

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सबै समूह/उपसमूहको तह ८, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको
लागि 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	उत्तिर्णाङ्क	खण्ड	परीक्षा प्रणाली	प्रश्न संख्या * अङ्कभार	समय
प्रथम	शासकीय प्रबन्ध, व्यवस्थापन र व्यवसायीकता	१००	४०	(क)	छोटो आउने प्रश्न	४ प्रश्न * ५ अंक	३ घण्टा
				(ख)	लामो आउने प्रश्न	३ प्रश्न * १० अंक	
					छोटो आउने प्रश्न	४ प्रश्न * ५ अंक	
				लामो आउने प्रश्न	३ प्रश्न * १० अंक		
द्वितीय	सेवा सम्बन्धी (विस्तृत ज्ञान)	१००	४०	(क)	तर्कयुक्त विश्लेषणात्मक प्रश्न	३ प्रश्न * १० अंक	३ घण्टा
				(ख)	समस्या समाधानमूलक प्रश्न	१ प्रश्न * २० अंक	
					तर्कयुक्त विश्लेषणात्मक प्रश्न	३ प्रश्न * १० अंक	
				समस्या समाधानमूलक प्रश्न	१ प्रश्न * २० अंक		

द्वितीय चरणः अन्तर्वार्ता

पूर्णाङ्कः- ३०

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्यः

- लिखित परीक्षाको माध्यम भाषा नेपाली र अंग्रेजी अथवा नेपाली अंग्रेजी दुवै हुन सक्नेछ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ।
- लिखित परीक्षामा सोधिने प्रश्नसंख्या र अंकभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ।
- विषयगत प्रश्नहरूको हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more Parts of a single question) एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ।
- विषयगत प्रश्न हुने पत्र/विषयमा प्रत्येक खण्डका प्रश्नका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन्। परीक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नु पर्नेछ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम 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 पर्नेछ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराईनेछ।
- पाठ्यक्रम स्वीकृत मिति:- २०८०/०८/२१

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सबै समूह/उपसमूहको तह द, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको
लागि पाठ्यक्रम

प्रथमपत्र

शासकीय प्रबन्ध, व्यवस्थापन र व्यावसायिकता
(Governance, Management and Professionalism)

खण्ड (क) : ५० अङ्क

1. Governance

- 1.1. Meaning, features and dimensions of governance
- 1.2. Global Governance System
- 1.3. Corporate governance System
- 1.4. The federal, provincial and local level governance
- 1.5. New Public Governance

2. Public Administration

- 2.1. Concept of Public Administration
- 2.2. Basics elements of Personnel Administration
- 2.3. Financial Administration: Budget Preparation, Implementation, Monitoring and Evaluation

3. Management and Financial Analysis

- 3.1. Contemporary issues and Emerging concept of management: Time management, Resource management, Change management, Technology management, Information management, Performance Management, Grievance management, Team management, Conflict management, Stress management, Participative management, Disaster Management
- 3.2. Role and Importance of Leadership, Motivation, Team work, Decision making, Control and coordination in Management
- 3.3. Corporate planning and strategic management
- 3.4. Skill, Competencies and knowledge for successful manager
- 3.5. Issues and Challenges for Manager
- 3.6. Corporate social responsibility
- 3.7. Project management:
 - 3.7.1. Project Planning and Scheduling: Network models-CPM/PERT, Human resource planning and resource scheduling, Project preparation for implementation and justification
 - 3.7.2. Project monitoring and control: System of control, Project control cycle, Feedback control systems, Cash control
 - 3.7.3. 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; tariff structure
- 3.8. Management Information system (MIS) and Enterprise Resource Planning (ERP)

4. Ethics, Morality and Accountability

- 4.1. Essence, determinants, consequences and dimensions of ethics
- 4.2. Human values, Norms and Perceptions
- 4.3. Ethics in public service
- 4.4. Challenges of corruption and corruption control strategies
- 4.5. Accountability, responsibility and authority
- 4.6. Compliance mechanism of public accountability

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सबै समूह/उपसमूहको तह द, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको
लागि पाठ्यक्रम

- 5. Professionalism :** The foundational values for public service - integrity, impartiality, dedication, empathy, tolerance and compassion

खण्ड: (ख) : ५० अङ्क

6. Constitution, Policy, Act and Rules

- 6.1. Constitution of Nepal
- 6.2. Nepal Electricity Authority Act, 2041
- 6.3. Present Nepal Electricity Authority, Employee Service bylaws
- 6.4. Public Procurement Act, 2063, and Public Procurement Regulation, 2064
- 6.5. Present Nepal Electricity Authority, Financial Administration bylaws
- 6.6. Electricity Act, 2049 and Electricity Regulation, 2050
- 6.7. Electricity Regulatory Commission Act, 2074
- 6.8. Good Governance (Management and Operation) Act, 2064
- 6.9. National Water Resources Policy, 2075
- 6.10. Corruption Control Act, 2059
- 6.11. Land Acquisition Act, 2034
- 6.12. Environment Protection Act, 2076 and Environment Protection Regulation, 2077
- 6.13. Present Nepal Electricity Authority, Electricity distribution bylaws
- 6.14. Hydropower development policy, 2058

7. Power Sector Development in Nepal

- 7.1. Energy Supply & Demand - trend and challenges
- 7.2. Power Sector Development - history, generation structure, challenges and prospects
- 7.3. Private sector's participation in hydropower and Solar generation
- 7.4. Power Development Agreement (PDA), Power Purchase Agreement (PPA), licensing, feasibility study, Detail Engineering Design
- 7.5. Nepal Electricity Authority: Corporate structure, functions of different business groups, NEA's Subsidiary & Associate Companies, objective, achievement and challenges
- 7.6. Concept of NEA Restructuring in federal context, Operational Performance
- 7.7. Various model of Investment for Hydropower development
- 7.8. Corporate Development Plan (CDP) of NEA

8. New Trends of Power Sector

- 8.1. Energy security, present and future energy mix scenario of : (1) Nepal, (2) Bilateral: BBIN, SAARC and (3) The world
- 8.2. Global efforts and achievements on Energy Efficiency, energy intensity
- 8.3. Concept of Energy banking, Energy Trade, Energy Exchange and Regional, Grid International Energy market trends
- 8.4. Financial & Technical Aspects of Cross Border Grid Connectivity
- 8.5. Recent international practices in power sector reform; Energy wheeling charge, Energy pool market, Availability based tariff

9. Grid Operation

- 9.1. Management of Active/Reactive power in complex system-challenges and opportunities for management
- 9.2. Power system stability - Issues and challenges
- 9.3. Control and protection: Importance, trends and challenges in complex electrical systems

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, ईलेक्ट्रिकल समूह/उपसमूह, तह ८, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक
परीक्षाको लागि पाठ्यक्रम
द्वितीय पत्र
सेवा सम्बन्धी विस्तृत ज्ञान
खण्ड (क): - ५० अङ्क

1. Electrical Engineering Fundamentals

- 1.1. Active, reactive and apparent power computations, power factor, power factor improvement
- 1.2. Three phase systems: balanced and unbalanced systems, voltage current relations and computation of power in three phase systems
- 1.3. Transients in RL and RC and RL electrical Circuits
- 1.4. Operational Amplifiers: Concepts, Inverting and Non-inverting Amplifier Circuit, The Difference Amplifier, zero crossing detectors
- 1.5. Automatic feedback control system; Sensors and transducers time and frequency response, stability criterion, root locus, PID Controller
- 1.6. Power electronics devices; Diode, power transistors, MOSFET, thyristors, GTO, IGBT, TRIAC
- 1.7. Switched mode DC-AC and AC-DC converters, Sinusoidal PWM, dynamic model and control of PWM inverters
- 1.8. AC-AC Converters: Single-phase AC regulator; Three-phase AC regulators, Single-phase and three-phase Cyclo-converters
- 1.9. Basics of Flexible AC transmission systems (FACTS)

2. Electrical Machines

- 2.1. Transformers: Construction, Losses and efficiency, Voltage regulation, multi-phase Connections, Grounding, Current harmonics at no load and loading conditions, Parallel operation, short time Overloading capacity, Temperature rise, Auto-transformers, Instrument transformers, trends for dry-transformer at higher voltage level, challenges and applications, 3-core transformers applications & advantages
- 2.2. Synchronous Machines: Construction, Operating Characteristics, Losses and efficiency, Steady state and transient equivalent circuits, Excitation system and requirements, Stability, Parallel operation and hunting, Field of applications; PMSG construction, equivalent circuit and applications, synchronous condensers
- 2.3. Induction Machines: Construction, Operating Characteristics, Losses and efficiency, Equivalent circuits, Starter and speed control of induction motor, Induction generator controllers and harmonics, Field of applications and selection of induction machines, DC Machines: Construction, Characteristics, Losses and efficiency, Armature reaction, Starter and speed regulation of motors, Applications

3. Power Plants

- 3.1. 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. Governing mechanism
- 3.2. Diesel Electric Power Plants: Merits and demerits; application; site selection;

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, ईलेक्ट्रिकल समूह/उपसमूह, तह ८, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

elements of a diesel plant and its schematic arrangement; performance and thermalefficiency

- 3.3. Renewable energy technology: Micro hydro, solar photovoltaic, wind and geothermal method of power generation and their importance, grid interconnection of renewable energy, maximum power point tracking technologies for solar and wind generation
 - 3.4. Measurement Indices : Plant capacity factor/Plant factor; utilization factor/plant use factor; significance of load factor and diversity factor in generation planning
4. **Power Transmission and Distribution System**
- 4.1. Transmission Systems: Choice of voltage, Surveying, Route selection, Right of way, advantages and limitations of HVDC lines, HTLS conductors technology and applications
 - 4.2. Performance analysis of transmission lines, Surge impedance and surge impedance loading, Proximity effect, Skin effect
 - 4.3. Principles of power system protection, Protection system components, Disconnecting switches and contactors, Types and characteristics of circuit breakers and protective relays, busbar configurations and their protection, Automatic reclosure
 - 4.4. Protection of generators, transformers and transmission/distribution lines
 - 4.5. Distribution system layouts, Radial, loop and ring distribution system, primary and secondary voltage selection criterion, overhead and underground distributions, ABC cables
 - 4.6. Substation layout and location, Bus bar schemes, substation automations
 - 4.7. Urban and rural distribution; scope of renewable energy for rural electrification
 - 4.8. Consumer Load Characteristics, Concept of load curve; load duration curve; demand factor; Small area load forecasting methods
 - 4.9. Protection coordination
5. **Power System Analysis**
- 5.1. Load flow study: N-R Method, decoupled and DC Load flow methods
 - 5.2. Symmetrical and unsymmetrical faults in power system, Zbus building methods, Fault calculations by symmetrical component method and Zbus in interconnected power system, fault location identification criterion
 - 5.3. Power system stability: Steady state, dynamic and transient stability, Equal area criterion, Swing equation for a multi-machine system, stability enhancement techniques
 - 5.4. Load dispatching: Principle of economic load dispatch, requirements, tools and role of dispatcher, Rationale and tools of demand side management
 - 5.5. Real power/frequency balance, Reactive power/ Voltage balance
 - 5.6. Concept of Grid codes

खण्ड (ख) : ५० अङ्क

6. **High Voltage Engineering**
- 6.1. Corona phenomenon: Factors affecting corona and its disadvantages; corona loss, audible noise and radio interference
 - 6.2. Inductive interference between power and communication lines
 - 6.3. External and internal over voltages; temporary, switching and lightning over

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, ईलेक्ट्रिकल समूह/उपसमूह, तह द, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

- voltage computations, sub synchronous resonance and Ferro resonance
- 6.4. Factors affecting the different types of over voltages and controlling the over voltages
 - 6.5. Insulation coordination and insulator design for transmission line, transformers and cables
 - 6.6. Characteristics and suitability of different types of surge arrestors, MOV
 - 6.7. Insulation withstands tests, Generation of high AC, DC and impulse voltage for testing
 - 6.8. Dielectric strength and breakdown of gas, liquid and solid dielectrics, partial discharge
 - 6.9. Leakage resistance and Dielectric loss computations in cables
 - 6.10. High voltage testing of electrical apparatus, non-destructive testing of materials and apparatus, High voltage testing procedures and statistical treatment of results; test standards (IEC, IEEE, CIGRE)
7. **Engineering Economics**
- 7.1. General Characteristics of Capital Investments, Sources of Funds, Tax Considerations
 - 7.2. Disbursement scheduling, Cash flow analysis, Time value of money
 - 7.3. Project evaluation indicators, IRR, Payback period and others Criterion, Choosing the best alternative
 - 7.4. Incremental Analysis, Sensitivity & breakeven analysis
 - 7.5. Risk analysis, Inflation & price change
 - 7.6. Rationing limited financial resources between projects
 - 7.7. Energy tariff schemes and regulatory issues: Power billing (Utility costs, Customer classes and rate schedules, Commercial and Industrial rates, Real time prices) Need for demand charges, Time/price/demand correlation, Demand measures, Demand rates, Demand ratchets, Demand adjustments/low power factor
8. **Power System Reliability and Risk Assessment**
- 8.1. Evolution of power system reliability: engineering aspect, economic perspective; reliability evaluations of simple and complex system; Application of Binomial distribution and Markov process in reliability evaluation; Frequency and duration concepts, state space models.
 - 8.2. Concepts of Hierarchical Level (HL); Generation Capacity planning; concepts and applications of LOLP, LOLE, EENS, ECOST, IEAR
 - 8.3. Composite reliability evaluation: methods; common indices used; impact of tie line capacity and reliability
 - 8.4. Distribution system reliability: evaluation techniques, customer oriented indices, load and energy oriented indices, evaluation of radial systems, effect of disconnect switches, effect of protection failure, effect of transformer load.
 - 8.5. Reliability and its compliance in deregulated power system: challenges and governance, international perspectives, current state in Nepal, challenges and opportunities
9. **Contract Management**
- 9.1. Preparation of contract documents, specifications, condition of contract and other contractual procedures
 - 9.2. Familiarization with procurement guidelines and standards of PPMO Nepal,

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, ईलेक्ट्रिकल समूह/उपसमूह, तह द, सहायक प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

World Bank & Asian Development Bank (WB & ADB)

- 9.3. Standard Bidding Document for ICB including for EPC contract, Standard Bidding Document for NCB including for EPC contract
- 9.4. Settlement of contractual disputes (mediation, arbitration and negotiation)

10. **Trends and Status of Power Sector Development**

- 10.1. Role of Government institutions involved in power sector development, Role of IPPs, Major projects under implementation and planning, Importance of power exchange agreement with India, Scope of power exchange with other countries, Cross border/regional power trade, Coordination between stakeholders in power sector, Scope for export-oriented development of power sector, Legal and economic aspects for cross border transactions
- 10.2. Electricity market: Market Principles, Power Pool, Independent System Operator, Distribution System Operator, Power Balancing, Market Participants, Power Markets, Market Rules, Bidding, Trading, Settlement System, Locational Marginal Pricing, Transmission pricing, Merchant Power, Differential Electricity, Congestion Management, Ancillary Services, Hedging

11. **International Treaty and Conventions**

- 11.1. Koshi Agreement, Gandak Agreement and Electricity Exchange agreements
- 11.2. Treaty between the then Government of Nepal and Government of India concerning the integrated development of Mahakali River including Sarada Barrage, Tanakpur Barrage and Pancheswar Project
- 11.3. Trends and issues in Project Development Agreements (PDA) and Power Purchase Agreements (PPA)

12. **Service-Related Manuals/Test**

- 12.1. Manual for preparing Environmental Management Plan (EPM) for Hydropower Projects
- 12.2. Hydropower plant installation and maintenance manuals
- 12.3. National Environmental Impact Assessment Guidelines, 1993
- 12.4. Safety Guidelines and standards for Generation, Transmission and Distribution of Hydro Electricity
- 12.5. Compliance with standards: Importance of Inspection & testing of electrical equipment
- 12.6. International standards: IEC, ISO, IEE, AS, BS, CS, IS, NS, EN, GB/T, JIS