

ललितपुर महानगरपालिका

अधिकृत छैटौं तह, मेकानिकल इन्जिनियर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम यस पाठ्यक्रमलाई दुई चरणमा विभाजन गरिएको छः

**परीक्षा योजना (Examination Scheme)**

प्रथम चरण: लिखित परीक्षा (Written Examination):

Paper	Subject	Part	Full Marks	Pass Marks	Exam Type		No. of Questions x Marks	Time
1 <sup>st</sup>	General Subject	Part I: General Awareness & General Reasoning Test	100	40	Objective	Multiple Choice Questions (MCQ)	20 प्रश्न x 1 marks	1 Hour and 30 Minutes
		Part II: General Technical Subject					80 प्रश्न x 1 marks	

द्वितीय चरण: अन्तर्वार्ता (Interview):

Paper/Subject	Full Marks	Pass Marks	Exam Type	Time
Interview	20		Board Interview	-

द्रष्टव्यः

- प्रथम चरणको प्रश्नपत्रको भाषा नेपाली वा अंग्रेजी वा नेपाली र अंग्रेजी दुवै हुनेछ।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नको 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।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षरहरू (Capital Letters): A, B, C, D मा लेख्नुपर्नेछ। सानो अक्षरहरू (Small Letters): a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको वा केरमेट गरेको भए सो उत्तरलाई गलत मानिनेछ।
- उत्तरपुस्तिकामा प्रश्नपत्रमा उल्लेखित 'कि' स्पष्टसँग उल्लेख गर्नु पर्नेछ। 'कि' उल्लेख नगरेको वा उत्तरपुस्तिकामा कुनै संकेत गरेको पाइएमा उत्तरपुस्तिका रद्द हुनेछ।
- बहुवैकल्पिक प्रश्न हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर प्रयोग गर्न पाइने छैन।
- परीक्षामा सोधिने प्रश्नहरू यथासम्भव सम्बन्धित पाठ्यक्रममा विभाजन गरेको अङ्कको आधारमा सोधिनेछ।
- पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
- प्रथम चरणको परीक्षाबाट छनोट भएका उम्मेदवारलाई मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित गराइनेछ।
- प्रथम चरणको लिखित परीक्षा र द्वितीय चरणको अन्तर्वार्ता तथा स्थानीय र अनुभवको अंकको योग समेतका आधारमा योग्यताक्रमको सूचीमा समावेश गरी अन्तिम परीक्षाफल प्रकाशन गरिनेछ।
- पाठ्यक्रम लागु मिति: २०८१/०८/१९.

## ललितपुर महानगरपालिका

अधिकृत छैटौं तह, मेकानिकल इन्जिनियर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

### Part I : General Awareness & General Ability Test (20 Marks)

1. **General Awareness and Contemporary Issues:** (10 x 1 Mark= 10 Marks)
  - 1.1. Physical, socio-cultural, and economic geography and demography of Nepal.
  - 1.2. Major natural resources of Nepal.
  - 1.3. Current periodical plan of Nepal.
  - 1.4. Information on sustainable development, environment, pollution, climate change, biodiversity, science and technology.
  - 1.5. Governance system and Government (Federal, Provincial, and Local)
  - 1.6. Concept, objective, and importance of public policy.
  - 1.7. Government planning, budgeting, and accounting system.
  - 1.8. Major events and current affairs of national and international importance.
  - 1.9. Public Service Charter.
  - 1.10. नेपालको संविधानको भाग १, २, ३, ४, ५, १७, १८, १९ र २० तथा अनुसूचीहरू।
  - 1.11. स्थानीय सरकार सञ्चालन ऐन, २०७४।
  - 1.12. ललितपुर महानगरपालिका वारे सामान्य जानकारी।
2. **General Reasoning Test:** (10 x 1 Mark = 10 Marks)
  - 2.1 **Logical Reasoning**
    - Verbal Ability-understanding instructions, technical documents, and verbal problem-solving
    - Classification-categorize materials, components, or processes efficiently.
    - Coding-Decoding-understanding machine codes, automation systems, and industrial control programming.
    - Order & Ranking -sequencing tasks, project schedules, or optimizing production processes.
    - Venn-diagram-Problem solving, design and analysis, optimization.
  - 2.2 **Numerical Reasoning**
    - Arithmetic Series, Fractions, Percentages, Ratio-material calculations, load analysis, cost estimation, and scaling mechanical systems.
    - Time & Work-project management, estimating task durations (e.g., machine repairs, assembly processes).
    - Data Interpretation & Data Verification-interpreting and verifying data from testing or machinery for correct technical decision-making.
  - 2.3 **Spatial Reasoning**
    - Figure Series, Figure Analogy- mechanical part interactions and system movements, mechanical design and assembly.
    - Pattern Completion, Embedded Images-recognizing patterns and visualizing components in space for mechanical design and assembly processes.
    - Cubes and Dices-visualizing 3D shapes and components in manufacturing, assembly, and spatial arrangement of mechanical systems.
    - Paper Folding & Cutting-visualizing how materials, components, or parts might be manipulated or shaped in the manufacturing or fabrication process.

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### Part II: General Technical Subject (80 Marks)

- 1. Material Science and Metallurgy:** (5 x 1 Mark= 5 Marks)
  - 1.1 Types of materials and material selection
  - 1.2 Mechanical properties and testing: Tension, impact, fatigue and hardness tests
  - 1.3 Cold working and hot working.
  - 1.4 Types of steel
- 2. Fluid Mechanics:** (5 x 1 Mark= 5 Marks)
  - 2.1 Fluid properties: Viscosity, surface tension, compressibility, Vapor Pressure.
  - 2.2 Viscous effects: Reynold's number, boundary layer, frictional resistance to flow in pipes.
  - 2.3 Flow measurement: Pitot-static tube, orifice, venturi meter, nozzle, rotameter.
- 3. Thermodynamics and Heat Transfer :** (10 x 1 Mark= 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** (15 x 1 Mark= 15 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.
  - 4.7 Safety and Maintenance of Workshop Tools.
  - 4.8 Use of Hand Tools in Maintenance.
  - 4.9 Workshop Organization and Tools for Automobile Servicing/Maintenance.
  - 4.10 Lubrication Systems in Machinery.
- 5. Hydraulic and Electric Machines:** (15 x 1 Mark= 15 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 and Reciprocating pump, 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. Automobile Engineering (20 x 1 Mark= 20 Marks)**

- 6.1 Classification of automobiles and their features, parts and components of engine
- 6.2 Fuel Systems: Fuel system for petrol engine, fuel injection for diesel engine, petrol fuel injection system
- 6.3 Cooling and lubrication systems for engines
- 6.4 Electrical system: Battery, ignition system, charging system, accessories
- 6.5 Chassis layout and frames, suspension system, wheels, tyres and brake
- 6.6 Transmission system and steering system
- 6.7 Automobile emission and its control: combustion, constituents of exhaust, effect of air fuel ratio and driving mode, control of automobile emission
- 6.8 Automobile service stations and service procedure: types of service stations, location and lay out, equipment, tools, service procedures
- 6.9 Vehicle Safety Systems and (ADAS) Advanced Driver Assistance Systems (airbags, anti-lock braking systems (ABS), traction control, lane assist, and collision detection)
- 6.10 Electric Vehicles (EVs) and Battery Systems -components of electric vehicles, including battery types (Li-ion, lead-acid), charging systems, regenerative braking, and maintenance practices specific to EVs.
- 6.11 Firefighting Vehicles and Specifications-specialized design and equipment of firefighting vehicles, including water tanks, pumps, nozzles, hoses, ladders, emergency lighting systems, and the vehicle's drivetrain for carrying heavy loads and rapid deployment.

**7. Environment and Waste Management: (10 x 1 Mark= 10 Marks)**

- 7.1 Environment Basics: Understanding ecosystems, environmental sustainability, and the role of engineers in minimizing environmental impacts.
- 7.2 Types and Sources of Waste: Classification of waste (solid, liquid, hazardous, e-waste) and their sources in urban and industrial settings.
- 7.3 Waste Management Techniques: Principles of waste reduction, reuse, recycling, and safe disposal methods.
- 7.4 Waste Management Equipment: Introduction to mechanical tools and equipment such as compactors, shredders, balers, and conveyors used in waste management.
- 7.5 Waste Processing Plants: Overview of design and operation of processing plants, including composting, biogas production, incineration, landfilling and recycling facilities.
- 7.6 Regulations and Local Context: Policies, standards, and challenges in waste management specific to Nepal's local government level.
- 7.7 Innovative Solutions: Role of mechanical engineering in developing sustainable and cost-effective waste management solutions.