

ललितपुर महानगरपालिका

अधिकृत छैटौं तह, इलेक्ट्रिकल 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 st	General Subject	Part I: General Awareness & General Reasoning Test	100	40	Objective	Multiple Choice Questions (MCQ)	20 Questions. x 1 marks	1 Hour and 30 Minutes
		Part II: General Technical Subject					80 Questions. 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 लेखदा 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.

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अधिकृत छैटौं तहइलेक्ट्रिकल 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 बारे सामान्य जानकारी।
2. **General Reasoning Test** (10 x 1 Mark = 10 Marks)
 - 2.1 **Logical Reasoning:** 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:** Arithmetic Series, Analogy, Classification, Arithmetical Reasoning, Fraction. Percentage, Ratio, Average, Profit & Loss, Time & Work, Date & Calendar, Data Sufficiency, Data Interpretation & Data Verification.
 - 2.3 **Spatial Reasoning:** 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.

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Part II: General Technical subject (80 marks)

1. **D.C. and A.C. CIRCUIT ANALYSIS:** (10 x 1 Mark = 10 Marks)
 - 1.1 Basic circuit concept: Ohm's law, voltage, current, power and energy, conducting and insulating materials., Kirchhoff's law.
 - 1.2 Series and parallel electric circuits, star-delta and delta-star conversion, linear and non-linear circuit, bilateral and unilateral circuits, active and passive circuits.
 - 1.3 Network Theorem: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem and Maximum power transfer theorem.
 - 1.4 Alternating current fundamentals: Principle of generation of alternating voltages and currents and their equations and waveforms, average, peak and rms values.
 - 1.5 Concept of complex Impedance and Admittance, RLC series and parallel circuits, Phasor algebra.
 - 1.6 Resonance in series and parallel RLC circuit, bandwidth and effect of Q-factor, Active, Reactive and Apparent power.
 - 1.7 Three phase systems: star and delta connection of three phase system, relation between line and phase voltage, three phase power measurement.
 - 1.8 Two-port network: Z, Y, T and h parameters.
2. **ELECTRICAL MACHINES:** (10 x 1 Mark = 10 Marks)
 - 2.1 Magnetic circuits: Flux linkage, inductance and energy; magnetic materials and their properties; magnetically induced emf and force.
 - 2.2 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.
 - 2.3 D.C. Generator: 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.
 - 2.4 D.C. Motor: Construction detail, Operating principle of dc motor, Back emf, Types of dc motor, their characteristics and applications, DC motors starter, Speed control of dc motor
 - 2.5 Three phase 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.
 - 2.6 Single phase induction motor: Construction, Operation and Characteristics of single-phase motors: Split phase motors, shaded pole motors, applications, Speed control, Induction generator.
 - 2.7 Synchronous generator: 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.

2.8 Synchronous Motor: Constructions detail, operating principle of synchronous motor, Starting methods, Effect of excitation on performance of synchronous motor, V and Inverted V curves.

3. INSTRUMENTATIONS AND POWER ELECTRONICS: (10 x 1 Mark = 10 Marks)

- 3.1 Measurement and error: Static and Dynamic Errors, Maxwell bridges, Schering Bridge, Wien Bridge, Accuracy and Precision.
- 3.2 Measuring instruments: Moving Coil and Moving Iron Instruments: Galvanometer, Ammeter, Voltmeter, Wattmeter, Watt-hour meter, Maximum Demand Meter, Frequency Meter and Power Factor Meter, Measurement of resistances.
- 3.3 Transducers and sensors: Electrical, Mechanical and Thermal: Potentiometer, LVDT, Strain Gauge, load cell, Hall Effect Sensors, Piezoelectric Sensors, Capacitive Sensors, thermistor, thermocouples, photoconductive cells, photo diodes.
- 3.4 Instrument transformers: Construction and Operating Principles of Measuring and Protection type CTs, Potential Transformers.
- 3.5 Power semiconductor switches: Construction and Characteristics of power diode, Thyristors, GTO, TRAIAC, IGBT and MOSFET, Power loss in Power Switches, Protection of Power Switching Devices and Circuits.
- 3.6 Power converters: Rectifiers: Operating principle, half wave and full wave rectifier, Performance parameters of rectifier and THD evaluation, power factor improvement techniques, Inverters: basic principle of inverter, output waveforms, THD evaluation, Pulse Width Modulation for Inverters.
- 3.7 DC-DC converters: principle of operation of DC-DC converters, output waveforms, average output voltage.
- 3.8 Applications of power electronics: Operation of UPS and battery, etc.

4. GENERATION, TRANSMISSION AND DISTRIBUTION: (10 x 1 Mark = 10 Marks)

- 4.1 Hydroelectric Power Plants: Hydraulic to electrical energy conversion, output power equation, classification, elements of hydroelectric power plant and schematic layouts, site selection, essential features of hydroelectric alternators, auxiliaries in hydroelectric plant, advantages and disadvantages of hydroelectric plants.
- 4.2 Turbines: classification of water turbines, working principle of different types of water turbines, physical characteristics and efficiencies, governing of water turbines, selection of water turbines.
- 4.3 Non-Conventional method of power generation: Concept of solar photovoltaic and wind method of power generation and their importance, Energy security.
- 4.4 Power transmission system: Overhead and underground transmissions, advantages and limitations of high voltage transmission; choice of working voltage, conductor size and configuration.
- 4.5 Mechanical Design of transmission line: supports and cross arms, insulators used in overhead lines, vibration dampers sag tension calculation.
- 4.6 Power Distribution System: Voltage levels, primary and secondary distribution, radial and ring mains distribution, single phase and three phase ac distribution.
- 4.7 Distribution System component and equipment: pole/tower types, conductors and insulators used in distribution lines, distribution transformer and its accessories.

4.8 Fault finding and protection coordination in distribution system, distribution system reliability indices, rural distribution system and loss reduction.

5. POWER SYSTEM ANALYSIS: (10 x 1 Mark = 10 Marks)

- 5.1 Transmission line parameters: Computation of series and shunt parameters of transmission line equivalent circuits, concept of GMD and GMR, proximity effect and skin effect.
- 5.2 Per unit system representation: Single line impedance and reactance diagrams.
- 5.3 Transmission line performance: Lumped and distributed parameter modeling, ABCD parameters, efficiency & regulations calculations, Ferranti effect, surge impedance loading.
- 5.4 Over voltages in transmission lines: Power frequency, switching and lightning over voltages, surge arrestors.
- 5.5 VAR compensation: Real and reactive power flow through transmission line, series and shunt compensations.
- 5.6 Fault calculations: Symmetrical components, grounded & ungrounded systems, L-G, L-L, L-L-G and 3-phase faults.
- 5.7 Load Flow studies: Gauss Seidel and Newton Raphson methods.
- 5.8 Stability Studies: Static and Transient stability, equal area criterion, methods of improving stability of the system.

6. SWITCHGEAR AND PROTECTION: (10 x 1 Mark = 10 Marks)

- 6.1 Fuse: Types, characteristics and operating principles.
- 6.2 Magnetic Contactors: Types, construction, operating principles.
- 6.3 Isolators (Disconnecting switches): types, construction and operating principles.
- 6.4 MCB and MCCB: Construction, operating principles, characteristics.
- 6.5 Relays: Electromagnetic and Static Relays, Over current Relay, Impedance Relay, Directional Relay.
- 6.6 Circuit Breakers: ACB, OCB, ABCB, VCB and SF6 CB; construction, operating principles and applications.
- 6.7 Protection schemes: Over current, under voltage, differential, distance protection.
- 6.8 Grounding: System and equipment grounding, electric shock, safe value of current and voltages, touch and step potentials, Ground Fault Current Interrupters.

7. UTILIZATION OF ELECTRICAL ENERGY AND POLICY: (10 x 1 Mark = 10 Marks)

- 7.1 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.
- 7.2 Illumination: luminous flux, luminous intensity, construction and working principle of incandescent lamps, fluorescent lamps, CFL, LED, indoor and outdoor lighting schemes.
- 7.3 Electrical design and estimation: Electrical Drawing, Estimation and Costing for buildings and industrial complexes; National Building Code; National electricity standards and codes.
- 7.4 Tariff schemes: Types of tariffs, tariff schemes in Nepal; Nepal Electricity Regulations and Acts.
- 7.5 Electrical energy conservation and demand side management.
- 7.6 Electrical accessories use and their operational characteristics.

7.7 Basic concept about Energy Audit.

7.8 Nepal Engineering Council and related professional organizations.

8. SAFETY ENGINEERING AND STANDARDS:

(10 x 1 Mark = 10 Marks)

8.1 Effects of electric shock on human beings, first aid requirements, safety and precautions against electric shocks; safety rules and regulation.

8.2 Common safety tools and devices for electric utility technician; Technical Standards and performance test of safety tools and devices, significance live line maintenance and relevant precautionary measures.

8.3 Earthing and shielding techniques; earth resistance and resistivity measurements.

8.4 Earthing of electrical system and electrical equipment. its importance and methods of earthing.

8.5 Fire hazards; firefighting techniques and equipment for electric utility.

8.6 Quality of Electricity: Supply quality parameters, effect of quality on equipment and application, standards.

8.7 National Building Code; National electricity standards and codes.

8.8 Standards and Calibration of testing electrical equipment and devices.