

**नेपाल विद्युत प्राधिकरण**  
प्राविधिक सेवा, सिभिल समुह, सिभिल उपसमूह, तह-१० प्रबन्धक पदको  
खुला तथा आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

**द्वितीय पत्र: सेवा सम्बन्धी विस्तृत ज्ञान (१०० पुर्णाङ्क)**

पत्र	विषय	पुर्णाङ्क	उत्तीर्णाङ्क	खण्ड	परीक्षा प्रणाली	प्रश्न संख्या	प्रति प्रश्न अङ्कभार	समय
द्वितीय	सेवा सम्बन्धी (विस्तृत ज्ञान)	१००	४०	क	लामो उत्तर/ विश्लेषणात्मक समिक्षा	२	१५	३ घण्टा
					विश्लेषणात्मक समिक्षा/समस्या समाधान	१	२०	
				ख	लामो उत्तर/ विश्लेषणात्मक समिक्षा	२	१५	
					विश्लेषणात्मक समिक्षा/समस्या समाधान	१	२०	

**खण्ड (क)**

**(२x१५=३०, १x२०=२०)- अङ्क ५०**

**1. Overview of Hydrology and Sedimentology**

**2. Project Engineering:**

- 2.1. Power market survey
- 2.2. Load demand forecast and determination of capacity requirement
- 2.3. Site selection
- 2.4. Different stages of project Development
- 2.5. Field investigations and study;
  - 2.5.1. Reconnaissance Survey
  - 2.5.2. Topographical survey
  - 2.5.3. Hydrological investigation
  - 2.5.4. Sedimentological investigation
  - 2.5.5. Geological investigations
  - 2.5.6. Sub-surface exploration
  - 2.5.7. Seismological studies
  - 2.5.8. Material investigation
  - 2.5.9. Landslide hazard mapping
  - 2.5.10. Flood study: Pre-monsoon flood and Maximum flood, Landslide Dam outburst flood, Glacier Lake outburst flood
- 2.6. Project preparation for implementation and justification of the Project
- 2.7. Types of Hydropower Projects
- 2.8. Knowledge of DoED Guideline for study of Hydropower Projects, 2018

### **3. Optimization Study:**

- 3.1. Power optimization
- 3.2. Determination of load factor, utilization factor and plant capacity factor
- 3.3. General knowledge of firm energy and secondary energy
- 3.4. Reservoir and Peaking Run-off-River Projects and their importance for run-off-river schemes

### **4. Overall Design of Hydro-Electric Projects:**

- 4.1. General layout of hydraulic structures
- 4.2. Overview of Water Conveyance Structures
- 4.3. Selection of surface structures and underground structures
- 4.4. General arrangement of electrical and mechanical installations
- 4.5. Output and capacity of the plant
- 4.6. Optimization of water conveyance system
- 4.7. Economic Diameter of Penstock
- 4.8. Overview of Power House
- 4.9. Power House Design and planning
- 4.10. Relationship between Dam and Adjacent Power House
- 4.11. Reservoirs
- 4.12. Downstream water release.
- 4.13. Fish passage facilities
- 4.14. Cascade Development
- 4.15. Economic Parameters
- 4.16. Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA)
- 4.17. Knowledge of DoED Power House Design Guidelines for Hydropower Projects, 2018
- 4.18. Knowledge of DoED Design Guidelines for water conveyance system of Hydropower Projects
- 4.19. Knowledge of DoED Design Guidelines for Headworks of Hydropower Projects

### **5. Design of Dams and its Structures:**

- 5.1. Overview and design of different Types of dams (Embankment, Concrete, Roller Compacted (RCC) and Rock-Filled Concrete (RFC))
- 5.2. Factor affecting on selection of economic dam site
- 5.3. Factors affecting on design & constructions in different types of dams
- 5.4. Floods and their economic aspects
- 5.5. Spillway capacity
- 5.6. Economic height of dam
- 5.7. Stability Analysis of dams
- 5.8. Concept of Gravel core Rock filled Dam
- 5.9. Familiar with International Commission on Large Dams (ICOLD) guidelines

**6. Economic Analysis of Hydro-electric Projects:**

- 6.1. Economic and Financial analysis and justify the project development
- 6.2. Plant capacity in relation to the stream flow
- 6.3. Investment models in Hydropower development in Nepal

**7. Cost of electric Power:**

- 7.1. Size and cost optimization of Hydro, solar and wind projects
- 7.2. Effect of size on operation and management costs
- 7.3. Unproductive capital and its effect on the cost of Power
- 7.4. Different annual cost associated for effective operation
- 7.5. Consumer tariff fixation
- 7.6. Levelized cost of electricity

**8. Engineering Economics:**

- 8.1. Disbursement schedule, Cash flow analysis, Time value of money
- 8.2. Project evaluation indicators, IRR, RoE, Payback period, EIRR, FIRR and others Criterion, Choose the best alternative
- 8.3. Incremental, Sensitivity & breakeven analysis
- 8.4. Risk analysis, Inflation & price change
- 8.5. Financing of projects
- 8.6. Taxation system in Nepal
- 8.7. Energy tariff schemes and regulatory issues and different directives.

खण्ड (ख)

(२x१५=३०, १x२०=२०) - अङ्क ५०

**9. Multi-Purpose Hydropower Projects:**

- 9.1. Multi-purpose hydropower projects and their planning
- 9.2. Benefits of Multipurpose Hydropower Projects
- 9.3. Benefits of river basin development
- 9.4. Special considerations for Multi-Purpose Hydropower Projects
- 9.5. Reservoir Routing and its Significance

**10. Storage and Related Economic Problems:**

- 10.1. Cost of Storage
- 10.2. Minimum dry weather flow
- 10.3. Consequences of short supplies
- 10.4. Re-regulating Dam, importunate in storage project and its cost
- 10.5. Cost sharing mechanism on regulated discharge

**11. Reservoirs - Problems of Sedimentation:**

- 11.1. Influence of forest on rainfall
- 11.2. Control of Sedimentation
- 11.3. Evaluation of effect of Sedimentation on Power Production

- 11.4. Management of Sedimentation in Reservoir
- 11.5. Soil conservation
- 11.6. Effect of dams on river regime
- 11.7. Mechanism of reservoir silting
- 11.8. Method of desilting of reservoir

**12. Maintenance of Civil Engineering Works:**

- 12.1. Maintenance and its requirement
- 12.2. Maintenance processes
- 12.3. Scheduling and programming of preventive maintenance
- 12.4. Maintenance squad
- 12.5. Maintenance Manual and its significance
- 12.5. Maintenance of:
  - 12.5.1. Reservoirs
  - 12.5.2. Dams and spillways
  - 12.5.3. Canals and forebays
  - 12.5.4. Tunnels
  - 12.5.5. Pipelines
  - 12.5.6. Power House

**13. Safety Engineering:**

- 13.1. Safety rules and regulations
- 13.2. Storage and handling of explosives, compressed gases and inflammable substances
- 13.3. Safety precautions in handling electrical installations in construction premises, earthing and shielding techniques
- 13.4. Water Induced Hazards and its management
- 13.5. Disaster Management Plan in Hydropower Project
- 13.6. Fire hazards, firefighting techniques and equipment
- 13.7. Noise hazards, its sources, effect on health and control
- 13.8. First aid requirements in case of health hazard
- 13.9. Field instrumentation and warning systems
- 13.10. Climate change and its impact in Nepalese Hydropower

**14. Contract management:**

- 14.1. Knowledge of Public Procurement Act, Regulation, guidelines, standards of World Bank, Asian Development Bank and Asian Infrastructure Investment Bank etc.
- 14.2. Preparation of contract documents, specifications, condition of contract and other contractual procedures.
- 14.3. International Standard Bidding Document, National Standard Bidding Document
- 14.4. Arbitration and Mediation

**15. Project Scheduling of Planning:**

- 15.1. Concept of Project Scheduling
- 15.2. Resource Planning & Management
- 15.3. Analysis of Critical Path, CPM & PERT

**16. Quality Control:**

- 16.1. Need of Quality Control
- 16.2. Mechanism of Quality Control
- 16.3. Technical Auditing
- 16.4. Quality Control Management
- 16.5. Quality Assurance Plan

**17. Social Aspect & its Management:**

- 17.1. Social Issues in Hydropower Project
- 17.2. Grievance Mechanism
- 17.3. Importance & Process of CSR

**18. International Treaty and Conventions:**

- 18.1. Koshi Agreement, 1954/1966
- 18.2. Gandak Agreement, 1959
- 18.3. Electricity Exchange 1961
- 18.4. Treaty between the Government of Nepal and Government of India concerning the integrated development of Mahakali River including Sarada Barrage, Tanakpur Barrage and Pancheswar Project.

**19. Service-Related Manuals:**

- 19.1 The Environment Protection Act and Regulation 2019
- 19.2 Manual for public Involvement in Environmental Impact Assessment (EIA) process of Hydropower Projects
- 19.3 Manual for preparing Terms of Reference (TOR) for environmental Impact Assessment, (EIA) of Hydropower Projects
- 19.4 Manual for preparing Scoping Document for Environmental Impact Assessment (EIA) of Hydro power Projects,
- 19.5 Manual for preparing Environmental Management Plan (EPM) for Hydropower Projects
- 19.6 National Environmental Impact Assessment Guidelines, 1993,
- 19.7 Safety Guidelines and standards for Generation, Transmission and Distribution of Hydro Electricity.

