

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश
प्रदेश निजामती सेवाको इन्जिनियरिङ्ग सेवा, मेकानिकल समूह, जनरल मेकानिकल र निर्माण उपकरण सम्भार
उपसमूह, अधिकृतस्तर सातौं तहको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक लिखित
परीक्षाको पाठ्यक्रम र परीक्षा योजना

पाठ्यक्रमको रूपरेखा:- संयुक्त र एकीकृत परीक्षा प्रणाली (Integrated and Unified Examination System) को आधारमा सबैका लागि निम्नानुसारको 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 ३०मिनेट
		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।०८।२४

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उपसमूह, अधिकृतस्तर सातौं तहको 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. Material Science and Metallurgy (5 Marks)
 - 1.1. Types of materials and material selection
 - 1.2. Imperfections in atomic arrangement: Slip and twinning, dislocation, points and surface defects
 - 1.3. Mechanical properties and testing: Tension, impact, fatigue and hardness tests
 - 1.4. Cold working and hot working
 - 1.5. Types of steel
 - 1.6. Phase transformation and heat treatment: Iron-carbon equilibrium diagram, hardening, tempering, annealing and normalizing
2. Fluid Mechanics (5 Marks)
 - 2.1. Fluid properties: Viscosity, surface tension, compressibility, Vapor Pressure
 - 2.2. Fluid statics: Pressure variations in static fluid, pressure head, manometer, force on submerged surfaces
 - 2.3. Equations of fluid flow: Types of flow, continuity equation, Bernoulli's equation, and momentum equation.
 - 2.4. Viscous effects: Reynold's number, boundary layer, frictional resistance to flow in pipes
 - 2.5. Flow measurement: Pitot-static tube, orifice, venturi meter, nozzle, rotameter
3. Thermodynamics and Heat Transfer (10 Marks)
 - 3.1. Basic concepts: Thermodynamic system, Temperature equilibrium, Zeroth law, thermodynamic property, pure Substance, laws of thermodynamics, heat engine, refrigerator and heat pump and Air Conditioning System
 - 3.2. Refrigeration: Reversed Carnot cycle, vapor compression cycle, absorption refrigeration systems, refrigerants and their properties
 - 3.3. Air Conditioning: Psychometric properties and psychometric chart, heating, cooling, humidification and dehumidification process, air conditioning systems
 - 3.4. Thermodynamic cycles: Carnot cycle, Otto cycle, Diesel cycle, Brayton cycle, Rankine cycle
 - 3.5. Heat engine: working of spark ignition engine and compression ignition engine, major components and their function, cycle of operation in four stroke and two-stroke cycle engines.
 - 3.6. Modes of heat transfer: Conduction, convection and radiation, heat transfer in plane wall and tubes, Stefan's Boltzmann law, Reflectivity and Transmissivity.
4. Workshop Technology and Metrology (5 Marks)
 - 4.1. Machine tools operation and application: Lathe, shaper, milling, grinding, drilling machines
 - 4.2. Metal joining operation and application: Oxy-acetylene welding and arc welding
 - 4.3. Limits, fits, tolerances and gauges
 - 4.4. Linear measurement: Block Gauges, length bars, comparators
 - 4.5. Angular measurement: Bevel protractor, sine bar, spirit level, clinometers and angle gauges
 - 4.6. Errors in measurement
5. Advance Machines and Machining Techniques (5 Marks)
 - 5.1. Numerical Control (NC) and Computer Numerical Control (CNC) machines, CNC machine tools, machine control units, general introduction to CNC programming

- 5.2. Modern Machining techniques: Ultrasonic machining, abrasive jet machining, abrasive water jet machining, electro chemical machining, electrical discharge machining, laser beam machining, electron beam machining, plasma arc machining
- 6. Hydraulic and Electric Machines (8 Marks)
 - 6.1. Working principle and characteristic of water turbines: Pelton, Francis, Kaplan, Propeller and Cross flow turbines
 - 6.2. Working principle and Characteristic of Pumps: Centrifugal pump and Reciprocating pump
 - 6.3. DC Motors: Shunt field, Series field and Compound field motors, Torque- speed characteristics
 - 6.4. DC Generators: Shunt, Series and Compound field machines, Voltage/speed/load characteristics, Effects of variable load, variable torque
 - 6.5. Synchronous and Induction Machines: Basic structure of synchronous machines, Generator on isolated load, Generator on large system, Synchronous motor
- 7. Instrumentation and Control (5 Marks)
 - 7.1. Basic concepts of control system: Classification, transfer function, block diagram and signal flow graph
 - 7.2. Sensors and transducers: Mechanical detector-transducer elements, resistance, variable inductance, mutual inductance, capacitive, piezo-electric, linear variable differential, thermoelectric, Hall effect, photo electric and photo emissive transducers, strain gauges
 - 7.3. Basic concepts of microprocessors and microcontrollers and their applications
 - 7.4. Basic Boolean algebra and numbering systems, basic logic gates
 - 7.5. Control system: Components, derivative, proportional and integral controllers and their combinations, hydraulic and pneumatic control systems, response characteristics of control systems
- 8. Automobile Engineering (7 Marks)
 - 8.1. Classification of automobiles and their features, parts and components of engine
 - 8.2. Fuel Systems: Fuel system for petrol engine, fuel injection for diesel engine, petrol fuel injection system and different types of sensors used in vehicles.
 - 8.3. Cooling and lubrication systems for engines
 - 8.4. Electrical system: Battery, ignition system, charging system, accessories
 - 8.5. Chassis layout and frames, suspension system, wheels, tyre and brake
 - 8.6. Transmission system and steering system
 - 8.7. Automobile emission and its control: combustion, constituents of exhaust, effect of air fuel ratio and driving mode, control of automobile emission
 - 8.8. Automobile service stations and service procedure: types of service stations, location and lay out, equipment, tools, service procedures
 - 8.9. Type of pollutants emitted from automobile
 - 8.10. Electrical vehicles and hybrid vehicles

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उपसमूह, अधिकृतस्तर सातौं तहको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक लिखित
परीक्षाको पाठ्यक्रम

द्वितीयपत्र (Paper II) : Technical Subject

Section (A) - 20 Marks

1. Machine Design and Drawing

- 1.1. Design analysis: Types of loads and stresses, theories of failure, factor of safety.
- 1.2. Design of machine components: Design of parts subjected to tension, compression, shear, bending, and design of shafts, keys, splines, couplings, fasteners, power screws, helical compression springs, knuckle joints, riveted joints and welded connections.
- 1.3. Design of power transmission elements: Belt drives, selection of flat and V belts, design of pulleys and flywheels, design of gear drives, spur, helical, bevel and worm gear drives.
- 1.4. Design of bearings: Hydrodynamic journal bearings, pressure-fed and self contained bearings and rolling contact bearings
- 1.5. Load lifting devices: Selection of steel wire ropes for hoists and cranes, crane hooks, design of hook block, sheaves and rope winding drums.
- 1.6. Pressure vessels: classification, material selection, loads and types of failures.
- 1.7. Types of projections, Assembly drawing, bolt, nut and screw fastener, 2D and 3D (Computer Aided Design) and commands
- 1.8. Design standardization: Importance of standardization, international organizations for standardization

Section (B) - 30 Marks

2. Industrial Engineering

- 2.1. Plant location and layout: Factors affecting location of factory plant building and service facilities, product or line layout, process or functional layout and fixed position layout
- 2.2. Production planning and inventory control: Forecasting techniques (time series, moving average, exponential smoothing, trend and seasonality). Inventory functions, cost, classification, deterministic and probabilistic inventory models
- 2.3. Operation research: Linear programming, problem formulation, simplex method, duality and sensitivity analysis, transportation and assignment models, PERT and CPM methods of project management
- 2.4. Quality Management: Concept of quality, statistical quality control, acceptance sampling, zero defects, six sigma, quality circle, quality assurance, total quality management
- 2.5. Ergonomics: Productivity and working environment, man-machine systems, illumination, noise and vibration, ventilation, air conditioning, temperature control, anthropometry, work-space layout
- 2.6. Safety: Workplace hazards and risks, hazard identification and risk assessment, risk control, causes and prevention of accidents, fire prevention and firefighting equipment, electrical safety, safe handling of chemicals, material handling and material safety data sheets

3. Maintenance Management

- 3.1. Maintenance: Reliability, maintainability, total life cycle, routine, fixed time, break down and shut down maintenance, maintenance work load and budget, documentation and recording, maintenance audit
- 3.2. Preventive and Predictive maintenance: Condition monitoring, signature analysis, online and off-line maintenance, non-destructive test, wear particles and oil analysis, thermography test, scanning electron microscope
- 3.3. Corrosion: Types of corrosion, corrosion testing, control and prevention
- 3.4. Tribology: Surfaces, friction and wear, lubrication, surface topography measurement
- 3.5. Total Productive Maintenance (TPM): Types of losses, measures to control losses, basics of TPM, cost estimation and safety measures

Section (C) - 20 Marks

4. Environmental engineering

- 4.1. Air Pollution: Pollution from combustion and atmospheric pollution, types of pollutants, sources of pollutants, particulate control, control of gaseous pollutants, indoor air pollution control
- 4.2. Noise Pollution: Measurement of noise, noise control
- 4.3. Water Pollution: Causes and effects, Waste water treatment
- 4.4. Solid Waste Management: Recycling, energy recovery, incineration, land filling
- 4.5. Global impacts: Green-House Effect, acid rain, climate change, ozone layer depletion
- 4.6. Electrical vehicles & hybrid vehicles their benefits and shortcoming

5. Energy Resources

- 5.1. Energy consumption scenario of Nepal, commercial and non-commercial energy resources
- 5.2. Hydroelectricity, national potentials, achievements and utilization
- 5.3. Solar energy and its applications: Solar thermal, solar photovoltaic
- 5.4. Biomass energy, wind energy
- 5.5. Methods of enhancing energy efficiency & energy conservation

Section (D) - 30 Marks

6. Engineering Economics

- 6.1. Time Value of Money: Simple interest, Compound interest, Continuous compound interest
- 6.2. Project Evaluation Techniques: Payback period method, NPV method, Future value analysis, IRR method
- 6.3. Benefit and Cost Analysis: Cost benefit ratio, breakeven analysis, make or buy decision
- 6.4. Engineering economics decisions
- 6.5. Corporate tax system in Nepal
- 6.6. Depreciation and its types

7. Professional Practice

- 7.1. Ethics and Professionalism: Perspectives on morals, codes of ethics and guidelines of professional engineering practice, Nepal Engineering Council Act and Rules
- 7.2. Contract Act and Rules,
- 7.3. Procurement and procurement procedure, Public Procurement Act, Rules and Guidelines in Nepal
- 7.4. Introduction to Intellectual Property: copy right, trademark, industrial design, patent, unfair competition, World Intellectual Property Organization (WIPO)
- 7.5. Karnali Province Civil Service Act and Regulations: Code of conduct

8. Construction Equipment, Planning and Management

- 8.1. Construction equipment, their types and uses: Earthmoving equipment, Hauling equipment, Hoisting equipment, Finishing equipment, Drilling equipment, Blasting equipment, Tunneling equipment, Pile driving equipment
- 8.2. Equipment life and replacement procedures: Physical life, profit life, economical life, replacement analysis, replacement decision making
- 8.3. Planning of equipment: Equipment selection, fleet standardization, resources management for operation, maintenance and service facilities

द्वितीय पत्रको प्रश्नसंख्या तालिका

खण्ड/भाग	A-20	B-30		C-20		D-30		
एकाई	1	2	3	4	5	6	7	8
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 नेपाल सरकारका 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 मूलमर्म 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 गतिशीलता, व्यवहार, व्यक्तित्व, मनोवृत्ति, क्रियाशीलता, निर्णयशक्ति, समस्या समाधान क्षमता, नेतृत्व क्षमता, समय व्यवस्थापन तथा व्यक्तित्वमा भएका अन्य गुणहरुको आकलन 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।

सामूहिक छलफल

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 अनुसारको ३ जना भन्दा बढीको समिति रहनेछ।

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