

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश
प्रदेश निजामती सेवाको इन्जिनियरिङ्ग सेवा, ईलेक्ट्रीकल इन्जिनियरिङ्ग समूह, जनरल ईलेक्ट्रीकल इन्जिनियरिङ्ग उपसमूह, अधिकृतस्तर सातौँ तह, ईन्जिनियर पदको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम र परीक्षा योजना

पाठ्यक्रमको रूपरेखा:- यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ।

प्रथम चरण:- लिखित परीक्षा (Written Examination) पूर्णाङ्क:- २००
अन्तिम चरण:- (क) सामूहिक परीक्षण (Group Test) पूर्णाङ्क:- १०
(ख) अन्तर्वार्ता (Interview) पूर्णाङ्क:- ३०
परीक्षा योजना (Examination Schedule)

१. प्रथम चरण: लिखित परीक्षा (Written Examination) पूर्णाङ्क: २००

पत्र	विषय	खण्ड	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या Xअङ्क	समय
प्रथम	General Subject	Part I: General Knowledge and General Ability Test	१००	४०	वस्तुगत (Objective): बहुवैकल्पिक प्रश्न (Multiple Choice Questions)	५०X१=५०	१ घण्टा ३० मिनेट
		Part II: General Technical Subject				५०X१=५०	
द्वितीय	Technical Subject		१००	४०	विषयगत (Subjective): छोटो उत्तर लामो उत्तर	१०X५=५० ५X१०=५०	३ घण्टा

२. अन्तिम चरण: सामूहिक परीक्षण (Group Test) र अन्तर्वार्ता (Interview) पूर्णाङ्क: ४०

पत्र/विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
सामूहिक परीक्षण (Group Test)	१०	सामूहिक छलफल (Group Discussion)	३० मिनेट
अन्तर्वार्ता (Interview)	३०	बोर्ड अन्तर्वार्ता (Board Interview)	

द्रष्टव्यः

१. यस पाठ्यक्रम योजनालाई प्रथम चरण र अन्तिम चरणमा विभाजन गरिएको छ।
२. खुला र समावेशी समूहको एउटै प्रश्नपत्रबाट परीक्षा सञ्चालन हुनेछ।
३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।
४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ। तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन।
५. बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा क्याल्कुलेटर प्रयोग गर्न पाइने छैन।
६. विषयगत प्रश्नहरूको हकमा तोकिएको अङ्कमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ।
७. परीक्षा हलमा मोबाइल फोन, स्मार्ट वाच, हेड फोन वा यस्तै प्रकारका विद्युतीय उपकरण, पुस्तक, नोटबुक, झोला लगायतका वस्तुहरू लैजान पाइने छैन।
८. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ।
९. विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक भाग/खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन्। परीक्षार्थीले प्रत्येक भाग/खण्डका प्रश्नहरूको उत्तर सोही भाग/खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ।
१०. यस पाठ्यक्रम अनुसारका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगावै संशोधन भई कायम रहेका विषयवस्तुलाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
११. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अन्तिम चरणको परीक्षामा सम्मिलित गराइनेछ।
१२. लिखित परीक्षा र अन्तिम चरणको सामूहिक परीक्षण र अन्तर्वार्ताको कुल प्राप्ताङ्कको आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ।
१३. पाठ्यक्रम अध्यावधिक भई लागू हुने मिति: २०८१।०९।०२

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश
प्रदेश निजामती सेवाको इन्जिनियरिङ्ग सेवा, ईलेक्ट्रीकल इन्जिनियरिङ्ग समूह, जनरल ईलेक्ट्रीकल इन्जिनियरिङ्ग
उपसमूह, अधिकृतस्तर सातौँ तह, ईन्जिनियर पदको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक
लिखित परीक्षाको पाठ्यक्रम

प्रथम पत्र (Paper I): General Subject

Part (I):

General Awareness & General Ability Test

(50 Marks)

1. General Awareness and Contemporary Issues (25×1 Mark = 25 Marks)
 - 1.1 Physical, socio-cultural and economic geography and demography of Nepal with special focus on Karnali Province
 - 1.2 Major natural resources of Nepal
 - 1.3 Geographical diversity, climatic conditions, and livelihood & lifestyle of people
 - 1.4 Notable events and personalities, social, cultural and economic conditions in modern history of Nepal
 - 1.5 Current periodic plan of Karnali Province and Nepal
 - 1.6 Information on sustainable development, environment, pollution, climate change, biodiversity, science and technology
 - 1.7 Nepal's international affairs and general information on the FAO, SAARC & WTO
 - 1.8 The Constitution of Nepal
 - 1.9 Governance system and Government (Federal, Provincial and Local)
 - 1.10 Provisions of civil service act (Karnali Province Civil Service Act, 2080 and Regulations, 2080) and regulation relating to organizational structure, posts of service, fulfillment of vacancy and code of conduct
 - 1.11 Functional scope of public services
 - 1.12 Public Service Charter
 - 1.13 Concept, objective and importance of public policy
 - 1.14 Fundamentals of management: planning, organizing, staffing, directing, controlling, coordinating, decision making, motivation and leadership
 - 1.15 Government planning, budgeting and accounting system
 - 1.16 Major events and current affairs of national and international importance
 - 1.17 Public service delivery system and its barriers in Nepal
2. General Ability Test (25 ×1 Mark = 25 Marks)
 - 2.1 Verbal Ability Test (8×1 Mark = 8 Marks)

Jumble words, Series, Analogy, Classification, Coding-Decoding, Matrix, Ranking Order Test, Direction and Distance Sense Test, Common Sense Test, Logical Reasoning, Assertion and Reason, Statement and Conclusions
 - 2.2 Numerical Ability Test (9×1 Mark = 9 Marks)

Series, Analogy, Classification, Coding, Arithmetical reasoning/operation, Percentage, Ratio, Average, Loss & Profit, Time & Work, Data interpretation & Data verification
 - 2.3 Non-verbal/Abstract Ability Test (8×1 Mark = 8 Marks)

Figure Series, Figure Analogy, Figure Classification, Figure Matrix, Pattern Completion/Finding, Analytical Reasoning Test, Figure Formation and Analysis, Rule Detection, Water images, Mirror images, Cubes and Dice & Venn-diagram

Part (II):
General Technical Subject (50 Marks)

1. D.C. Circuit Analysis (5 Marks)

- 1.1. Circuit elements: Resistor, Inductor and Capacitor
- 1.2. Resistivity, conductivity, effect of temperature on resistance, resistance temperature coefficient
- 1.3. Ohms law, Kirchoff's law, nodal and mesh analysis
- 1.4. Series and parallel circuit, delta-star and star-delta transformation
- 1.5. Network Theorem: Thevenins theorem, Norton's theorem, Superposition theorem, Reciprocity theorem and Maximum power transfer theorem.
- 1.6. Transient response of RLC circuit excited by DC source

2. A. C. Circuit Analysis (5 Marks)

- 2.1. Generation of alternating voltage and current, average and RMS value.
- 2.2. RLC series and parallel circuits, Phasor algebra/Diagram
- 2.3. Concept of complex Impedance and Admittance
- 2.4. Resonance in series and parallel RLC circuit, bandwidth and effect of Q-factor
- 2.5. Active, Reactive and Apparent power
- 2.6. Transient response of RLC circuit excited by AC source
- 2.7. Two-port network: Z, Y, T and h parameters, T to two-port network connection
- 2.8. Generation of three-phase voltages, star and delta connections, current and voltage relation in star and delta connections, three phase power measurement

3. Electrical Machines (5 Marks)

- 3.1. Transformer : Constructional detail, Operating principle, Equivalent Circuit, Losses and efficiency, Voltage regulation, Exciting current, harmonics, Transformer inrush current, Transformer tests, Auto transformer, Three phase transformer connections, Parallel operation.
- 3.2. D.C. Machine: Constructional detail, Operating principle of dc generator, Voltage build-up process, Types of dc generator, their characteristics and applications, Losses and efficiency, Armature reaction and commutation, Operating principle of dc motor, Back emf, Types of dc motor, their characteristics and applications, DC motors starter, Speed control of dc motor
- 3.3. Induction machine: Constructional detail, Operating principle of three phase induction motor, Equivalent circuit, Torque-speed characteristic, Losses and efficiency, Starting methods, Speed control of three phase induction motor, Induction motor tests, Induction generator, Single phase induction motors- types, characteristics and applications.
- 3.4. Synchronous machine: Constructional detail, Operating principle of synchronous generator, Armature reaction, Equivalent circuit, phasor diagram and power angle characteristics of cylindrical rotor machine and salient pole machine, Parallel operation of synchronous generators, Operating principle of synchronous motor, Starting methods, Effect of excitation on performance of synchronous motor, V and Inverted V curves.

4. Instrumentation (5 Marks)

- 4.1. Transducers: Measurement of electrical, mechanical, thermal and hydraulic variables
- 4.2. Moving Coil and Moving Iron Instruments: Galvanometer and its sensitivity, Conversion of Galvanometer to Ammeter and Voltmeter, Ammeter, Voltmeter, Wattmeter, Watt-hour meter, Maximum Demand Meter, Frequency Meter and Power Factor Meter

- 4.3. Accuracy and Precision: Absolute and Relative Errors
- 4.4. Measurement of low, medium, high resistances and Megger
- 4.5. DC and AC bridge circuits
- 4.6. Operational Amplifier and filters: Ideal Op-Amp, Feedback Op-Amp, Adder, Signal Amplification, attenuation, differentiation and integration
- 4.7. Oscilloscope: Operating principles, Analog and Digital Oscilloscope
- 4.8. Analog to Digital and Digital to Analog converters: Weighted resistor type and Ladder type D/A converters, Dual-ramp type and Successive approximation type A/D converters
- 4.9. Digital instrumentation: Fundamental principles, interfacing to the computers, Microprocessor based instrumentation
- 4.10. Instrument Transformers: Construction and Operating Principles, Measuring and Protection of CTs, Potential transformers PTs, Error of Instrument Transformer
5. Generation, Transmission and Distribution (5 Marks)
 - 5.1. Hydroelectric Power Plants: Hydraulic to electrical energy conversion, output power equation, classification, elements of hydroelectric power plant and schematic layouts, site selection, classification of water turbines, working principle of different types of water turbines, physical characteristics and efficiencies, governing of water turbines, selection of water turbines, essential features of hydroelectric alternators, auxiliaries in hydroelectric plant, advantages and disadvantages of hydroelectric plants, watermills and micro-hydropower plants.
 - 5.2. Steam power Plants: Elements of a steam power plant and their schematic arrangement; working principle, vibration monitoring, governing, cooling efficiency, alternators used for steam turbine driven units
 - 5.3. Diesel Power Plants: Elements of a diesel power plant, schematic arrangement; working principle, efficiency, cooling, governing, speed control, application, performance and thermal efficiency, alternators used for diesel units, advantages and disadvantages of diesel plants.
 - 5.4. Non-Conventional method of power generation: Concept of solar photovoltaic, wind and geothermal method of power generation and their importance
 - 5.5. Power transmission system: Overhead and underground transmissions, advantages and limitations of high voltage AC and DC transmission; choice of working voltage, conductor size and configuration, supports and cross arms, insulators used in overhead lines, vibration dampers sag tension calculation.
 - 5.6. Power Distribution System: Voltage levels, primary and secondary distribution, radial and ring mains distribution, single phase and three phase ac distribution, pole/tower types, conductors and insulators used in distribution lines, distribution transformer and its accessories, protection coordination in distribution system.
6. Power System Analysis (5 Marks)
 - 6.1. Transmission line parameters: Computation of series and shunt parameters of transmission line equivalent circuits, concept of GMD and GMR, proximity effect and skin effect.
 - 6.2. Per unit system representation: Single line impedance and reactance diagrams 6.3 Transmission line performance: Lumped and distributed parameter modeling, ABCD parameters, efficiency & regulations calculations, Ferranti effect, surge impedance loading
 - 6.3. Load flow: Y-bus of a power system network, Gauss-Seidal and Newton-Raphson methods

- 6.4. Over voltages in transmission lines: Power frequency, switching and lightning over voltages, surge arrestors
- 6.5. VAR compensation: Real and reactive power flow through transmission line, series and shunt compensations
- 6.6. Fault calculations: Symmetrical components, grounded & ungrounded systems, L-G, L-L, L-L-G and 3-phase faults.
- 6.7. Stability studies: Steady state & transient stability limits, swing equations, equal area criterion, stability enhancement techniques.
- 6.8. Corona: corona inception voltage, power loss, waveform deformation, RI and AN due to corona

7. Switchgear and Protection (5 Marks)

- 7.1. Fuse: Types, characteristics and operating principles
- 7.2. Magnetic Contactors: Types, construction, operating principles and applications.
- 7.3. Isolators (Disconnecting switches): types, construction and operating principles
- 7.4. MCB and MCCB: Construction, operating principles, characteristics.
- 7.5. Relays: Electromagnetic and Static Relays, Over current Relay, Earth Fault Relay, Distance Relay, Impedance Relay, Directional Relay
- 7.6. Circuit Breakers: ACB, OCB, ABCB, VCB and SF6 CB; construction, operating principles and applications
- 7.7. Protection schemes: Over current, under voltage, differential, distance protection
- 7.8. Grounding: System and equipment grounding, method of grounding, electric shock, safe value of current and voltages, touch and step potentials, Ground Fault Current Interrupters

8. Automatic Control System (5 Marks)

- 8.1. Mathematical modeling: differential equation representation, transfer function notations and state space representations of a physical system.
- 8.2. Block diagram: block diagram representation of the control system components, signal flow graphs.
- 8.3. Time response: impulse response, step and ramp response analysis of a 1st and 2nd order systems, overshoot and damping concepts.
- 8.4. Steady state error: evaluation of the steady state error and error constants
- 8.5. Stability: Relative and absolute stability, Routh-Herwitz criterion.
- 8.6. Controllers: lead-lag and PID controllers.
- 8.7. Root locus: judging the relative stability and setting controller parameters of a close loop control system using root locus technique.
- 8.8. Frequency response: Polar and Bode plots, stability in frequency domain, gain margin and phase margins, controller parameters selection using frequency response.

9. Basic Electronics (5 Marks)

- 9.1. Bi-polar junction transistor: construction, operating characteristics, use as amplifier and switch.
- 9.2. Logic circuit: Decimal, Binary and Hexadecimal system, logic gates, adder, Encoder, Decoder, Multiplexer, De-multiplexer.
- 9.3. Power Electronics Devices: Thyristor, Triac, MOSFET, BJT, GTO – Construction and their characteristics
- 9.4. Rectifier: Rectifier using diodes - half wave, full wave, single phase, three phase, capacitor and inductor filters, Controlled rectifier using thyristors - half wave, full wave, single phase, three phase.
- 9.5. DC chopper: Step down chopper, Step up chopper.

- 9.6. Inverter: Single phase voltage inverter, Three phase voltage inverter, current source inverter.
- 9.7. Cyclo-converter – Single phase and three phase.
- 9.8. AC voltage controller – with resistive load and inductive load.

10. Utilization Of Electrical Energy (5 Marks)

- 10.1. Economic considerations: Cost classification; interest and depreciation
- 10.2. Load characteristics: load curves, load duration curve, demand factor; load factor, diversity factor, causes of low power factor and its disadvantages, power factor improvement and its economics
- 10.3. Plant use factor; load sharing between base load and peak load plants
- 10.4. Tariff: objective, factors affecting tariff, types of tariffs
- 10.5. Illumination: Illumination and luminance, radiant efficiency, plane and solid angles, laws of illumination; polar curves, illumination requirement, design of indoor and out-door lighting scheme.
- 10.6. Lamps: Incandescent lamps, arc lamps, sodium discharge lamps, mercury fluorescent lamps, high pressure mercury vapor lamps
- 10.7. Electrical energy conservation techniques.
- 10.8. Energy Organizations: General introduction about IEA, World Energy Council, OPEC and Energy Trilemma Index, AEPC, DOED

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प्रदेश निजामती सेवाको इन्जिनियरिङ्ग सेवा, ईलेक्ट्रीकल इन्जिनियरिङ्ग समूह, जनरल ईलेक्ट्रीकल इन्जिनियरिङ्ग
उपसमूह, अधिकृतस्तर सातौं तह, ईन्जिनियर पदको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक
लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र (Paper II): Technical Subject

Section A -20 Marks

1. Hydro Power Policy and Planning

- 1.1. History of power development in Nepal; hydro power potential; energy supply demand trends; challenges/Risks and prospects of hydropower development; role of government institutions; NEA and private sectors in power development; concept of deregulation and unbundling; Concept of independent regulatory commission; efforts towards power sector reform.
- 1.2. Salient features of various Nepalese power plants; current scenario of transmission and distribution networks and substations in Nepal.
- 1.3. Legal provisions:
 - 1.3.1. Hydropower Development Policy
 - 1.3.2. Electricity Act and Regulation
 - 1.3.3. NEA Act
 - 1.3.4. Civil Service Act and Regulation
 - 1.3.5. Water resource Act and Regulation
 - 1.3.6. Public Procurement Act and Regulation
 - 1.3.7. Land Acquisition Act

2. Economics of Power Utilization

- 2.1. Economic considerations: Cost classification; interest and depreciation
- 2.2. Demand characteristics: load curves, load duration curve, demand factor; load factor, diversity factor, utilization factor, causes of low power factor and its disadvantages, power factor improvement and its economics
- 2.3. Tariff: objective, factors affecting tariff, types of tariff.
- 2.4. Illumination: Illumination and luminance, radiant efficiency, plane and solid angles, laws of illumination; polar curves, illumination requirement, design of in-door and out-door lighting scheme. Incandescent lamps, arc lamps, sodium discharge lamps, mercury fluorescent lamps, high pressure mercury vapor lamps.

Section B-20 Marks

3. Network Analysis

- 3.1. Ohms law, Kirchoff's law, nodal and mesh analysis
- 3.2. Series and parallel circuit, delta-star and star-delta transformation
- 3.3. Concept of complex Impedance and Admittance RLC series and parallel circuit
- 3.4. Network Theorem: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem and Maximum power transfer theorem.
- 3.5. Resonance in series and parallel RLC circuit
- 3.6. Active, Reactive and Apparent power and its significance.
- 3.7. Transient response of RLC circuit excited by DC and AC sources
- 3.8. Two Port networks: Two port parameters, short circuit admittance parameter, open circuit impedance parameters, Transmission parameters, Image parameters and Hybrid parameters. Ideal two port devices, ideal transformer. Tee and Pie circuit representation, Cascade and Parallel Connections.

4. Control System

- 4.1. Mathematical modeling: differential equation representation, transfer function notations and state space representations of physical systems, Block diagram algebra, signal flow graphs.
- 4.2. Transient and steady state response: impulse response, step and ramp response analysis of a 1st and 2nd order systems, overshoot and damping, steady state error and error constants
- 4.3. Effect of feedback on stability and steady state error
- 4.4. Stability: Relative and absolute stability, Routh -Herwitz criterion.
- 4.5. Root locus: Manual plotting and judging the relative stability using root locus technique.
- 4.6. Frequency response: Polar, and Bode plots, stability in frequency domain, gain margin and phase margins, Nyquist criterion for stability.
- 4.7. Root locus: Manual plotting and judging the relative stability using root locus technique
- 4.8. Control system design: lead-lag and PID controllers and setting the controller parameters using Root locus and Bode plots.

Section C-30 Marks

5. Static and Dynamic Electrical Machines

- 5.1. Transformer: Working principle, Equivalent Circuit, Losses and efficiency, Voltage regulation, Transformer tests, Auto transformer, Three phase transformer connections, Parallel operation
- 5.2. D.C. Machine: Constructional detail, Operation in motoring and generating mode, Back emf in DC motor, Types of DC motor, their characteristics and applications, DC motor starter, Speed control of DC motor
- 5.3. Induction machine: Equivalent circuit, Torque-speed characteristic, Losses and efficiency, Starting methods, Speed control of three phase induction motor, Induction motor tests, Single phase induction motors- types, characteristics and applications
- 5.4. Synchronous machine: Salient pole and cylindrical rotor construction, generating and motoring principle, phasor diagram and power angle characteristics, Parallel operation of synchronous generators, Starting methods for synchronous motor, Effect of excitation, V and Inverted V curves, Synchronous condenser

6. Electrical Supply Systems

- 6.1. Power Plants: components of hydro power plant, Steam power Plants and Diesel Power Plants; Turbine classifications, governing systems, Plant use factor; load sharing between base load and peak load plants, economic operation of power generating stations.
- 6.2. Transmission system: Overhead and underground transmissions, EHV AC and HVDC Transmission.
- 6.3. Electrical and Mechanical design of Overhead AC transmission: Selections of conductor size and configuration, supports and cross arms, insulators, sag and tension calculation.
- 6.4. Power Distribution System: primary and secondary distribution, Distribution network layouts, protection coordination in distribution system.

7. Power System Analysis

- 7.1. Computation of transmission line parameters, GMD and GMR, proximity effect and skin effect.

- 7.2. Transmission line performance: Per unit system representation, Single line diagram, Lumped and distributed parameter modeling, ABCD parameters, efficiency & regulations calculations, Ferranti effect, surge impedance loading
- 7.3. Load flow: Basic Load flow equation, Gauss-Seidal and Newton-Raphson methods
- 7.4. Over voltages in transmission lines: Power frequency, switching and lightning over voltages, surge arrestors
- 7.5. VAR compensation: Real and reactive power flow through transmission line, series and shunt compensations
- 7.6. Fault calculations: Symmetrical and unsymmetrical faults
- 7.7. Power system stability studies: Steady state & transient stability limits, swing equations, equal area criterion, stability enhancement techniques.
- 7.8. Corona: corona inception voltage, power loss, waveform deformation, RI and AN due to corona

Section D-30 Marks

8. Measurement and Instrumentation

- 8.1. Accuracy, Precision, Absolute and Relative Errors, Parallax
- 8.2. Deflection type measuring instruments: Galvanometer, Ammeter, Voltmeter, Wattmeter, Watt-hour meter, Maximum Demand Meter, Frequency Meter
- 8.3. Instrument Transformers: Operating Principles of Measuring and Protection type CTs, Potential transformers
- 8.4. Transducers: Tachometer, potentiometer, Measurement of electrical, mechanical, thermal and hydraulic variables
- 8.5. Measurement of low medium and high resistances by Ohmmeter method, Meggers and DC bridges
- 8.6. Measurement of inductance, capacitance and frequency by AC bridge circuits
- 8.7. Operational Amplifier: Signal Amplification, attenuation, differentiation, integration and adder
- 8.8. Operating principles of Analog and Digital Oscilloscope
- 8.9. Analog to Digital and Digital to Analog converters
- 8.10. Digital instrumentation: Fundamental principles, interfacing to the computers, Microprocessor based instrumentation

9. Power System Protection

- 9.1. Fuse, Magnetic Contactors, Isolators, MCB and MCCB: characteristics and operating principles
- 9.2. Relays: Electromagnetic and Static Relays, Over current Relay, Earth fault relay, Distance relay, Impedance Relay, Directional Relay
- 9.3. Circuit Breakers: ACB, OCB, ABCB, VCB and SF6 CB; construction, operating principles and applications
- 9.4. Protection schemes: Over current, under voltage, over voltage, differential, distance protection.
- 9.5. Grounding: System and equipment grounding, method of grounding, electric shock, safe value of current and voltages, touch and step potentials, Ground Fault Current Interrupters

10. Power Electronics

- 10.1. Devices: Power Transistor, Power Diodes, Thyristor, Triac, MOSFET, BJT, UJT, GTO – Construction and their characteristics
- 10.2. Rectifier : Rectifier using diodes - half wave, full wave, single phase, three phase, capacitor and inductor filters, Controlled rectifier using thyristors - half wave, full wave, single phase, three phase.

- 10.3. DC chopper: Step down chopper, Step up chopper.
 10.4. Inverter: Single phase voltage inverter, Three phase voltage inverter, current source inverter.
 10.5. Cyclo-converter– Single phase and three phase.
 10.6. AC voltage controller– with resistive load and inductive load

द्वितीय पत्रको प्रश्नसंख्या तालिका

खण्ड/भाग	A-20		B-20		C-30			D-30		
एकाई	1	2	3	4	5	6	7	8	9	10
छोटो प्रश्नसंख्या	2	2	2	-	-	-	2	-	-	2
लामो प्रश्नसंख्या	-	-	-	1	1	1	-	1	1	-

सामूहिक परीक्षण

सामूहिक परीक्षण व्यक्तित्व परीक्षणको एक अंश हो। प्रदेश निजामती सेवाको क्षेत्र विस्तार तथा कार्य पद्धति परिवर्तन समेत भैरहेको सन्दर्भमा कर्णाली प्रदेश सरकारको नीति, योजना, कार्यक्रम लगायत शासन व्यवस्था सम्बन्धी समसामयिक विषयमाथि विचार-विमर्श, छलफल गरी तिनको अझै बढी प्रभावकारी तथा कार्यान्वयन योग्य समाधान पहिल्याउने सम्बन्धमा उम्मेदवारहरुको क्षमता पहिचान गर्नु यस परीक्षणको मूल मर्म हो। यसको लागि छलफल, विचार-विमर्श गरी परिस्थिति बुझ्न सक्ने, निर्णय दिने, जनतालाई क्रियाशील बनाउने, चित्त बुझाउने, निर्धारित लक्ष्य अनुसार काम गर्ने/गराउने, जस्ता कामका लागि लेखन क्षमताका साथसाथै समस्यालाई यथार्थपरक ढंगले पहिचान गर्नसक्ने, वाक्पटुता, शिष्टता, तर्कशक्तिको पनि आवश्यकता पर्दछ।

त्यसैले यस परीक्षणमा उम्मेदवारहरुको बौद्धिक क्षमता, संचार सीप, समूह गतिशिलता, व्यवहार, व्यक्तित्व, मनोवृत्ति, क्रियाशीलता, निर्णयशक्ति, समस्या समाधान क्षमता, नेतृत्व क्षमता, समय व्यवस्थापन तथा व्यक्तित्वमा भएका अन्य गुणहरुको आंकलन अर्थात परीक्षण र मूल्याङ्कन गर्नको लागि उम्मेदवारहरुलाई कुनै समसामयिक विषय/सवाल/समस्यामा सामूहिक छलफल गरी समस्या समाधान केन्द्रीत प्रभावकारी र कार्यान्वयन योग्य समाधान निकाल्न दिइन्छ।

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफलको रूपमा अवलम्बन गरिनेछ। दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहबीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति गर्नुपर्नेछ। यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसार कम्तीमा तीन जनाको समिति रहनेछ।

आयोगका अध्यक्ष वा अध्यक्षले तोकेको सदस्य	– अध्यक्ष
आयोगका सदस्य	– सदस्य
मनोविज्ञानवेत्ता	– सदस्य
दक्ष/विज्ञ (१ जना)	– सदस्य