नेपाल विद्युत् प्राधिकरण

प्राविधिक सेवा, सिभिल समूह, सिभिल उपसमूह, तह–७, ईन्जिनियर पदको
खुल्ला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

१. शैक्षिक योग्यता: प्रचलित कर्मचारी सेवा विनियमावलीमा व्यवस्था भए अनुसार ।
२. लिखित परीक्षाको विषय, पूर्णांङ्क, परीक्षा प्रणाली, प्रश्नसंख्या, अंकभार र समय निम्नानुसार हुनेछ ।

पत्र	विषय	पूर्णांङ्क	परीक्षा प्रणाली		प्रश्न संख्या	प्रति प्रश्न अंकभार	समय
प्रथम	जनरल सिभिल ईन्जिनियरिंङ्ग	३०	वस्तुगत वहुउत्तर		३०	१	३० मिनेट
द्वितीय	हाइड्रो पावर ईन्जिनियरिंङ्ग	७०	विषयगत	छोटो उत्तर	८	५	२ घण्टा ३० मिनेट
				लामो उत्तर	३	१०	

३. वस्तुगत वहुउत्तर परीक्षा प्रणाली प्रश्नको उत्तर लेख्दा केरमेट गरेको, दोहोरो लेखेको, सच्याएको, निर्दिष्ट स्थानभन्दा अन्यत्र लेखेको वा उत्तर नै सारेकोलाई गल्ती मानिनेछ ।
४. वस्तुगत वहुउत्तर परीक्षा प्रणाली प्रश्नमा प्रत्येक गलत उत्तर वापत सो प्रश्न वापत पाउने अंकको ०.२ (बीस प्रतिशत २०%) का दरले सो बिषयमा पाएको कुल प्राप्तांकबाट घटाईनेछ ।
५. कालो/नीलो मसी मात्र भएको डटपेन/कलमले उत्तरको लागि निर्धारित कोठाका प्रश्नमा क,ख,ग,घ मध्ये एउटा मात्र सहि उत्तर स्पष्ट रुपले लेख्नूहोला । पेन्सिलले लेखेकोलाई मान्यता दिइने छैन ।
६. प्रथम र द्वितीयपत्रको परीक्षा २ पटक गरेर हुनेछ । प्रथमपत्रको परीक्षा सकिएपछि द्वितीयपत्रको परीक्षा तत्काल हुनेछ ।
७. द्वितीयपत्रको लिखित परीक्षाको माध्यम नेपाली वा अंग्रेजी भाषा हुनेछ ।
८. सामान्यत: प्रत्येक शिर्षकको अंकभार तोकिए बमोजिम हुनेछ ।

प्रथमपत्र : जनरल सिभिल ईन्जिनियरिंङ्ग [30]

1. ***CONSTRUCTION MATERIAL*** [5]
   a) Knowledge of building materials, their different properties and their use in construction
   b) Investigation and testing of construction materials for confirmation of their suitability for use
   c) Natural and artificial building block materials such as stones, boulders, bricks, concrete blocks; their characteristics and use in the construction
   d) Concept of cementing materials, their types, composition and properties of cementing materials such as lime; cement and cement mortar
   e) Knowledge of use of metals in the construction including their types and properties for steel and alloys
   f) Knowledge of use of wood and timber in the construction including types, properties of wood and timber trees available in the country
   g) General knowledge of miscellaneous construction materials such as asphaltic materials, paints, varnishes and polymers.

2. ***CONCRETE AND CONCRETE TECHNOLOGY*** [5]
   a) General knowledge of constituents and physical as well as mechanical properties of concrete
   b) Knowledge of strength of concrete, grade of concrete and effect of properties of constituents on strength of concrete.
   c) Concept of water cement ratio and its effect on the quality and strength of concrete
   d) General knowledge of concrete mix design, testing of concrete and concrete test samples
   e) General knowledge of use of steel reinforcements and its benefit in the reinforced concrete
   f) Knowledge of mixing, transportation, placement and curing of concrete
   g) General knowledge of use of different chemical admixtures in concrete for different purposes

3. ***STRUCTURAL ANALYSIS AND DESIGN*** [6]
   a) Knowledge of stresses and strains; moment of inertia; theory of torsion and flexure
   b) Knowledge of analysis of:
      i) Beams and frames - bending moment, shear force, deflection of beams and frames
      ii) Determinate structures - energy methods; three hinged system
      iii) Indeterminate structures – slope deflection method, moment distribution method, use of influence line diagrams for simple beams
   c) Concept of reinforced concrete structures, working stress and limit state philosophy
   d) Knowledge of analysis of reinforced concrete beams and slabs in bending, shear, deflection, bond and end anchorage
   e) Knowledge of design of axially loaded columns with isolated and combined footings
   f) Concept of prestressed reinforced concrete structures
   g) Knowledge of steel and timber structures including standard and built-up sections
   h) Knowledge of design of riveted, bolted and welded connections of steel structures
   i) Knowledge of design of simple elements of steel structures such as ties, struts, axially loaded and eccentric columns, column bases
   j) Concept of design principles on timber beams and columns
4. ***ESTIMATING, SPECIFICATION AND VALUATION*** [2]
   a) Concept of estimates, their types and specific uses
   b) General knowledge of methods of taking out quantities
   c) Knowledge of key components of estimating norms and rate analysis
   d) Knowledge of preparation of bill of quantities
   e) Knowledge of purpose, types and importance of specification
   f) Knowledge of purpose, principles and methods of valuation
5. ***DRAWING TECHNIQUES*** [2]
   a) Concept of drawing sheet composition and its essential components
   b) Knowledge of suitable scales for site plans, preliminary drawings, working drawings, etc.
   c) Knowledge of theory of projection drawing; perspective, orthographic and axonometric projection; first and third angle projection
   d) General knowledge of drawing tools and equipment
   e) Concept of drafting conventions and symbols
   f) Concept of topographic, electrical, mechanical, plumbing and structural drawings
   g) Concept of techniques of free hand drawing
6. ***SURVEY*** [4]
   a) General concept of survey and its basic principles
   b) Knowledge of linear measurements, its techniques - chain, tape, ranging rods and arrows; representation of measurement and common scales; sources of errors; effect of slope and its correction; correction for chain and tape measurements; Abney level and clinometers
   c) Knowledge of compass and plane table survey; bearings; types of compass; problems and sources of errors of compass survey; principles and methods of plane table survey
   d) General knowledge of leveling and contouring; principles of leveling; temporary and permanent adjustment of level; bench marks; booking methods and their reductions; longitudinal and cross sections survey; reciprocal leveling; trigonometric leveling; contour interval and characteristics of contours and method of contouring
   e) Concept of theodolite traversing; need of traverse and its significance; computation of coordinates; adjustment of closed traverse and closing errors
7. ***CONSTRUCTION MANAGEMENT*** [5]
   a) Concept of construction scheduling and planning; network techniques (CPM, PERT) and bar charts
   b) General knowledge of contractual procedures and management; types of contract; tender; tender notice; contractors' prequalification; evaluation of tenders; selection of contractor;

contract acceptance; condition of contract; quotation and direct order; contract packaging; dispute resolution and muster roll.

c) Knowledge of material management, procurement procedures and material handling
d) Concept of cost and quality control
e) Concept of project maintenance
f) Knowledge of occupational health and safety

8. ***INSTITUTIONAL KNOW-HOW*** [1]
   a) General knowledge of Nepal Electricity Authority, its organizational structure and function of various business groups.
   b) General knowledge of various power plants of Nepal, their types, salient features and their geographical locations.
   c) General knowledge on Nepalese Power Transmission System, Voltage levels and Lengths, export-import links for Power exchange with India.

9. द्वितीयपत्रः हाइड्रो पावर ईन्जिनियरिंङ्ग [70]

10. ***HYDROPOWER DEVELOPMENT*** [4]
    a) Hydropower development history, issues and facts.
    b) Hydropower development in Nepal and its potential.
    c) Types of hydropower development and their characteristics.
    d) Hydropower development and planning.
    e) Hydropower development institutions in Nepal.

1. PROJECT INVESTIGATION [10]
   f) Stages of project studies and field investigation.
   g) Basic idea of
      i. Topographical survey
      ii. Geological and geotechnical investigation
      iii. Seismological study
      iv. Hydrometerological investigation including sedimentological investigation
      v. Construction material investigation
      vi. Initial environmental examination (IEE) and environmental impact assessment (EIA) studies

2. HYDROLOGY AND SEDIMENTOLOGY [10]
   a) Water gauging station; Rainfall – runoff correlation and rating curve.
   b) Velocity & discharge measurement; computation of runoff from a catchment area.
   c) Different methods of determination of maximum & minimum discharge in a river.
   d) General understanding of flow duration curve, design discharge, diversion flood, design flood and maximum probable flood.
   e) Basic knowledge on snow, glacier hydrology, glacier lake and glacier lake outburst phenomena including glacier lake outburst flood (GLOF).
   f) Sediment - its types, estimation of sedimentation load and collection rate.
   g) Storage reservoir; power studies; evaporation losses & reservoir operation studies.

3. DESIGN [16]
   a) Concept of head loss, friction loss, local loss, gross head and net head.
   b) Principles of open channel flow and pipe flow; Reynold's Number, Froude Number and their usage.
   c) Purpose, types, selection as well as hydraulic and structural design of :
      i) Weirs, dams, spillways, intakes, desilting basins and gates
      ii) Canals, box culverts, siphons, aqueducts and forebays
      iii) Tunnels, surge tanks, penstock pipes, anchor blocks and saddle piers
      iv) Powerhouse and appurtenant structures
   d) Slope stabilization measures

e) General layout of different project components
f) Hydraulic transient analysis
g) Knowledge of computer aided design and software packages for the design of different components of hydropower project

4. HYDRO-MECHANICAL AND ELECTRO-MECHANICAL INSTALLATIONS [7]

a) General knowledge of hydraulic installations such as gates, valves, draft tubes
b) General knowledge of mechanical installations on:
  i. Types of turbines, their usage and selection criteria, concept of specific speed
  ii. Need and working principle of governors
c) General knowledge of electrical installations on:
  i. Types of hydro-generators and their usage
  ii. Need and selection of Transformers and auxiliary equipment
d) General knowledge on transmission lines and substations

5. OPTIMIZATION [7]

a) Optimization of dam height, water conveyance system, installed capacity
b) Concept of firm capacity of the plant, dependable capacity, load factor, utilization factor and plant capacity factor
c) Knowledge of firm energy, useable energy, secondary energy, load curve and plant outage
d) Concept of daily poundage basin and its importance for run-off river schemes
e) Importance of reservoir type hydropower plant

6. PROJECT PLANNING [5]

a) Concept of power demand, power demand variation and load forecast
b) General concept of multipurpose water resources development
c) Concept of river basin development and integrated water resource management
d) Concept of screening and ranking of hydropower projects
e) Concept of project planning and scheduling
f) General knowledge of use of CPM and PERT as tools for decision making
g) Concept of project monitoring and control, system of control, project control cycle, feedback control system and cash control
h) Project preparation for implementation and justification of the project
i) Concept of capital planning and budgeting including capital planning procedures; preparation of operating budget, fixed as well as flexible budget and budgetary control

7. ECONOMIC AND FINANCIAL ANALYSIS [7]

j) Concept of method of economic and financial analysis including cost benefit ratio; internal rate of return; net present worth; payback period; minimum attractive rate of return and their application in the project evaluation
k) General knowledge of risk analysis; tariff structure; investment decisions; interest and time value of money

8. SAFETY ENGINEERING [4]

l) Knowledge of Safety rules and regulation in the project construction area including:
  i. Safety in storage and handling of explosives
  ii. Safety of storage and handling of compressed gases and flammable substances
  iii. Precaution to be taken for electrical equipment in the premises with explosives such as earthing and shielding technique
m) Knowledge of fire hazard, fire fighting technique and equipment
n) Knowledge of noise hazard, noise hazard sources, its control and effect in health
o) Knowledge of first aid requirements for the treatment in the case of accidents

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