**लोक सेवा आयोग**
**संघीय संसद सेवा, प्राविधिक समूह, राजपत्राङ्कित तृतीय श्रेणी, मेकानिकल इञ्जिनियर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम**

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

| | | |
|---|---|---|
| **प्रथम चरण :–** | लिखित परीक्षा (Written Examination) | पूर्णाङ्क :– २०० |
| **द्वितीय चरण :-** | (क) सामूहिक परीक्षण (Group Test) | पूर्णाङ्क :– १० |
| | (ख) अन्तर्वार्ता (Interview) | पूर्णाङ्क :– ३० |

**परीक्षा योजना (Examination Scheme)**

**प्रथम चरण : लिखित परीक्षा (Written Examination)** **पूर्णाङ्क :– २००**

| पत्र | विषय | खण्ड | पूर्णाङ्क | उर्तीर्णाङ्क | परीक्षा प्रणाली | | प्रश्नसंख्या ×अङ्क | समय |
|---|---|---|---|---|---|---|---|---|
| प्रथम | General Subject | Part I: General Awareness & General Reasoning Test | १०० | ४० | वस्तुगत (Objective) | बहुवैकल्पिक प्रश्न (MCQs) | ५० प्रश्न × १ अङ्क | १ घण्टा ३० मिनेट |
| | | Part II: General Technical Subject | | | | | ५० प्रश्न × १ अङ्क | |
| द्वितीय | Technical Subject | | १०० | ४० | विषयगत (Subjective) | छोटो उत्तर लामो उत्तर | ४ प्रश्न × ५ अङ्क<br>८ प्रश्न × १०अङ्क | ३ घण्टा |

**द्वितीय चरण : सामूहिक परीक्षण (Group Test) र अन्तर्वार्ता (Interview)** **पूर्णाङ्क :– ४०**

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

**द्रष्टव्य :**

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
२. प्रथमपत्र र द्वितीयपत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
३. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको 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 ।
४. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
५. विषयगत प्रश्नहरुको हकमा तोकिएको अंकको 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 टिप्पणीहरु (Short notes) सोध्न सकिने छ ।
६. द्वितीय पत्रमा (विषयगत प्रश्न हुनेका हकमा) प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
७. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।
८. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
९. यस भन्दा अगाडि लागु भएका माथि उल्लेखित सेवा, समूहको पाठ्यक्रम खारेज गरिएको छ ।
१०. पाठ्यक्रम लागू मिति : - **२०८०/०७/२०**

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## 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
   - 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 periodical plan of 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 UNO, SAARC & BIMSTEC
   - 1.8 The Constitution of Nepal (From Part 1 to 5 and Schedules)
   - 1.9 Governance system and Government (Federal, Provincial and Local)
   - 1.10 Provisions of civil service act and regulation relating to constitution of civil service, organisational 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, 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

2. **General Reasoning Test (25 ×1 Mark = 25 Marks)**
   - 2.1 **Logical Reasoning** (9×1 Mark = 9 Marks)
     Verbal Ability, Alphanumeric Series, Reasoning Analogies, Classification, Coding-Decoding, Order & Ranking, Distance & Directions, Analytical and Logical Reasoning, Assertion and Reason, Statement and Conclusion, Input-Output, Venn- diagram
   - 2.2 **Numerical Reasoning** (8×1 Mark = 8 Marks)
     Arithmetic Series, Analogy, Classification, Arithmetical Reasoning, Fraction. Percentage, Ratio, Average, Profit & Loss, Time & Work, Date & Calender, Data Sufficiency, Data Interpretation & Data Verification
   - 2.3 **Spatial Reasoning** (8×1 Mark = 8 Marks)
     Figure Series, Figure Analogy, Figure Classification, Figure Matrix, Pattern Completion, Embedded Images, Image Formation & Analysis, Mirror and Water Images, Cubes and Dices, Paper Folding & Cutting

## 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 steels and Cast iron
   - 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, Laminar and Turbulent flow, Boundary layer, Frictional resistance to flow in pipes, Energy losses in pipes
   - 2.5 Flow measurement: Pitot-static tube, Orifice, Venturimeter, Nozzle and Rotameter

3. **Thermodynamics and Heat Transfer** **( 7 marks)**
   - 3.1 Basic concepts: Thermodynamic system, Thermodynamic property, Pure substance, Laws of thermodynamics, Heat engine, Refrigerator and Heat pump
   - 3.2 Thermodynamic cycles: Carnot cycle, Otto cycle, Diesel cycle, Brayton cycle and Rankine cycle
   - 3.3 IC engines: Classifications, Components, Two-stroke and Four-stroke operations, Performance of IC engines
   - 3.4 Refrigeration: Reversed Carnot cycle, Vapor compression cycle, Absorption refrigeration systems, Refrigerants and their properties
   - 3.5 Air Conditioning: Psychometric properties and Psychometric chart, Heating, cooling, Humidification and dehumidification process, Air conditioning systems
   - 3.6 Modes of heat transfer: Conduction, Convection and Radiation, Heat exchanger: Types and application

4. **Workshop Technology and Metrology** **(5 marks)**
   - 4.1 Machine tools operation and application: Lathe, Shaper, Milling, Grinding, Drilling and Planing machines
   - 4.2 Numerical Control (NC) and Computer Numerical Control (CNC) machines, NC machine tools, Machine control units, General introduction to CNC programming
   - 4.3 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
   - 4.4 Welding: Classification of welding processes, Principles and equipment used in Gas welding, Arc welding, Resistance welding, Thermitt welding, Soldering and Brazing
   - 4.5 Limits, Fits, Tolerances and Gauges

4.6 Measurements: Linear and Angular measurements, Types of measuring instruments
4.7 Errors in measurement and calibration

5. **Hydraulic and Electric Machines** **(5 marks)**
5.1 Working principle and characteristic of water turbines: Pelton, Francis, Kaplan and Cross flow turbines
5.2 Working principle and Characteristic of Pumps: Centrifugal pump, Reciprocating pump and Hydraulic ram
5.3 DC Motors: Shunt field, Series field and Compound field motors, Torque- speed characteristics
5.4 DC Generators: Shunt, Series and Compound field machines, Voltage/Speed/Load characteristics, Effects of variable load, Variable torque
5.5 Synchronous and Induction Machines: Basic structure of synchronous machines, Generator on isolated load, Generator on large system, Synchronous motor

6. **Instrumentation and Control** **(5 marks)**
6.1 Basic concepts of control system: Classification, Transfer function, Block diagram and Signal flow graph
6.2 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
6.3 Basic concepts of microprocessors and microcontrollers, their applications
6.4 Basic Boolean algebra and numbering systems, Basic logic gates
6.5 Control system: Components, Derivatives, Proportional and Integral controllers and their combinations, Hydraulic and Pneumatic control systems, Response characteristics of control systems

7. **Automobile Engineering** **(8 marks)**
7.1 Classification of automobiles and their features, parts and components
7.2 Fuel Systems: Fuel system for petrol engine, Fuel injection system for diesel engine
7.3 Cooling and lubrication systems for engines
7.4 Supercharging and Turbocharging: Working principle of Supercharger and Turbocharger, Advantages and disadvantages
7.5 Electrical system: Ignition system, Charging system, Lightings, and Accessories
7.6 Chassis layout and frames, Suspension system, Wheels, Tyres and Brakes
7.7 Transmission system and Steering system
7.8 Automobile emission and its control: Combustion, Constituents of exhaust, Effect of air fuel ratio and Driving mode, Control of automobile emission
7.9 Automobile service stations and service procedure: Types of service stations, Location and lay out, Equipment, Tools, Service procedures
7.10 Electric Vehicles: Body frame, Battery charging system, Types of battery chargers, Battery: Types and Cooling system
7.11 Hybrid vehicles: Technology and types
7.12 Vehicle diagnostic tools

8. **Engineering Economics** **(5 marks)**

8.1 Time Value of Money: Simple interest, Compound interest, Continuous compound interest

8.2 Project Evaluation Techniques: Payback period method, NPV method, Future value analysis, IRR method

8.3 Engineering economics decisions: Benefit and Cost Analysis, Break even analysis, Owning, Leasing and Hiring decision

8.4 Corporate tax system in Nepal

8.5 Depreciation and its types

9 **Printing press and water treatment plant** **(5 marks)**

9.1 Printing Press

9.1.1 Basic print media, Printing technology, Printing process and Maintenance of printing machines

9.1.2 Digital printing, Offset printing, Flexography printing, Gravure and Screen printing

9.1.3 Basic principle of imaging technique: Pre-press, Presses

9.1.4 Printing Electronics: Materials, Components

9.1.5 Printing inks: Types of printing inks

9.2 Water treatment plant

9.2.1 Water quality and treatment, Water treatment processes

9.2.2 Stages of water treatment

9.2.3 Problems faced in water treatment and their remedies

9.2.4 Nepal's drinking water quality standard

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