

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सबै समूह/उपसमूह, तह ६, सहायक ईन्जिनियर पदको आन्तरिक
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रम योजनालाई निम्नानुसार दुई चरणमा विभाजन गरिएको छः

प्रथम चरण:- लिखित परीक्षा पूर्णाङ्क:- २००
द्वितीय चरण:- अन्तर्वार्ता पूर्णाङ्क:- ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण: लिखित परीक्षा

पूर्णाङ्क:- २००

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	खण्ड	परीक्षा प्रणाली	प्रश्नसंख्या * अङ्कभार	समय
प्रथम	व्यवस्थापकीय ज्ञान	१००	४०	क	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 सम्बन्धी (विस्तृत ज्ञान)	१००	४०	क	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 चरण:- अन्तर्वार्ता

पूर्णाङ्क:- ३०

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्यः

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टा छुट्टै हुनेछ।
- लिखित परीक्षामा सोधिने प्रश्नसंख्या र अंकभार यथासम्भव सम्बन्धित पत्रविषयमा दिईए अनुसार हुनेछ। /
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तरवापत २० प्रतिशत अंक कट्टा गरिनेछ। तर उत्तर नदिएमा त्यसवापत अंक दिईने छैन र अंक कट्टा पनि गरिने छैन।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेखदा अंग्रेजी ठुलो अक्षर (Capital Letter) A,B,C,D मा लेख्नु पर्नेछ। सानो अक्षर (Small Letter) a,b,c,d लेखेमा वा अन्य कुनै संकेत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाईने छैन।
- विषयगत प्रश्नहरूको हकमा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more Parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ।
- विषयगत प्रश्न हुने पत्रविषयमा प्रत्येक खण्डका प्रश्नका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन्। परीक्षार्थीले / प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नु पर्नेछ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्रविषयका विषयवस्तुमा जुन सुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा / संशोधन भएका वा) महिना अगाडि ३ विनियम तथा नीतिहरू परीक्षाको मिति भन्दा ,नियम ,ऐन ,परेका कानून कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्नेछ। (संशोधन भई हटाईएका वा थप गरी संशोधन भई
- प्रथम चरणको परीक्षावाट छनौट भएका उम्मेदवारलाई मात्र दोश्रो चरणको परीक्षामा सम्मिलित गराईनेछ।
- पाठ्यक्रम स्वीकृत मिति: - २०८०/०८/२१

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प्रथमपत्र

व्यवस्थापकीय ज्ञान

खण्ड (क) - ५० अङ्क

विद्युत विकास र संस्थागत जानकारी

१. नेपाल विद्युत प्राधिकरणको परिचय र कार्यहरू
२. नेपालको उर्जा विकासमा नेपाल विद्युत प्राधिकरण र निजी क्षेत्रको भूमिका
३. नेपालको आर्थिक, सामाजिक विकासमा नेपाल विद्युत प्राधिकरणको भूमिका
४. नेपालमा सार्वजनिक संस्थान स्थापनाको उद्देश्य तथा यसका भूमिका, उपलब्धी एवम चुनौतीहरू
५. संघीय अवधारणा अनुसार नेपाल विद्युत प्राधिकरणको पुनःसंरचना
६. आवधिक योजनामा उर्जा विकास सम्बन्धी व्यवस्था
७. दिगो विकास र वातावरण
८. विद्युतका नियामक निकायहरूको जानकारी
 - ८.१ उर्जा, जलस्रोत तथा सिंचाई मन्त्रालय
 - ८.२ जल तथा उर्जा आयोग
 - ८.३ विद्युत नियमन आयोग
 - ८.४ विद्युत विकास विभाग
९. उर्जाका स्रोतहरू
१०. नेपालमा उर्जा विकासको अवस्था, सम्भावना, समस्या, अवसर र चुनौतीहरू
११. आयोजना व्यवस्थापन र यसका चुनौतीहरू
१२. Energy Exchange, Energy Trading, Energy Banking, Energy Pool Market, Regional Grid

संविधान, ऐन, नियम तथा विनियमहरू

१. नेपालको संविधान,
२. नेपाल विद्युत प्राधिकरण ऐन, २०४१
३. विद्युत ऐन, २०४९
४. विद्युत चोरी नियन्त्रण ऐन, २०५८
५. विद्युत नियमन आयोग ऐन, २०७४
६. वातावरण संरक्षण ऐन, २०७६
७. जग्गा प्राप्ती ऐन, २०३४
८. सार्वजनिक खरिद ऐन, २०६३
९. सार्वजनिक खरिद नियमावली, २०६४
१०. वातावरण संरक्षण नियमावली, २०७७
११. विद्युत चोरी नियन्त्रण नियमावली, २०५९
१२. नेपाल विद्युत प्राधिकरण, प्रचलित कर्मचारी सेवा शर्त विनियमावली
१३. नेपाल विद्युत प्राधिकरण, प्रचलित आर्थिक प्रशासन विनियमावली
१४. सामुदायिक ग्रामिण विद्युतीकरण विनियमावली, २०७१

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१५. विद्युत वितरण विनियमावली, २०७८

खण्ड (ख) - ५० अङ्क

1. **Hydropower Development in Nepal:** Historical background of hydropower development; Geographical, Geological, and Topographical opportunities and challenges of hydropower development in Nepal; Estimation of power and energy, Stages of hydropower development - Reconnaissance, Pre-feasibility, Feasibility study and detail design, Cost-benefit analysis; Tendering and contracting; Roles and responsibilities of owner, consultant, and contractor; Operation and maintenance
2. **Planning and Operational Issues in Hydropower:** Project Cycle; Hydropower Planning – site selection, capacity optimization; Types 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 of turbines and generators; Multipurpose storage hydropower projects and inter-basin transfer
3. **Electro- Mechanical and Hydro-Mechanical Equipments:** Duties and responsibilities of the operator in charge of a plant; Inspection requirement and concept and importance of 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:** Existing and planned voltage level of Nepalese transmission & distribution systems and selection criteria; Alignment fixing criterion of transmission and distribution line; Clearance Requirement of conductors at different voltage level; Social issues during routing and construction of distribution lines; Roles and responsibilities of community electricity user groups in distribution system; Transmission system in Nepali context; Cross-border and regional 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
5. **Power System in Nepal:** Load Forecasting; Peak Load and Peak Demand, Energy mix and Generation mix; Major power stations and their main features, Types and sizes of overhead conductors and underground cables commonly used for transmission and distribution lines; Typical single and three phase distribution transformer sizes and their voltage ratings utilized by NEA and BPC; TOD meters and its tempering issues; Energy audit; 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 market, Cross border and regional power trading issues and opportunities

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द्वितीयपत्र
सेवा सम्बन्धी विस्तृत ज्ञान
खण्ड (क) - ५० अङ्क

1. Electrical Engineering Fundamentals

- 1.1 Ohm's law, electrical resistance, voltage and current, concept of electrical power and energy, conducting and insulating materials
- 1.2 Series and parallel electric circuits, Krichhoff's laws
- 1.3 Superposition theorem, Thevenin's theorem, Maximum power transfer theory
- 1.4 Magnetic circuits: Flux and flux linkage, inductance, energy stored in an inductor, magnetic materials and their properties, magnetically induced emf and force
- 1.5 Alternating current and its waveform in R, R-L, R-C and R-L-C circuits, concept of active and reactive power
- 1.6 Three phase system: Star and delta connection of three phase system, relation between line and phase voltage, concept of neutral, effect of unbalanced load in a three phase system

2. Electrical Machines

- 2.1 Transformers: Core and shell type transformers, constructional details of a transformer; tank, conservators, breather, explosion vent, bushings, transformer oil, transformer tests, no-load and load losses, efficiency; three phase transformer connections; parallel operation of transformers, transformer capacity, temperature rise
- 2.2 DC Motors: Construction details; yoke poles, windings, carbon brushes and commutator, Working principles, operating characteristics of different types of DC motors, losses and efficiency, applications, starting and speed control of DC motors
- 2.3 Synchronous Generators: Construction and working principle, armature and field winding, equation of induced E.M.F., losses and efficiency, parallel operation and synchronizing
- 2.4 Three phase Induction Motors: Construction details; yoke poles, windings, squirrel cage and phase wound type, slip rings, working principles, equivalent circuits, starting methods, no-load and block rotor tests, methods of speed control and motor selection

3. Electrical Measurements

- 3.1 Indicating, recording, measuring instruments, analog and digital measuring instruments, construction and operating principles, errors in measurements, accuracy class of the instruments.
- 3.2 Ammeter and Voltmeter, Shunt and Multiplier, multi-range meters
- 3.3 Power, energy and frequency measurements principles
- 3.4 Measurements of resistance: Ammeter - Voltmeter method, Kelvin double bridge method, Wheatstone bridge method, Megger
- 3.5 Inductance and Capacitance measurements: Maxwell bridge, Anderson bridge, Schering bridge
- 3.6 Maximum demand meter: operating principle, applications

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4. Power Plants

- 4.1 Hydroelectric power plants: Merits and demerits, classifications and layouts, selection of sites, types of turbines, their working principles and applications, control of turbines, hydropower plant auxiliaries
- 4.2 Diesel electric power plants: Merits and demerits, selection of sites, elements of a diesel plant, layout and operating principles
- 4.3 Non-conventional power generation: Basic principles of solar PV, wind power, geothermal, biomass and tidal power generation
- 4.4 Automatic voltage regulator: construction, operation and applications
- 4.5 Starting of Generators: Prerequisites for starting of generators in hydro and diesel station, role of black start generating units in power stations

5. Switchgear and Protection

- 5.1 Working principle and construction of air break, air blast, vacuum, SF6 and oil circuit breakers; specification, rating and selection of circuit breakers, their testing
- 5.2 Application of overcurrent, earth fault and under voltage relays; isolators and contactors
- 5.3 Overload and short circuit protection, earth fault protection, unit protection, differential protection
- 5.4 CT and PT accuracy class, construction and operation, and their role in protection

खण्ड (ख) - ५० अङ्क

6. Sub-Stations

- 6.1 Substations classification: Indoor and outdoor substations, switching station, area substation and distribution substation
- 6.2 General layout of a substation, busbar arrangements, earthing of equipments in a substation
- 6.3 Cabling in substations, busbar reactors, CT and PT connections in substation
- 6.4 Lightning arrester: role, location and operation
- 6.5 Cooling system and its significance
- 6.6 Role of auxiliary equipment in power stations, storage batteries, their capacities, charging and maintenance.
- 6.7 Precautionary signs: Danger plate, phase plate, anti-climbing device

7. Transmission Lines

- 7.1 Necessity of high voltage transmission, choice of voltage level, conductor, conductor spacing
- 7.2 Line parameter calculation, voltage regulation and efficiency of short and medium transmission lines
- 7.3 Sag, tension and clearances, supports and cross arms
- 7.4 Jumpers, vibration dampers
- 7.5 Need for surveying and leveling in overhead line construction, distance measurement, leveling surveying and pegging of the route
- 7.6 Live-line maintenance procedure and its significance

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8. Utilization of Electrical Energy

- 8.1 Illumination: radiant energy and radiant efficiency, luminous flux, luminous intensity, construction and working principle of incandescent lamps, fluorescent lamps, CFL, LED, lighting schemes, lamps for street lighting
- 8.2 Power electronics devices: construction and characteristics of power diode, Thyristors, GTO, TRIAC, MOSFET
- 8.3 Domestic drive: Characteristics of motors for sewing machine, vacuum cleaner, mixer, washing machine, grinding machine

9. Distribution and Consumer Service

- 9.1 Radial, ring and loop distribution system
- 9.2 Selection of supports and conductors in secondary distribution system; stay wire
- 9.3 Earthing of electrical system and equipment
- 9.4 Consumer supply connection
- 9.5 Fuse, MCB and MCCB protection
- 9.6 Consumer supply energy meters: Construction and principle of operation, creeping errors and their compensation, testing of energy meters.
- 9.7 Tarrif schemes in Nepal: simple tariff, two part tariff

10. Power System Operation and Maintenance

- 10.1 Concept of demand factor, diversity factor, load factor and load curves, load duration curves
- 10.2 Operation of substation during normal and abnormal condition
- 10.3 Preventive maintenance in electrical system for transmission lines and its equipment, distribution lines and its equipments, transformers, switchgears, motors, generators, turbines excitation system, and communication system used in power system
- 10.4 Electrical safety: Safety guidelines, rules and regulations for working personnels; safety tools, devices and their applications

11. Quality Control

- 11.1 Accrediation of Lab
- 11.2 Calibration of testing devices, condition monitoring devices