

चिलिमे जलविद्युत कम्पनी लिमिटेड

प्राविधिक सेवा, सिभिल समूह, तह-७, ईन्जिनियर पदको
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

१. शैक्षिक योग्यता: चिलिमे जलविद्युत कम्पनी लिमिटेड कर्मचारी सेवा शर्त विनियमावलीमा व्यवस्था भए अनुसार ।
२. लिखित परीक्षाको विषय, पूर्णाङ्क, परीक्षा प्रणाली, प्रश्न संख्या, अंकभार र समय निम्नानुसार हुनेछ ।

पत्र	विषय	परीक्षा प्रणाली		प्रश्न संख्या	प्रति प्रश्न अंकभार	पूर्णांक	समय
प्रथम	जनरल सिभिल ईन्जिनियरिङ्ग	बस्तुगत बहुउत्तर		३०	०.५	१५	३० मिनेट
द्वितीय	हाइड्रोपावर ईन्जिनियरिङ्ग	बिषयगत	लामो उत्तर	२	१०	७०	२ घण्टा ३० मिनेट
			छोटो उत्तर	१०	५		

३. बस्तुगत बहुउत्तर परीक्षा प्रणालीमा प्रत्येक पश्चात चार वटा सम्भाव्य उत्तर दिइने छ । प्रश्नको उत्तर लेख्दा केरमेट नगरेको, दोहोरो लेखेको, सच्याएको, निर्दिष्ट स्थानभन्दा अन्यत्र लेखेको वा उत्तर नै सारेकोलाई गल्ती मानिनेछ ।
४. प्रत्येक गलत उत्तर वापत सो प्रश्न वापत पाउने अंकको ०.२ (बीस प्रतिशत २०%) का दरले सो बिषयमा पाएको कूल प्राप्तांकबाट घटाईनेछ ।
५. प्रत्येक पत्रको न्यूनतम ४० प्रतिशत उत्तीर्णाङ्क हुनेछ ।
६. कालो/नीलो मसी मात्र भएको डटपेन/कलमले उत्तरको लागि निर्धारित कोठाका पश्चात क,ख,ग,घ मध्ये एउटा मात्र सहि उत्तर स्पष्ट रूपले लेख्नुहोला । पेन्सिलले लेखेकोलाई मान्यता दिइने छैन ।
७. प्रथम र द्वितीयपत्रको परीक्षा २ पटक गरेर हुनेछ । प्रथम पत्रको परीक्षा सकिएपछि द्वितीयपत्रको परीक्षा तत्काल हुनेछ ।
८. द्वितीयपत्रको लिखित परीक्षाको माध्यम नेपाली वा अंग्रेजी भाषा हुनेछ ।
९. सामान्यतया प्रत्येक शिर्षकको अंकभार तोकिए बमोजिम हुनेछ ।

प्रथमपत्र - जनरल सिभिल ईन्जिनियरिङ्ग [15]

1. CONSTRUCTION MATERIAL [2.5]

- a) Knowledge of building materials, their properties and uses in construction.
- b) Natural and artificial building blocks such as stones, boulders, bricks, concrete blocks; their properties and uses.
- c) Concept of cementing materials such as lime, cement, cement mortar; their types, composition and properties.
- d) Knowledge of use of metals such as steel and alloys; their properties and uses.
- e) Knowledge of use of wood and timber available in the country; their types, properties and uses.
- f) General knowledge of miscellaneous construction materials such as asphalt, paint, varnishes and polymers.

2. CONCRETE AND CONCRETE TECHNOLOGY [2.5]

- a) General knowledge of constituents and physical properties of concrete.
- b) Knowledge of strength of concrete, grade of concrete and effect of constituents on strength of concrete.
- c) Concept of water cement ratio and its effect on the strength of concrete.

- d) General knowledge of concrete mix design, testing of concrete (destructive tests and nondestructive tests) and concrete test samples.
- e) Knowledge of mixing, transportation, placement, compaction and curing of concrete.
- f) General knowledge of use of admixtures in concrete for different purpose.
- g) General knowledge of use of steel reinforcements and its uses in the reinforced concrete.

3. STRUCTURAL ANALYSIS AND DESIGN [2.5]

- a) Knowledge of stresses and strains; 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 arches.
 - iii) Indeterminate structures – slope deflection method, moment distribution method and use of influence line diagrams for simple beams
- c) Concept of reinforced concrete structures, working stress method and limit state method.
- d) Knowledge of analysis and design 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. DRAWING, ESTIMATING AND VALUATION [2.5]

- 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 and orthographic projection.
- d) Concept of drafting conventions and symbols
- e) Concept of topographic, electrical, mechanical, plumbing and structural drawings
- f) Concept of estimates, their types and specific uses
- g) General knowledge of methods of taking out quantities
- h) Knowledge of key components of estimating norms and rate analysis
- i) Knowledge of preparation of bill of quantities
- j) Knowledge of purpose, types and importance of specification
- k) Knowledge of purpose, principles and methods of valuation

5. SURVEY [2]

- a) General concept of survey and its basic principles.
- b) 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.
- c) Concept of theodolite traversing; need of traverse and its significance; computation of coordinates; adjustment of closed traverse and closing errors.
- d) Concept of total station.

6. CONSTRUCTION MANAGEMENT [2]

- 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; and dispute resolution, Tender document and Contract document.
- c) Knowledge of material management, and material handling.
- d) Concept of cost and quality control
- e) Concept of project maintenance

7. INSTITUTIONAL KNOW-HOW [1]

- a) General knowledge of Chilime Hydropower Company Limited, its subsidiary companies.
- 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.

द्वितीयपत्र – हाइड्रोपावर ईन्जिनियरिङ्ग [70]**1. HYDROPOWER DEVELOPMENT [5X1]**

- a) History of hydropower development.
- b) Hydropower development in Nepal and its potential.
- c) Types of hydropower development and their characteristics.
- d) Phases of Hydropower development.
- e) Hydropower development institutions in Nepal.

2. PROJECT INVESTIGATION [10X1]

- a) Desk study and field investigation.
- b) Basic idea of
 - i. Topographical survey
 - ii. Geological and geotechnical investigation
 - iii. Seismological study
 - iv. Hydrometeorological investigation including sedimentological investigation
 - v. Construction material investigation
 - vi. Initial environmental examination (IEE) and environmental impact assessment (EIA) studies

3. HYDROLOGY AND SEDIMENTOLOGY [10X1]

- 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.

4. DESIGN [5X3]

- a) General layout of different project components.
- b) Concept of head loss, friction loss, local loss, gross head and net head.

- c) Principles of open channel flow and pipe flow; Reynold's Number, Froude Number and their usage.
- d) 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
- e) Hydraulic transient analysis.
- f) Slope stabilization measures
- g) Knowledge of computer aided design and software packages for the design of different components of hydropower project

5. HYDRO-MECHANICAL AND ELECTRO-MECHANICAL INSTALLATIONS [5X2]

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

6. DESIGN OPTIMIZATION [5X1]

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

7. PROJECT PLANNING [5X1]

- 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 Capital budgeting techniques
- f) Capital structure planning
- g) Concept of project planning and scheduling, use of barchart, CPM & PERT
- h) Concept of project monitoring and control.

8. ECONOMIC AND FINANCIAL ANALYSIS [5X1]

- a) Concept of method of economic and financial analysis including payback period; net present worth; internal rate of return; cost benefit ratio; and their application in the project evaluation
- b) General knowledge of risk analysis; tariff structure; interest and time value of money.

9. SAFETY ENGINEERING [5X1]

- a) Causes of accidents in construction
- b) 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 inflammable substances

- iii. Precaution to be taken for electrical equipment in the premises with explosives such as earthing and shielding technique
- iv. Personal protective equipment.
- c) Knowledge of fire hazards, firefighting technique and equipment
- d) Knowledge of noise hazards, noise hazard sources, its control and effect in health
- e) Knowledge of first aid requirements for the treatment in the case of accidents

