नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सवै समूह/उपसमूह, तह ७ ईन्जिनियर पदको लागि आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रम योजनालाई निम्नानुसार दुई चरणमा विभाजन गरिएको छः

प्रथम चरणः- लिखित परीक्षा **पूर्णाङ्कः- २००**

द्वितीय चरणः- अन्तर्वार्ता **पूर्णाङ्कः- ३०**

परीक्षा योजना (Examination Scheme)

प्रथम चरणः लिखित परीक्षा **पूर्णाङ्कः- २००**

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	खण्ड	परीक्षा प्रणाली		प्रश्नसंख्या * अङ्कभार	समय
प्रथम	व्यवस्थापकीय ज्ञान	१००	४०	क	विषयगत	छोटो उत्तर आउने प्रश्न	२ प्रश्न * ५ अंक	३ घण्टा
						लामो उत्तर आउने प्रश्न	४ प्रश्न * १० अंक	
				ख		छोटो उत्तर आउने प्रश्न	२ प्रश्न * ५ अंक	
						लामो उत्तर आउने प्रश्न	४ प्रश्न * १० अंक	
द्वितीय	सेवा सम्वन्धी (विस्तृत ज्ञान)	१००	४०	क	विषयगत	छोटो उत्तर आउने प्रश्न	२ प्रश्न * ५ अंक	३ घण्टा
						लामो उत्तर आउने प्रश्न	४ प्रश्न * १० अंक	
				ख		छोटो उत्तर आउने प्रश्न	२ प्रश्न * ५ अंक	
						लामो उत्तर आउने प्रश्न	४ प्रश्न * १० अंक	

द्वितीय चरणः- अन्तर्वार्ता पूर्णाङ्कः- ३०

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्यः

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।

२. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टा छुट्टै हुनेछ।

३. लिखित परीक्षामा सोधिने प्रश्नसंख्या र अंकभार यथासम्भव सम्वन्धित पत्र/विषयमा दिईए अनुसार हुनेछ।

४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तरवापत २० प्रतिशत अंक कट्टा गरिनेछ। तर उत्तर नदिएमा त्यसवापत अंक दिईने छैन र अंक कट्टा पनि गरिने छैन।

५. वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठुलो अक्षर (Capital Leter) A,B,C,D मा लेख्नु पर्नेछ। सानो अक्षर (Small Leter) a,b,c,d लेखेमा वा अन्य कुनै संकेत गरेको भए सवै उत्तरपुस्तिका रद्द हुनेछ।

६. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाईने छैन।

७. विषयगत प्रश्नहरुको हकमा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा वढी भाग (Two or more Parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा वढी टिप्पणीहरु (Short notes) सोध्न सकिनेछ।

८. विषयगत प्रश्न हुने पत्र/विषयमा प्रत्येक खण्डका प्रश्नका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन। परीक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नु पर्नेछ।

९. यस पाठयक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुन सुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्नेछ।

१०. प्रथम चरणको परीक्षावाट छनौट भएका उम्मेदवारलाई मात्र दोश्रो चरणको परीक्षामा सम्मिलित गराईनेछ।

११. **पाठयक्रम स्वीकृत मितिः- २०८०/०८/२१**

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, सवै समूह/उपसमूह, तह ७ ईन्जिनियर पदको लागि आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

<u>प्रथमपत्र :</u> व्यवस्थापकीय ज्ञान

खण्ड (क) - ५० अङ्क

१. विद्युत विकास र संस्थागत जानकारी

१.१ नेपालको जलस्रोत विकासमा नेपाल विद्युत प्राधिकरणको भूमिका
१.२ नेपालको उर्जा विकासमा नेपाल विद्युत प्राधिकरण र निजी क्षेत्रको भूमिका
१.३ नेपालको आर्थिक, सामाजिक विकासमा नेपाल विद्युत प्राधिकरणको भूमिका
१.४ नेपालमा सार्वजनिक संस्थान स्थापनाको उद्देश्य तथा यसका भूमिका एवम चुनौतीहरु
१.५ संघीय अवधारणा अनुसार नेपाल विद्युत प्राधिकरणको पुन:संरचना
१.६ आवधिक योजनामा उर्जा विकास सम्वन्धी व्यवस्था
१.७ दिगो विकास र वातावरण
१.८ विद्युतका नियामक निकायहरुको जानकारी
  १.८.१ उर्जा, जलस्रोत तथा सिंचाई मन्त्रालय
  १.८.२ जल तथा उर्जा आयोग
  १.८.३ विद्युत नियमन आयोग
  १.८.४ विद्युत विकास विभाग
१.९ उर्जाका स्रोतहरु
१.१० नेपालमा उर्जा विकासको अवस्था, सम्भावना, समस्या, अवसर र चुनौतीहरू
१.११ सामूहिक सौदावाजी र ट्रेड युनियनको काम, कर्तव्य तथा अधिकार
१.१२ आयोजना व्यवस्थापन र यसका चुनौतिहरु
१.१३ Energy Effeciency and Demand side Management
१.१४ Energy Exchange, Energy Trading, Energy Banking, Energy Pool Market, Regional Grid

२. संविधान, ऐन, नियम तथा विनियमहरु

२.१ नेपालको संविधान
२.२ नेपाल विद्युत प्राधिकरण ऐन, २०४१
२.३ विद्युत ऐन, २०४९
२.४ विद्युत चोरी नियन्त्रण ऐन, २०५८
२.५ विद्युत नियमन आयोग ऐन, २०७४
२.६ जलस्रोत ऐन, २०४९
२.७ वातावरण संरक्षण ऐन, २०७६
२.८ जग्गा प्राप्ती ऐन, २०३४
२.९ सार्वजनिक खरिद ऐन, २०६३
२.१० सार्वजनिक खरिद नियमावली, २०६४
२.११ वातावरण संरक्षण नियमावली, २०७७
२.१२ विद्युत चोरी नियन्त्रण नियमावली, २०५९
२.१३ नेपाल विद्युत प्राधिकरण, प्रचलित कर्मचारी सेवा शर्त विनियमावली,
२.१४ नेपाल विद्युत प्राधिकरण, प्रचलित आर्थिक प्रशासन विनियमावली,
२.१५ सामुदायिक ग्रामिण विद्युतीकरण विनियमावली, २०७१

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, सवै समूह/उपसमूह, तह ७ ईन्जिनियर पदको लागि आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

२.१६ विद्युत वितरण विनियमावली, २०७८

२.१७ विद्युत महशुल संकलन विनियमाली,२०७९

खण्ड (ख) - ५० अङ्क

1. **Hydropower Development :** Historical Background of Power Development; Geographical, Geological, and Topographical opportunities and challenges of hydropower development in Nepal; Types of hydropower plants (based on head, capacity and layout), Criterion used for Estimation of power and energy potential; Stages of hydropower developments - Reconnaissance, Master Plan, Pre-feasibility, Feasibility and Detail design; Economic and financial analysis and project selection; Tendering, contracting and contract management; Co-ordination of civil, hydro-mechanical, electro-mechanical and electrical works during project construction; Operation and maintenance planning and implementation

2. **Developmental and Operational Issues in Hydropower :** Project Cycle; Hydropower Planning – site selection, capacity optimization; Types and components of hydropower projects and their selection – ROR, PROR, Storage and Pump Storage projects; Sediment Handling in Hydropower Projects; Project type mix and its importance; Selection criteria of turbines and generators; Multipurpose storage hydropower projects and inter-basin transfer; Cascade river development and impacts on upstream and downstream projects; Environmental and social issues of hydropower development; Public involvement and participation in hydropower projects; Social services and community development

3. **Electro-Mechanical and Hydro-Mechanical Equipments and Power Plant Operation** Duties and responsibilities of the operator in charge; Data sharing and communication with LDC in plant operation; Concept of SCADA system; Inspection requirement and protocol; Preventive, corrective, routine, and scheduled maintenance; Occupational health and safety in operation and maintenance at the power house; Fire hazard and fire fighting in power house and switch yard; Issues and challenges of transporting heavy equipment to the site

4. **Transmission and Distribution :** Structural design and alignment fixing criterion of transmission and distribution line; Selection of voltage level and clearance requirement of conductors of transmission and distribution lines; Environmental and social issues during routing, construction and operation; Integrated Nepal Power System; Challenges and opportunities of cross-border and regional grid inter-connections; Occupational health and safety in operation and maintenance of transmission lines, substations, and distribution systems; Fire hazard and fire fighting in substations; Safety tools and equipment, Safety Protocol, Types of Transmissions Towers and uses in Nepalese context

5. **Power System in Nepal :** Load growth and forecasting; Estimation of peak load and peak demand, Concept and importance of energy mix and generation mix; Transmission and distribution master plan; Technical and non-technical losses in transmission and distribution systems; Loss reduction measures; Concept of smart meter and smart grid; PPA, PDA, PPA-Guidelines; Electricity; Energy audit and energy market

6. **Quality control :** Types of Test of Materials, Machines and Equipment, Testing Lab and its Accrediation and Calibration of Testing equipments

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, मेकानिकल समूह, तह ७, ईन्जिनियर पदको लागि आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीयपत्र

सेवा सम्वन्धी विस्तृत ज्ञान

खण्ड (क) - ५० अङ्क

1. Fundamentals

1.1 Material Science: Types of Materials, Material Selection, Mechanical Properties and Testing, Cold working and Hot working, Types of steel, Phase Transformation and Heat Treatment

1.2 Thermodynamics: Thermodynamic System, Thermodynamic Property, Pure Substance, Zeroth Law; Control mass and Control volume formulation of first law of thermodynamics; Second Law of Thermodynamics, Kelvin Planck and Clausius Statements, Heat engine, Refrigerator and Heat pump; Otto cycle, Diesel Cycle, Brayton cycle, Rankine cycle; Modes of heat transfer: Conduction, Convection and Radiation

1.3 Fluid Mechanics: Physical properties of fluids, Atmospheric pressure, gauge pressure and vaccum pressure, measurement of pressure, Reynolds number, minor losses in pipes, total energy line, hydraulic gradient line, Measurement of flow using pitot tube, venture-meter, orifice meter and flow nozzle

1.4 Drawing and Machine Elements: Types of Projection, Production Drawings; Common machine elements, Gears, Bearings, Belt drive, Chain drive

1.5 Energy Resources and Environment: Energy consumption scenario of Nepal, Different types of energy resources and their application; Causes and effects of air pollution, Causes and effects of water pollution, Global impacts, Green house effects, acid rain, Montreal protocol

1.6 Industrial Engineering: Inventory Control: Inventory costs and Inventory models, Forecasting Techniques, Quality Management: Importance of quality, Statistical process control

1.7 Engineering Economics: Time Value of Money, Project Evaluation Techniques, Tax System and Depreciation

1.8 Power Plant Basics: Voltage, Current, Power, Power factor; Daily load curve, Load factor, Installed capacity, Capacity factor, Utilization factor; Plant availability and Reliability of power station

2. Workshop Technology

2.1 Types of hand tools and workshop equipments used in a Mechanical workshop

2.2 Measuring tools and Measurement of Precision works

2.3 Machine tools: Lathe, Shaper, Milling, Grinding, Drilling Machines

2.4 Metal Joining: Soldering, Brazing, Gas welding, Arc welding

2.5 Fits and tolerances

3. Hydropower Plants

3.1 General Layout of a Hydropower station, Types of Hydroelectric power plants, Major components of a Hydro-electric power plant and their functions

3.2 Types of Hydro Turbines & their Selection, Specific speed

3.3 Efficiencies and performance of turbines, Cavitation

3.4 Governor of water turbine

4. Thermal Power Plant

4.1 Diesel Power Plant: Major components of Diesel power Plant, Fuel Storage and Supply System, Cooling System, Performance of Diesel Power Plant, Applications of Diesel Power Plant, Advantages and Disadvantages of Diesel Power Plant, Supercharger, Turbochargers

4.2 Gas Turbine Power Plant: Gas Turbine Cycle; Open and Closed Cycles, Performance Improvement of Gas Turbine Power Plants; Intercooling, Regeneration and Reheating, Advantages and Disadvantages of Gas Turbine Power Plant

4.3 Steam Power Plant: Improved Rankine cycle, Performance Analysis, superheating reheating and regeneration, Advantages and Disadvantages Thermal Power Plants

5. Wind Power Plant

5.1 Introduction, different components, operation and maintenance

खण्ड (ख) - ५० अङ्क

6. Hydro-electric and Auxiliary Machines

6.1 Pumps: Centrifugal pump and reciprocating pump (working principle and characteristics)

6.2 DC Motors: Shunt field, series field and compound field motors, Torque-speed characteristics

6.3 DC Generators: Shunt, series and compound field machines, voltage/speed/load characteristics, effects of variable load, variable torque

6.4 Synchronous and induction machines: Basic structure of synchronous machines, Generator on isolated load, generator on large system, synchronous motor

6.5 Valves, Gates, Hoist and Lifting equipment, Trashrack and cleaning devices

7. Operation & Maintenance : Operational Manual and As built drawing of Power Plant

7.1 General Operational rule, Assignment, Duties and communication, Supervision, Inspection and Recording, Record keeping, Maintainance job card and log sheet, Store management and inventory control, Acquiring materials for repair works, Estimation of repair works

7.2 Starting and shut down of Hydro & Thermal Power station

7.3 Maintenance Planning & Concept of various maintenance practices

7.4 Condition monitoring of Mechanical Equipment used in a Power Station

7.5 Wear, Pitting of Runner and Other parts and their maintenance

7.6 Corrosion, its effects and protective measures

7.7 Troubling shooting in a Power station

7.8 SCADA system: Functions, elements and architecture

7.9 Turbine oil and its Grading

8. Refrigeration and Air Conditioning

8.1 Basic refrigeration cycles; Refrigerants

8.2 Types of air conditioning and their selection,

8.3 Major components of an air conditioning system and their functions, Chiller Plant

8.4 Ventilation system and its importance in a power plant

8.5 Cooling tower, Quality of cooling water, Treatment of cooling water

8.6 Operation and maintenance of an Air-conditioning system

9. Automotive system and Heavy Equipment

9.1 Components of Automobile (Diesel, Petrol, Electric Vehicle)

9.2 Transmission system; Suspension system; Steering system Cooling system; Lubrication system; Exhaust system, Electrical system, Fuel system

9.3 Basic knowledge of heavy equipment: Loader, Bulldozer, Grader, Excavator, Roller, Crane & Forklift

9.4 Battery Technology and its repair Maintenance

10. Safety engineering

10.1 Safety tools and devices

10.2 Live line maintenance and precautions, Earthing and seilding technique

10.3 Fire hazards, Firefighting technique and equipments, Application of DCP, CO_2, Chemical Foam in fire fighting

10.4 Noise hazards its Sources and Effect on health. Control of noise

10.5 First-aid requirements.

11. Quality Control

11.1 Technical Standards of Mechanical works, Establishment of Mechanical lab, its accrediation and calibration of Testing equipmentand devices, Condition Monitoring devices.