

चिलिमे जलविद्युत कम्पनी लिमिटेड

प्राविधिक सेवा, मेकानिकल समूह, तह-७, ईन्जिनियर पदको
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 | जनरल मेकानिकल ईन्जिनियरिङ्ग | बस्तुगत बहुउत्तर | ३० | ०.५ | १५ | ३० मिनेट | |
| द्वितीय | पावर प्लाण्ट ईन्जिनियरिङ्ग | विषयगत | लामो उत्तर | २ | १० | ७० | २ घण्टा ३० मिनेट |
| | | | छोटो उत्तर | १० | ५ | | |
| अन्तर्वार्ता | | | | | १५ | | |

- बस्तुगत बहुउत्तर परीक्षा प्रणालीमा प्रत्येक पश्चका चार वटा सम्भाव्य उत्तर दिइने छ । प्रश्नको उत्तर लेखदा केरमेट गरेको, दोहोरो लेखेको, सच्याएको, निर्दिष्ट स्थानभन्दा अन्यत्र लेखेको वा उत्तर नै सारेकोलाई गल्तीमानिनेछ ।
- प्रत्येक गलत उत्तर वापत सो प्रश्न वापत पाउने अंकको ०.२ (बीस प्रतिशत २०%) का दरले सो विषयमा पाएको कूल प्रासांकबाट घटाईनेछ ।
- कालो/नीलो मसी मात्र भएको डटपेन/कलमले उत्तरको लागि निर्धारित कोठाका पश्चमा क,ख,ग,घ मध्ये एउटा मात्र सहि उत्तर स्पष्ट रूपले लेख्नुहोला । पेन्सिलले लेखेकोलाई मान्यता दिइने छैन ।
- प्रथम र द्वितीयपत्रको परीक्षा २ पटक गरेर हुनेछ । प्रथम पत्रको परीक्षा सकिएपछि द्वितीयपत्रको परीक्षा तत्काल हुनेछ ।
- द्वितीयपत्रको लिखित परीक्षाको माध्यम नेपाली वा अंग्रेजी भाषा हुनेछ ।

प्रथमपत्र - जनरल मेकानिकल ईन्जिनियरिङ्ग

Paper I: General mechanical engineering

1. Workshop technology

[2]

- Safety rules and regulations to be observed and maintained in the workshop.
- Precautions in electrical works; uses and maintenance of safety equipment and firefighting equipment; electric shocks first aid; fire safety codes.
- Metal cutting tools such as lathe machine, milling machine, shaping machine, drilling machine, grinding machines.
- Arc welding and oxy-acetylene welding and their applications.
- Noise, dust and smoke protection in the workshop.

2. Internal combustion engine

[2]

- Laws of thermodynamics; consequences of second law of thermodynamics; energy balance in a closed and open system.
- Gas power cycles such as Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Rankine cycle and determination of cycle efficiencies.

- Working and main components of spark ignition and compression ignition internal combustion engines; compression ratio and thermal efficiency of SI and CI engines.
- Fuels used in internal combustion engine; fuel properties; fuel supply system; carburetor and electronic fuel injection system.
- Importance of engine cooling and lubrication systems.
- Exhaust emissions and their control in internal combustion engine

3. Lubricants [2]

- Types of lubricants and their properties.
- Grading of lubricating oils, uses of single grade and multi-grade oils.
- Lubricating oil selection, applications, changing and disposal.

4. Automobile engineering [1.5]

- Engine components and systems
- Transmission system: manual drive transmission and axle, automatic transmission and transaxle.
- Running gear system: frame, control system (brake and steering), suspension (springs and dampers), wheel and tires.
- Auxiliaries: electrical and electronics system, dashboard.
- Body.

5. Construction equipment [2]

- Salient features of reciprocating air compressors and pneumatic earth drilling equipment.
- Functions, characteristics and rating of loader, bulldozer, grader and excavators.
- Repair and maintenance of construction equipment.

6. Refrigeration and air conditioning [1.5]

- Basics of vapor compression refrigeration system; functions and uses of cycle components such as compressor, condenser and expansion valve, evaporator, thermostat and pressure cutouts.
- Major components of air conditioning system and their functions.
- Importance of ventilation system, determination of fresh air requirements for a confined space.

7. Safety engineering [2]

- Safety precautions, safety rules and regulations; physical effects of electric shocks.
- Safety tools and devices for electricity; live line maintenance and precautions; explosions of electrical equipment in premises and precautions to be taken.
- Earthing and shielding techniques.
- Fire hazards, firefighting techniques and equipment.
- Noise hazard: sources, control and effect on health.
- First aid requirements for post-event treatment.

8. Institutional know-how [2]

- General knowledge of Chilime Hydropower Company, its organizational structure.
- General knowledge of various power plants of Nepal, their types, salient features and their geographical locations.
- General knowledge of Nepalese power transmission system, voltage levels and lengths, import-export links for power exchange with India.

Paper II: Power plant engineering

- 1. Power plant cycles [2X5=10]**
 - Working of power plant cycles such as Rankine cycle, reheat cycle, binary vapour cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle.

- 2. Diesel engine power plant [2X5=10]**
 - Classification of internal combustion (IC) engines, different components of IC engines, 2-stroke and 4-stroke cycle diesel engines, combustion process in compression ignition (CI) engines, basic design of CI engines combustion, supercharging, turbo charging,
 - Operation of diesel power plant, types of diesel engine used for diesel power plants.

- 3. Hydro-electric power plant [1X10=10]**
 - Types of hydro-electric power plants, essential components, and auxiliaries (general, operational, maintenance),
 - Hydro-electric plant controls, electrical and mechanical equipment, ventilator, cooling and lubrication.
 - Calculation of hydro power, power house planning.
 - Preventive measures, safety measures and maintenance of electrical and mechanical plants.

- 4. Hydraulic machines [2X5=10][1X10=10]**
 - Turbines: main types, classification, design, working principles and characteristics of different types of turbines, specific speed, cavitations, efficiencies, performance, specific speed, selection, governing of water turbines.
 - Reciprocating pumps: main components, working principle, single acting and double acting, head discharge characteristics, power and efficiency calculation, seals and packing, common troubles and remedies.
 - Centrifugal pumps: main components, working principle, classification, pumping head, cavitation, power requirements, pump characteristics curves, selection, overhauling, trouble shooting and their remedies.

- 5. Machine design [2X5=10]**
 - Ball bearing, journal bearing, thrust bearing, and roller bearing: their construction and types, selection criteria, bearing materials and construction, mounting and alignment.
 - Uses and selection of Jacks, brakes and clutches, V-belts and flat belts, pulleys, ropes and cranes.
 - Basic regimes of fluid film lubrication and film thickness; lubrication of bearings, clearances and oil grooves.
 - Uses and selection of gasket, sealing materials.
 - Engineering Drawings:
Basics of engineering drawing, Machine drawing, Symbols used in drawings, Assembly drawing.

- 6. Economic and financial analysis [2X5=10]**
 - Methods of economic/financial analysis such as cost-benefit ratio, internal rate of return, net present value, payback period, minimum attractive rate of return and their applications.
 - Risk analysis, tariff structure, investment decisions, interest, and time value of money.