

# नेपालगंज उप-महानगरपालिका

नेपाल इन्जिनियरिङ्ग सेवा अटोमोवाइल्स/मेकानिकल समुह अन्तर्गतका अधिकृत छैठौं तह पदको खुल्ला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम।

यस पाठ्यक्रमलाई दुई चरणमा विभाजन गरिएको छ।

प्रथम चरण:- लिखित परीक्षा पूर्णाङ्क:- १००

द्वितीय चरण:- अन्तर्वार्ता पूर्णाङ्क:- २०

परीक्षा योजना

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या*अङ्क	समय
प्रथम	General Knowledge, IQ and Technical Subject	१००	४०	वस्तुगत बहुवैकल्पिक प्रश्न	१०० प्रश्न*१ अङ्क	१ घण्टा ४५ मिनेट

## (Part I): General Subject (30 Marks)

### 1. General Awareness and Contemporary Issues

(20 ×1 Mark = 20 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 Functional scope of public services
- 1.11 Public Service Charter
- 1.12 Concept, objective and importance of public policy
- 1.13 Fundamentals of management : planning, organizing, directing, controlling, coordinating, decision making, motivation and leadership
- 1.14 Government planning, budgeting and accounting system
- 1.15 Major events and current affairs of national and international importance

### 2. General Ability Test (10 ×1 Mark = 10 Marks)

#### 2.1 Verbal Ability Test (3×1 Mark = 3 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 (4×1 Mark = 4Marks)

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 (3×1 Mark = 3 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 (70 Marks)

### Paper (II) : - General Technical Subject (70 Marks)

#### 1. Material Science and Metallurgy (10 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, venturimeter, nozzle, rotameter

#### 3. Thermodynamics and Heat Transfer (10 marks)

- 3.1 Basic concepts: Thermodynamic system, thermodynamic property, pure Substance, laws of thermodynamics, heat engine, refrigerator and heat pump
- 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 IC engines: Classifications, components, two-stroke and four-stroke operations, performance of IC engines
- 3.6 Modes of heat transfer: Conduction, convection and radiation

#### 4. Workshop Technology and Metrology (10 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 Gages, 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 (13 marks)**

- 6.1 Working principle and characteristic of water turbines: Pelton, Francis, Kaplan and Cross flow turbines
- 6.2 Working principle and Characteristic of Pumps: Centrifugal pump and Reciprocating pump , Hydraulic ram
- 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 (12 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
- 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, tyres 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

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