

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, इलेक्ट्रिकल समूह/उपसमूह, तह-७, इञ्जिनियर पदको खुल्ला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

१. लिखित परीक्षाको विषय, पूर्णाङ्क, परीक्षा प्रणाली, प्रश्नसंख्या, अंकभार र समय निम्नानुसार हुनेछ

पत्र	विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या	प्रति प्रश्न अंकभार	समय
प्रथम	सामान्यज्ञान तथा सेवा सम्बन्धि सामान्य विषय	१००	४०	क) सामान्यज्ञान र बौद्धिक परीक्षण	वस्तुगत बहु बैकल्पिक प्रश्न	२५	२	२ घण्टा
				(ख) सेवासम्बन्धी सामान्य विषय	छोटो उत्तर आउने प्रश्न	१०	५	
द्वितीय	सेवा सम्बन्धी	१००	४०	विषयगत	लामो उत्तर आउने प्रश्न	१०	१०	३ घण्टा

२. वस्तुगत प्रश्नमा प्रत्येक प्रश्नका चार वटा सम्भाव्य उत्तर दिइने छ । जस मध्ये एउटा सही उत्तरमा (लोकसेवा आयोगले तोके बमोजिम) चिन्ह लगाउने वा लेख्नु पर्नेछ । गलत उत्तर बापत प्रति गलत उत्तर २० प्रतिशतका दरले अंक घटाइनेछ ।
३. प्राविधिक सेवा अन्तर्गतका सबै समूह/उपसमूहहरूको प्रथम पत्रको पाठ्यक्रम एउटै हुनेछ । प्रथम पत्रको लिखित परीक्षा सबै समूह/उपसमूहका लागि संयुक्त रूपमा एउटै प्रश्नपत्रवाट एकैदिन वा छुट्टाछुट्टै प्रश्नपत्रवाट छुट्टाछुट्टै दिन हुन सक्नेछ ।
४. प्रथमपत्र र द्वितीयपत्रको परीक्षा फरक फरक हुनेछ । द्वितीय पत्रमा २ खण्डहरू हुनेछन् । प्रत्येक खण्डको लागि फरक फरक उत्तर पुस्तिका प्रयोग गर्नुपर्नेछ ।
५. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी वा दुवै हुन सक्नेछ ।
६. सामान्यतः प्रत्येक इकाईबाट प्रश्नहरू सोधिनेछन् । प्रत्येक इकाईको अंकभार तोकिए बमोजिम हुनेछ । लामो उत्तर दिनुपर्ने प्रश्न एकै वा खण्ड खण्ड गरी (दुइ वा सो भन्दा बढी) सोध्न सकिनेछ । यस्तो प्रश्न एक भन्दा बढी इकाईबाट पर्ने गरी सोध्न सकिनेछ ।
७. यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
८. परीक्षामा कालो मसी भएको कलम वा डटपेन मात्र प्रयोग गर्नुपर्नेछ ।

प्रथमपत्र: सामान्य ज्ञान तथा सेवासम्बन्धी सामान्य विषय (प्राविधिक सेवा, तह-७ का सबै समूहका लागि)

खण्ड (क): सामान्य ज्ञान र बौद्धिक परीक्षण

[५० अंक]

१. सामान्यज्ञान :

(१५x२=३०)

- क) नेपालको भूगोल र आर्थिक तथा सामाजिक कृयाकलाप: धरातलीय स्वरूपको किसिम र विशेषता, नेपालमा पाईने हावापानीको किसिम र विशेषता, नदीनाला, तालतलैया, खनिज पदार्थ, प्राकृतिक स्रोत साधन, विद्युत, शिक्षा, स्वास्थ्य र सञ्चारसम्बन्धी जानकारी
- ख) नेपालको सामाजिक एवं सांस्कृतिक अवस्था: प्रथा, परम्परा, धर्म, जातजाति, भाषाभाषी, कला, संस्कृति र साहित्य
- ग) नेपालमा विद्युत विकास, ऊर्जाका स्रोत र सम्भावना
- घ) नेपालको संघीय, प्रादेशिक र स्थानीय संरचना तथा शासन प्रणालीसम्बन्धि जानकारी

- ड) विश्वको भूगोल: महादेश, महासागर, अक्षांश, देशान्तर, अन्तर्राष्ट्रिय तिथि रेखा, समय, पर्वतश्रृंखला, नदी, हिमनदी, ताल, हिमताल
- च) अन्तर्राष्ट्रिय सम्बन्ध तथा संघ/संस्था: संयुक्त राष्ट्र संघ र यसका एजेन्सीहरू (UNO and Its Agencies, दक्षिण एशियाली क्षेत्रीय सहयोग संगठन (SAARC) सम्बन्धी जानकारी
- छ) राष्ट्रिय तथा अन्तर्राष्ट्रिय महत्वका समसामयिक घटना तथा नविनतम गतिविधिहरू

२. बौद्धिक परीक्षण:

२.१ Verbal and Non-verbal Aptitude: (१०×२=२०)

Vocabulary, Alphabetical ordering of words, Classification, Coding-Decoding, Insert the missing character, Direction and Distance sense test, Ranking order test, Relationship Test, Logical sequence of words, Common sense test, Assertion and Reason, Logical reasoning, Figure series, Figure analogy, Figure Classification, Figure Matrix, Pattern completion/finding, Construction of squares and triangles, Analytical reasoning.

२.२ Numerical Ability and Quantitative Aptitude :

Arithmetical reasoning, Insert the correct mathematical signs, Decimal and Fraction, Percentage, Ratio, Average, Profit and Loss, Time and work.

खण्ड (ख): सेवासम्बन्धी सामान्य विषय (५० अङ्क)

1. Constitution, Act and Rules

3*5= 15

- 1.1. Present Constitution of Nepal
- 1.2. Nepal Electricity Act, 2041
- 1.3. Nepal Electricity Authority, Present Employee Service by laws
- 1.4. Electricity Regulatory Commission Act, 2074
- 1.5. Electricity Act, 2049 and Electricity Regulation, 2050
- 1.6. Public Procurement Act, 2063
- 1.7. Nepal Electricity Authority, Present Financial Administration by laws
- 1.8. Corruption Control Act, 2059
- 1.9. Good Governance (Management and Operation) Act, 2064
- 1.10. Land Acquisition Act, 2034
- 1.11. Environment Protection Act, 2053 and Environment Protection Regulation, 2054

2. Electricity Development in Nepal

2*5= 10

- 2.1. History of power development in Nepal; energy supply demand trends
- 2.2. Recent trends in power sector reform; Hydropower potential of Nepal and prospects and challenges for its development
- 2.3. Nepal Electricity Authority: objective, functions, corporate structure, achievement and challenges
- 2.4. Concept of NEA Restructuring in federal context
- 2.5. Silent features of energy crisis decade by government of Nepal

3. Development

1*5= 5

- 3.1. General concept of development administration
- 3.2. Planning in Nepal: efforts, achievement and challenges
- 3.3. Sustainable Development
- 3.4. Public Private Partnership

4. Management and financial analysis:

2*5= 10

- 4.1. Concept of Management
- 4.2. Motivation, Leadership, Control, Coordination and Team work, Decision making
- 4.3. Corporate planning and strategic management
- 4.4. Corporate social responsibility
- 4.5. Project management: Use of network models like CPM, PERT, manpower planning and resource scheduling; project monitoring and control; project control cycle

- 4.6. Financial analysis: Methods of financial analysis such as benefit cost ratio, internal rate of return, net present value, payback period, minimum attractive rate of return and their application; Concept of EIRR and FIRR; tariff structure

5. New Trends of Power Sector

2*5= 10

- 5.1. Various Sources of Energy: trend, Possibilities and challenges
- 5.2. Role of IPP (Independent Power Producer), opportunities and challenges
- 5.3. Power Purchase Agreement (PPA), Power development agreement (PDA)
- 5.4. Concept of Energy Pool Market and Energy Banking
- 5.5. Regional and sub regional interconnections with Nepalese grid

द्वितीय पत्र: सेवा सम्बन्धी
(इलेक्ट्रिकल उपसमूहका लागि)

१०० अङ्क

Section: A

{5x10=50}

1. ELECTRICAL MACHINES

- Magnetic circuits: Flux linkage, inductance and energy; magnetic materials and their properties; magnetically induced emf and force; AC operation of magnetic circuits; hysteresis and eddy current losses.
- Transformers: Equivalent circuits; losses and efficiency; efficiency curves; energy efficiency; regulation; grounding; transformer connections; parallel operation; overloading capacity; temperature rise; auto-transformer and instrument transformers.
- DC Machines: Working principles; types; operating characteristics; armature reaction; losses and efficiency; applications, starting and speed control of DC motors.
- Synchronous machines: Working principles; operating characteristics; losses and efficiency; steady state and transient equivalent circuits; excitation system and requirement, governor principle; parallel operation; hunting.
- Induction Machines: Working principles; operating characteristics of motoring and generating mode; losses and efficiency; equivalent circuits; starters; speed control and motor selection.

2. GENERATION

- Hydroelectric Power Plants: Merits and demerits; site selection; classification; elements of hydroelectric power plant and schematic layouts; different types of water turbines; efficiency curves; selection of water turbines; essential features of hydroelectric alternators; choice of size and number of generating units; auxiliaries in hydroelectric plant; Nepalese power plants, their types, salient features and locations.
- Diesel Electric Power Plants: Merits and demerits; application; site selection; elements of a diesel plant and its schematic arrangement; performance and thermal efficiency.
- Non conventional method of power generation: Micro hydro, solar photovoltaic, wind and geothermal method of power generation and their importance.
- Concept of load curve; load duration curve; mass curve; demand factor; plant factor; utilization factor and plant use factor; significance of load factor and diversity factor in generation planning.

3. POWER ELECTRONICS

- Power electronics devices; Diode, power transistors, MOSFET, thyristors, GTO, IGBT
- Rectifiers; uncontrolled and controlled rectifiers, operation with inductive loads, harmonic filtering
- Inverters; voltage source and current source inverters, harmonic filtering
- DC choppers; cyclo-converters; AC voltage controllers
- Introduction to HVDC lines; advantages and applications

4. TRANSMISSION AND DISTRIBUTION

- Transmission: Choice of voltage; conductor size; insulators used in overhead lines; vibration dampers; conductor configuration; clearances; span lengths; sag-tension calculation; pole/tower types; right of way;

- Line parameters computations, Performance of short, medium and long transmission lines; ABCD constants; surge impedance loading, Ferranti effect ,
- Corona phenomenon: Factors affecting corona and its disadvantages; corona loss, audible noise and radio interference;
- Inductive interference between power and communication lines
- Distribution Systems: Distribution feeders; conductor size; route selection; pole types; distribution substations; bus bar schemes; power factor correction; distribution system protection devices; distribution system reliability indices; transformer oil; consumer supply connection; metering system.

5. POWER SYSTEM ANALYSIS

- Load flow studies: Bus classification; load flow equations; Gauss Seidel and Newton Raphson methods of load flow solutions.
- Voltage control: Necessity of voltage control; methods of voltage control.
- Fault calculations: symmetrical and unsymmetrical faults; symmetrical components; sequence impedances; short circuit current calculations.
- Steady state, transient and dynamic stability; maximum steady state power flow; swing equation; equal area criterion; critical clearing angle; factors affecting transient stability, transient stability enhancements.

Section: B

{5x10=50}

6. SWITCHGEAR AND PROTECTION

- Types of protective relays; working principle and application, electromagnetic, static and digital relays
- Protection of generators, transformers and transmission and distribution lines;
- Characteristics of ACB, OCB, VCB, ABCB and gas circuit breakers and their applications;
- Over voltage computations, Protection against over voltage and lightning , surge arrestors
- Substations; classification; indoor and outdoor substations; selection and location of site; bus bar arrangements; substation switchgear; substation earthing.

7. SAFETY ENGINEERING

- Physical effects of electric shock, first aid requirements after electrical accidents, safety and precaution; safety rules and regulation;
- Safety tools and devices for electricity; live line maintenance and precautions;
- Earthing and shielding techniques; earth resistance and resistivity measurements
- Fire hazards; fire fighting techniques and equipment;

8. ELECTRICAL ENGINEERING BASICS:

- Electric charge and current, direct and alternating currents, electric voltage, Potential difference, power and energy
- Ohm's Law, Kirchhoff's Law; Star/ Delta and Delta / Star transformation;
- Network theorems; superposition theorem, maximum power transfer theorem, Thevenin's theorem and Norton's theorem
- Inductance and Capacitance in AC circuits; voltage and current relations in circuit elements, equivalent inductance and capacitance computations.
- AC analysis:, concept of phase difference, active and reactive power , complex power, power triangle, power factor, resonance in AC circuits
- Three phase systems; balanced and unbalanced systems, voltage current relations and computation of power in three phase systems

9. ELECTRICAL NETWORK ANALYSIS

- The Laplace Transform in Circuit Analysis; Circuit Analysis in the s-Domain
- The Transfer Function, Partial Fraction Expansions, the Convolution Integral
- Transients in electrical circuits; natural and step response of RL and RC and RLC Circuits
- Operational Amplifiers; Operational Amplifier Concepts, Inverting and Non-inverting Amplifier Circuit, The Difference Amplifier, zero crossing detectors
- Two port networks, reciprocity theorems

10. INSTRUMENTATION AND CONTROL

- Electrical measurements: Classification, working and applications of indicating, recording and integrating instruments for electrical measurements, Analog-digital and Digital-analog converters, precision and error
- Sensors and transducers: Sensors and transducers for speed, position, fluid flow and temperature
- Automatic feedback control system; time and frequency response of first and second order system, pole zero concept, stability criterion, root locus, and bode plots
- PID Controller; controlling the transient response and steady state error

