

# नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, मेकानिकल समूह/उपसमूह तह-८, सहायक प्रबन्धक पदको  
खुला तथा आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र: सेवा सम्बन्धी बिस्तृत ज्ञान (१०० पुर्णाङ्क)

**खण्ड क: (२×१५=३०, १×२०=२०) - ५० अंक**

## 1. Hydropower engineering

- 1.1. History and development of water power in Nepal and world
- 1.2. Types of power plant: run-of-river, storage, pumped storage
- 1.3. Classification of hydropower plant: large, medium, small, mini and micro hydropower plants
- 1.4. Safety measures and precautions applied in power plant
- 1.5. Environmental impact of hydropower plant

## 2. Water turbines

- 2.1. Classification of turbines on various criteria
- 2.2. Main components of turbines and their functions
- 2.3. Working principle of turbines and their efficiencies
- 2.4. Specific speed of a turbine
- 2.5. Selection of turbines

## 3. Water turbine governors

- 3.1. Types and working principles
- 3.2. Operation and maintenance

## 4. Hydro-mechanical equipment

- 4.1. Types, selection, use and design of gates, seals, hoisting equipment and valves
- 4.2. Use and design of trash rack and safety rack
- 4.3. Design, selection of penstock and accessories

## 5. Power plant instruments

- 5.1. Measurement of pressure, flow, temperature, speed, voltage, ampere, power and energy
- 5.2. Types of communication used in utilities and their application

## 6. Renewable energy technologies

- 6.1. Renewable energy sources: biomass, solar energy, wind energy, geothermal energy, hydropower
- 6.2. Renewable energy technologies for electricity generation: solar PV, wind power generator, biogas generator, micro-hydro power plant
- 6.3. Role of renewable energy technologies in rural electrification
- 6.4. Environmental benefits of renewable energy technologies

**खण्ड ख: (२×१५=३०, १×२०=२०) - ५० अंक****7. Construction equipment**

- 7.1. Introduction to construction equipment: types, general specification and application of construction equipment
- 7.2. Hydraulic system: pump, valve, cylinders and motors, accumulator and filters, reservoirs, hoses, pipe, tubes and couples, seals and fluids
- 7.3. Transmission: clutches, mechanical transmission, hydraulic assist transmissions, power shift transmission, hydrostatic drive, torque converters, differential, final drive, power take-offs, special drives
- 7.4. Undercarriage: track chain, idler, sprocket, track rollers, tyres
- 7.5. Implements and tools: blades, rippers, bucket
- 7.6. Electronic components and their functions
- 7.7. Repair and maintenance of construction equipment

**8. Engineering economics**

- 8.1. Cash flow analysis, project evaluation indicators
- 8.2. Criteria for capital investment decision, risk analysis
- 8.3. Taxation system in Nepal, energy tariff and regulatory issues

**9. Contract management**

- 9.1. Familiarization with procurement guidelines and standards of World Bank, ADB
- 9.2. Preparation of contract documents, specifications, condition of contract and other contractual procedures
- 9.3. Arbitration

**10. Internal combustion engine and pollution**

- 10.1. Introduction to IC engine: engine classification, engine operating cycles, engine components
- 10.2. Thermo-chemistry of fuel-air mixture: characteristics of flames, composition air and fuel, combustion stoichiometry, the first law of thermodynamics and combustion, the second law of thermodynamics applied to combustion
- 10.3. Fuel and fuel supply system: types of fuel used in IC engines, fuel supply system in SI and CI engines
- 10.4. Ignition system: purposes, types, components and their functions, problem associated with ignition system
- 10.5. Cooling system: purposes, types, components and their functions, problems related to cooling system
- 10.6. Lubricants and lubricating system: classification of lubricants and their uses, purposes, types, components and their functions of lubricating system
- 10.7. Pollution formation and control: pollution formation (source and chemistry), emission standards (national and international); tailpipe emission measuring instrument (gas analyzers); controlling measures (engine design, after treatment and use of alternative fuels; noise pollution)

10.8. Engine operating characteristics: engine performance parameters, indicated and brake power and mean effective pressure; operating variables that affects SI engine performance, efficiency and emission; SI engine combustion chamber design; variables that affect CI engine performance, efficiency and emissions; supercharged and turbocharged engine performance

**11. Air conditioning**

11.1. Air conditioning system design: summer air conditioning, winter air conditioning

11.2. Estimation of cooling and heating load

11.3. Selection of air conditioning apparatus for cooling

11.4. Noise, vibration and volume control

**12. Service related manuals**

Safety guidelines/standards for electricity generation, transmission and distribution of hydropower projects.

**The end**