis losses and Eddy current losses.
* Common types of faults on Alternator, Transformer, Busbar.
* Low-pass filters and High-pass filters

**Advance Course Contents*** Protection of Electrical Systems (Protection Schemes of Transformers, Busbars, Transmission Lines, Over- voltage/Under-voltage protection, Overcurrent Protection, Over-frequency/under-frequency protection, Earth Fault Protection, Buchholz’s Relay
* Types of Fault (Single phase, Double phase, triple phase, neutral faults, Symmetrical and Asymmetrical Faults etc)
* Methods of fault locating in overhead and underground lines.
* Distance Relays and their working
* T-Model and Pi-Model of Transmission lines
* Use of Shunt Reactors on Transmission Lines.
* Efficiency of Power Plants.
* Renewable energy sources (Working of PV cells, Working of Wind Mills etc)
* Harmonics and Transients.
 |
| 8 | Assistant Foreman (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:*** Tools & Plant
	+ Fundamental of Electrical / Mechanical Maintenance:
	+ Scheduled maintenance
	+ Minor repairs, Major repairs, overhauls
	+ Tools and Equipment used for repair work Electrically / Mechanically.
	+ Understand The Operations Of Lathe And Grinders.
	+ parts of lathe and grinder.
* functions of lathe.
* different types of threads and their measuring tools.
* Measure thread with thread gauge
* UNDERSTAND HT & L.T POWER CABLES –
	+ Concept of Cables (Heat Resistant, Fire Retarding, Welding Cables)
	+ Joint of Conductors and Power cables
* Introduction to welding process and welding equipment’s.
	+ Welding process.
	+ Welding torches. Gas cylinders.
	+ Pressure gauges.
	+ Type of Welding
* Safety rules to be observed during repair work
* 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.
	+ Types of drawings and their uses.
* Computer Applications
	+ Networking (LAN, WAN, Network, Internet, Browsing and Surfing)
	+ Basics of computers
	+ Input and Output Devices
* Electrical Instrumentation
	+ Errors In Am-Meters And Voltmeters
	+ Multiplier: Purpose Of Multiplier, Its Calculations And Construction
	+ 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. Types Of Scales In Use And Reading The Scale.
* Instrument Transformers: Types (C.T & P.T). Working And Advantages. Theory Of C.T & P.T, Standard Ratios.
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	+ Classification of Substation
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* Circuit Breaker
	+ Phenomena of arc & its effects.
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	+ Parts of Circuit breaker
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	+ Working principle.
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	+ Difference between CB & Isolator
* Grounding And Insulation:
	+ star Neutral point,
	+ Necessity of grounding.
		- Solid grounding.
	+ Resistance grounding.
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	+ Concept of Transformer Star-Delta Connection
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	+ Overhead Line Conductors: Type of conductor
	+ Concept of Sag
	+ Concept of Skin Effect, Ferranti Effect, Corona effect
	+ Difference between ACSR and AAAC
	+ Type of insulators
	+ Voltage drop in H.V. transmission lines
* Power System fundamentals:
	+ Import & Export Energy,
	+ Concept of Active and Reactive Power,
	+ Power Triangle.
* AC Machines:
	+ Working Principle of Transformer, AC Motor, Synchronous Generator, Synchronous motors
 |
| 9 | Laboratory Assistant (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:**

|  |  |  |
| --- | --- | --- |
| **Section****A** | **Basic Electronics & Measuring systems.** | **20** |
| Sub- SectionA-i: | Basic Electronics, Rectifiers, Converter, Thyristors. | 10 |
| Sub- SectionA-ii: | Resistors, Capacitors, Inductors, Measuring Units (V, A, Watt, Var) &Measuring Systems ,Power Factor | 10 |
| **Section****B** | **Grid Station Equipment & Protection****systems.** | **20** |
| Sub- SectionB-i: | Basics of Transformers (Power Transformers/DistributionTreanformer)/Transmission lines CT's PT's | 10 |
| Sub- SectionB-ii: | Protection systems of Transformer and Transmission lines, Circuit Breakers,Disconnecting Switches, Bus Bars. | 10 |
| **Section****C** | **AC and DC machines fundamentals.** | **20** |
| Sub- SectionC-i: | DC battery, DC Machines. | 10 |
| Sub- SectionC-ii: | AC Machines, Induction, Synchronous motors and Genrators. | 10 |
| **Grand Total** | **60** |

The syllabus for the posts of Test inspector BPS 15 and Lab Assistant BPS 14 is same however the paper difficulty level for both will be different. |
| 10 | Cable Jointer (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies**(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs**(15 Marks)**

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:*** Basic Electricity Principles
* Introduction to safety, its importance
* Earthing and types of earthing
* Introduction of Power Cable and Conductors, its parts and types.
* Measuring Instruments.
* Size of cables and their current carrying capacity
* Methods of installation/laying of power cable
* Maintenance/Testing of power cable
* Types of Joints of power cable
* Tools and equipment used in cable jointing
* Types and method of Power Cable Termination
* Method of Fault Location test for power cable
* Method of cable splicing
* Heat Shrink Joints
 |
| 11 | Telecom Mechanic-I (BPS-14) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. 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:****Job Related Course Content (60 Marks) Must Include:*****DIODES AND APPLICATIONS.*** * *Semi-Conductors.*
* *Semi-Conductor doping*
* *Intrinsic & extrinsic semi-conductor*
* *Biasing the PNjunction.*
* *Depletion region,Junctionbarrier potential*
* *Forward and reverse bias.*
* *Rectifier Diode.*

***CIRCUIT DIAGRAMS OF****:* * *Half wave rectifier.*
* *Full wave rectifier.*
* *Common emitteramplifier.*
* *Push pull power amplifier.*

***ELECTROSTATIC FIELDS*** * *Coulomb’s Law andfield intensity.*
* *Electric Field due to continuous chargedistribution formulae.*
* *Electric Flux density*
* *Gauss’s Law andits application toa pointcharge*
* *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 toWaveguides*
* *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.*
* *Squareand Pulsegenerator.*
* *Function generator.*

***CALIBRATION OF MEASURING INSTRUMENTS.**** *Standards of Calibration of Measuring Instruments.*
* *The techniques ofcalibration ofMeasuringInstruments.*
* *Explain the common faults in DigitalInstruments withtheir symptoms, causes and remedies*

***MODULATION AND DEMODULATION**** *Definition ofModulation and De-Modulation*
* *Needs of Modulation and De-Modulation*
* *Types ofModulation*
* *AM Receiver*
* *Block diagram of super-heterodyne receiver.*
* *Principle of super-heterodyning.*
* *Operation of each stage ofsuper-heterodyne receiver*
* *Block diagram explanationof F.M receiver.*
* *AM Transmitter*
* *Transmission system (Block Diagram).*
* *Amplitude modulation.*
* *Transmission Techniques, SSB, DSB with the help of blockdiagram.*
* *Principles offrequency modulation.*
* *System of FM modulation blockdiagram.*
* *Merits and demerits of FM.*

***TELEPHONY.**** *Automatic telephone system.*
* *Telephone Instruments, receiver, transmitter, bell.*
* *Tone dialing, TDMF (dualtone 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 Opticstransmission system.*
* *Video Telephone & Video conferencing.*
* *Merits and Demerits of Fiber Optic Communication.*
* *Optical Transmittingand Receiving Devices*
* *Wave DivisionMultiplexing*

***RESONANCE.*** * *Relationbetweenf, L and C at resonance.*
* *Series resonantcircuit.Impedance ofseriesresonant 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 parallelresonance curve comparison and Bandwidth.*
* ***FILTER & COUPLING CIRCUITS***
* *Purpose and action of afilter circuit. Types offilter circuit LPF,HPF, K filter and m drive filter.*
* *Band Passfilter (BPF) Band Stopfilter (BSF)*
* *Purpose and action of couplingcircuit.*
* *Type of coupling, RC, Impedancetransformer coupling.*

***UNDERSTAND BATTERIES*** * *Types of D.C source*
* *Types of cells (Mercury, Silver oxide, Nickel cadmium)*
* *Lead acid battery*
* *Solar cells*
* *Cells inseries and parallelof 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 Hexadecimalnumbers.*

***LOGIC GATES.*** * *Draw Symbols of OR gate.*
* *Draw Circuit oftwo inputOR gate.*
* *Function of OR gate.*
* *Describe Truth Table of OR gate.*
* *Describe Boolean expression for OR gate.*
 |
| 12 | Telecom Mechanic-II (BPS-12) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:*****DC SOURCE & BATTERIES*** * *Types of D.C source*
* *Types of cells (Mercury, Silver oxide, Nickel cadmium)*
* *Lead acid battery*
* *Solar cells*
* *Cells inseries and parallelof voltage and constant source of current*

***CIRCUIT DIAGRAMS OF****:* * *Half wave rectifier.* *Full wave rectifier.* *Common emitteramplifier.*

***ELECTROSTATIC FIELDS*** * *Coulomb’s Law andfield intensity.*
* *Electric Flux density*
* *Gauss’s Law andits application toa pointcharge*
* *Electric potential*
* *Electric Dipole*

***CALIBRATION OF MEASURING INSTRUMENTS.**** *Standards of Calibration of Measuring Instruments.*
* *The techniques ofcalibration ofMeasuringInstruments*
* *Explain the common faults in DigitalInstruments withtheir symptoms, causes and remedies*

***MODULATION AND DEMODULATION**** *Definition ofModulation and De-Modulation*
* *Needs of Modulation and De-Modulation*
* *Types ofModulation*
* *AM Receiver*
* *Block diagram of super-heterodyne receiver.*
* *Operation of each stage ofsuper-heterodyne receiver*
* *Block diagram explanationof F.M receiver.*
* *AM Transmitter*
* *Transmission system (Block Diagram)*
* *Amplitude modulation*
* *Principles offrequency modulation.*
* *Merits and demerits of FM.*

***TELEPHONY.**** *Automatic telephone system.*
* *Telephone Instruments, receiver, transmitter, bell.*
* *Tone dialing, TDMF (dualtone multi-frequency).*
* *Standard telephone set.*
* *Automatic telephone exchange.*
* *Telephone traffic &trunking principle.*
* *Pulse code modulation (PCM)*
* *Multiplexing, Time Division Multiplexing ( TDM)*
* *Digital Switching Time Switching and Space switching.*
* *Data Communication.*
* *Modem, Fax Machine*
* *Internet Communication.*

***LASERS**** *Corpuscular theory oflight*
* *Emission andabsorption of light*
* *Stimulated absorption andemission oflight* *Laser principle*
* *Types oflasers with brief description.*
* *Applications (basic concepts)*

***FIBER OPTICS*** * *Optical Fiber for light wave communication.*
* *Propagation*
* *Fiber Opticstransmission system.*
* *Merits and Demerits of Fiber Optic Communication.*
* *Optical Transmittingand Receiving Devices*
* *Wave DivisionMultiplexing*

***RESONANCE.*** * *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 parallelresonance curve comparison and Bandwidth.*

***FILTER & COUPLING CIRCUITS*** *Purpose and action of afilter circuit.**Types offilter circuit LPF,HPF, K filter and m drive filter.* * *Band Passfilter (BPF) Band Stopfilter (BSF)*
* ***DIODES AND APPLICATIONS.***
* *Semi-Conductors.*
* *Semi-Conductor doping*
* *Intrinsic & extrinsic semi-conductor*
* *Depletion region,Junctionbarrier potential*
* *Forward and reverse bias.*

***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 Hexadecimalnumbers.*

***LOGIC GATES.*** * *Draw Symbols of OR gate.*
* *Draw Circuit oftwo inputOR gate.*
* *Function of OR gate.*
* *Describe Truth Table of OR gate.*
* *Describe Boolean expression for OR gate.*

***LAWS OF RESISTANCE*** * *Define specific resistance*
* *Define conductor*
* *Define conductivity*
* *Explain the effect oftemperature on resistance*
* *Explain coefficient of resistance*
* *Describe the resistance inseries*
* *Describe the resistance in parallel*
* *Describe the resistance inseries-parallel*
* *Define power and energy*
* *Describe units of power and energy*
* *Explain the power dissipation inresistors*
 |
| 13 | Electrician-I (BPS-11) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:*** Understand Basic Concepts Of Electricity
	+ conductor, Insulator & semi- conductor.
	+ Resistance, conductance, electrical current, potential difference and state its unit.
	+ Ohm`s law.
	+ 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.
 |
| 14 | Crane Operator-I (BPS-11) | **General/ Professional/ Technical: (Total 85 Marks)**1. Islamic Studies **(10 Marks)**
2. Pakistan Studies, General Knowledge/ Current Affairs **(15 Marks)**

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:*** Crane types and components
* Crane setup
* Crane safety
* Hand and Radio signals
* Technical accuracy
* Emergency stop operation and disconnect
* Safe and productive lifting techniques
* Crane control operations
 |