

चिलिमे जलविद्युत कम्पनी लिमिटेड

प्राविधिक सेवा, मेकानिकल समूह, तह-६, सहायक ईन्जिनियर पदको
आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

- शैक्षिक योग्यता: चिलिमे जलविद्युत कम्पनी लिमिटेड कर्मचारी सेवा शर्त विनियमावलीमा व्यवस्था भए अनुसार ।
- 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	सेवा सम्बन्धी	बिषयगत	लामो उत्तर	२	१०	६०	२ घण्टा
			छोटो उत्तर	८	५		
द्वितीय	ब्यवस्थापकीय ज्ञान	बिषयगत	छोटो उत्तर	३	५	२५	१ घण्टा
			लामो उत्तर	१	१०		
अन्तर्वार्ता					१५		

- प्रथम र द्वितीयपत्रको परीक्षा २ पटक गरेर हुनेछ । प्रथम पत्रको परीक्षा सकिएपछि द्वितीयपत्रको परीक्षा तत्काल हुनेछ ।
- परीक्षामा कालो/नीलो मसी मात्र प्रयोग गर्नुपर्ने छ ।
- प्रत्येक पत्रको न्यूनतम ४० प्रतिशत उत्तीर्णाङ्क हुनेछ ।
- परीक्षाको माध्यम नेपाली वा अंग्रेजी भाषा हुनेछ ।
- सामान्यतः प्रत्येक शिर्षकको अंकभार तोकिए बमोजिम हुनेछ ।

प्रथमपत्र – सेवा सम्बन्धी (६०)

1. Fundamentals (5 Marks)

- 1.1. General aspects of machine component fabrication
- 1.2. Concept of Machine drawing: Assembly drawing, welded joints, bolt, nut, and screw fasteners, Keyways, and keyed assembly
- 1.3. Mechanical properties of materials and testing, metals and alloys, hardness testing, corrosion, and control
- 1.4. Laws of thermodynamics and their applications, thermodynamic cycles, Carnot cycle, and efficiency
- 1.5. Heat and work transfer, conduction process, convection process, electromagnetic spectrum (radiation)
- 1.6. Types of fluid flow, selection of pipe size, pipe losses and use of head losses, streamline flow, measurement of velocity, hydraulic and energy grade lines, pipe flow networks
- 1.7. Equations of fluid flow: Types of flow, continuity equation, Bernoulli's equation, and momentum equation

2. Power Plant Engineering (10 Marks)

- 2.1. Hydropower Plants: Classification of hydropower plants, the layout of hydropower plants, basic components, selection of sites, classification of water turbines and their selection, governing of water turbines and generator
- 2.2. Diesel Power Plants: Operation of diesel power plants, fuels, troubleshooting
- 2.3. Thermal Power Plants: Steam generation and distribution, the layout of steam power plants, steam turbines, the exhaust system of power plant
- 2.4. Solar PV Power Plants: Solar energy, Solar PV system, Grid Connected Solar PV System
- 2.5. Renewable energy technologies (RETs) and grid connection of RETs

3. Hydraulics and Hydraulic Turbines (10 Marks)

- 3.1. Types of flow, continuity equation, Bernoulli's equation, and momentum equation
- 3.2. Flow measurement: Pitot-static tube, orifice, venture meter, nozzle, rotameter
- 3.3. Types of turbines and their selection, specific speed, erosion, cavitation, efficiencies, performance
- 3.4. Working principle and operational characteristic of water turbines: Pelton, Francis, Kaplan, and Crossflow turbines
- 3.5. General layout of the hydropower plant, Head and flow measurement, and their relations to the power
- 3.6. Governing system of hydropower plant
- 3.7. Condition monitoring of a Hydropower plant
- 3.8. Hydraulic Turbine operation and maintenance
 - 3.8.1. Maintenance of Turbine Runner, Guide Vanes or Injectors, Turbine Guide Bearing
- 3.9. Concept of Operation and Maintenance of Auxiliaries and Ancillaries of Hydropower Plant
 - Governor of Hydraulic Turbine
 - Lubricating Oil System
 - Compressed air system
 - Drainage and dewatering system
 - Generator Cooling system
 - Air conditioning and ventilation system
 - Overhead cranes
 - Radial gates and Vertical sliding gates
 - Trashrack Cleaning Machines
- 3.10 Misalignment of shafts in Pumps
- 3.11 Concept of Regular maintenance of hydropower plants
- 3.12 Basic Concept of Material handling

4. Pumps and other Auxiliaries (5 Marks)

- 4.1. Different types of Pumps, the working principle, characteristics, operational and maintenance aspects of pumps: Centrifugal pump Reciprocating pump, and Hydraulic ram
- 4.2. Air compressors: Principles, Application and general maintenance aspects
- 4.3. Air Dryers: Principles, Application and general maintenance aspects
- 4.4. Types of bearings and their applications
- 4.5. Synchronous and Induction Machines: Basic structure of synchronous machines, Generator on isolated load, Generator on a large system, Synchronous motor

5. Fuel, Lubricating system, and Cooling Tower (5 Marks)

- 5.1. Types of fuel and their properties
- 5.2. Internal combustion engines: SI Engines, CI Engines, Boiler, properties of steam, and Steam turbine
- 5.3. Different types of lubricating oils, properties, and their testing
- 5.4. Cooling system, quality of cooling water, chemical treatment of cooling water
- 5.5. Operation of cooling tower

6. Operation and Maintenance (5 marks)

- 6.1. General operation rule, duties and communication, supervision, inspection, and record keeping
- 6.2. Norms and standards of operation of power plants
- 6.3. Maintenance planning
- 6.4. Condition monitoring of mechanical equipment used in power plants
- 6.5. Corrosion, Wear and pitting of hydro turbines and other parts and their maintenance
- 6.6. Impacts of hydraulic turbine erosion upon overall performance of generating station
- 6.7. Workshop/operation safety and occupational safety and health

7. Refrigeration, Air-conditioning, and Ventilation (5 Marks)

- 7.1. Basic refrigeration system
- 7.2. Types of the air-conditioning system and their selection
- 7.3. Major components of air-conditioning system in power plants
- 7.4. Refrigerating compressors and Cooling towers
- 7.5. Ventilation system in power plants
- 7.6. Operation and maintenance system of the ventilation and air-conditioning system

8. Heavy Equipment and Automotive Systems (5 Marks)

- 8.1. Pneumatic earth drilling system
- 8.2. Heavy equipment operations and their service
- 8.3. Engine, braking system, transmission system, steering system, suspension system
- 8.4. Lubrication and cooling system of heavy equipment

9. Equipment Operation Management (5 Marks)

- 9.1. Equipment selection, Equipment Productivity, Equipment performance
- 9.2. Training on equipment handling
- 9.3. Construction Equipment & Vehicles
- 9.4. Workshop planning, and Maintenance practices
- 9.5. Workshop / Operations Safety
- 9.6. Occupational safety & health

10. Mechanical workshop (5 Marks)

- 10.1. Safety considerations in mechanical workshop,
- 10.2. Different hand tools and machine tools
- 10.3. Operation of Lathe, shaper, milling, drilling and concept of CNC Machines
- 10.4. Arc and gas welding, Application of Welding technique in Repair and maintenance of hydraulic turbines
- 10.5. Casting and forging processes
- 10.6. Non-Destructive Techniques (NDTs) for inspection of Welds

द्वितीयपत्र – व्यवस्थापकीय ज्ञान [२५]

क) व्यवस्थापकीय ज्ञान [१५]

१. General (5x1)

- History of power development
- Energy supply and demand trends in Nepal
- Role of GON in hydropower development
- Role of IPPs' in power development
- CHPCL organizational structure, Subsidiary Company of CHPCL and their role in power development
- Introduction to Maintenance Management and Basic aspects of human resource management

२. चिलिमे जलविद्युत कम्पनी सम्बन्धी कानूनी व्यवस्था (५X१)

- चिलिमे जलविद्युत कम्पनीको प्रचलित कर्मचारी सेवा शर्त विनियमावली र आर्थिक प्रशासन विनियमावली
- चिलिमे जलविद्युत कम्पनीको कर्मचारी व्यवस्थापन
- चिलिमे जलविद्युत कम्पनीका सम्बद्ध कम्पनी तथा आयोजनाहरू

३. ऐन नियम, कानूनहरू (५X१)

- विद्युत ऐन, २०४९
- चिलिमे जलविद्युत कम्पनीको प्रबन्धपत्र तथा नियमावली
- कम्पनी ऐन, २०६३

ख) समस्या समाधान [१०X १]

पदले गर्नु पर्ने कामको सिलसिलामा पर्न सक्ने समस्यालाई आधार मानी समस्या दिइनेछ । समस्याको समाधान प्रस्तुत गर्नुपर्नेछ । यसरी समस्याको समाधान गर्दा प्रचलित ऐन नियमको परिधि र अवस्था समेतलाई विचार गरी दिइएको समस्याको निम्न आधारमा उपयुक्त समाधान र सुझाव प्रस्तुत गर्नुपर्नेछ ।

- (१) समस्याको स्पष्ट पहिचान गर्ने ।
- (२) समस्याका खास खास कारणहरू दर्शाउने ।
- (३) समस्या समाधानका लागि सुझावहरू दर्शाउने ।
- (४) प्रस्तुत सुझावहरू कार्यान्वयन गर्दा त्यसबाट पर्न सक्ने सकारात्मक प्रभावहरू उल्लेख गर्ने ।

- द्रष्टव्यः -**
- पाठ्यक्रममा राखिएका ऐन, नियम र विनियमहरू परीक्षा हुनु भन्दा ३ महिना अगाडि संशोधन भएकालाई सोही अनुरूप पाठ्यक्रममा समावेश भएको मानिने छ ।
 - लिखित परीक्षा उत्तीर्ण हुनेहरूको मात्र अन्तरवार्ता हुनेछ ।

