

नेपाल विद्युत प्राधिकरण
प्राविधिक सेवा, सिभिल समुह, सिभिल उप समूह, तह-८ सहायक 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	

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(२x१५=३०, १x२०=२०)- अङ्क ५०

1. Hydrological and Sedimentological Studies

1.1. Hydrology;

- **Drainage Area:** Basic knowledge of drainage area and its characteristics, Rainfall and stream flow data, Analysis of rainfall and stream flow data, Determination of flows
- **Floods:** Causes and occurrence of floods, Flood hydrographs, Flood estimates, Pre-monsoon flood and Landslide Dam outburst flood;
 - Knowledge of Landslide Dam
 - Landslide Dam outburst flood and its phenomena
- **River discharge:** Methods of flow measurement, Area capacity curve, Rating curves, Flow duration curve

1.2. Glacier lake outburst flood;

- Basic knowledge of snow and glacier hydrology
- Glacier Lake outburst flood (GLOF) and its phenomena

1.3. Sedimentation;

- Basic knowledge of sedimentation, sediment transportation and its effect
- Sediment sampling
- Estimates of sediment volume and sediment handling
- Sediment risk analysis

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 studies

2.5 Field investigations:

- Reconnaissance survey,
- Topographical survey,
- Hydrological, investigation,
- Sedimentological investigation,
- Geological investigations,
- Sub-surface exploration,
- Seismological studies,
- Material investigation,
- Landslide hazard mapping

2.6 Different stages of Project Development.

2.7 Types of Hydropower Projects (Run-off-River (RoR), Peaking Run-off- River (PRoR) and Reservoir).

2.8 Knowledge of DoED Guidelines for study of Hydropower Projects, 2018

3. Optimization Study:

3.1 Optimization of installed capacity.

3.2 Determination of load factor, utilization factor and plant capacity factor.

3.3 Firm energy and secondary energy.

3.4 Reservoir and PRoR Schemes and their importance for run-off-river schemes.

4. Hydraulics:

4.1 Flow in natural channels, open channels and closed conduits

4.2 Hydraulic Transients

4.3 Basic knowledge of; Hydraulic gradient, Friction loss, Water hammer, Hydraulic jump and Specific energy.

5. Overall Design of Hydro-Electric Projects:

5.1 General layout of hydraulic structures

5.2 Selection of surface structures and underground structures

5.3 Output and capacity of the plant

5.4 Water conveyance structures

5.5 Reservoirs

5.6 Downstream water release

5.7 Fish passing facilities

5.8 Cascade development

6. Dam and its Structure:

6.1 Types of Dam (Concrete Dam, Embankment Dam, Roller Compacted Concrete (RCC) Dam, Rock – Filled Concrete (RFC) Dam) and their importance

- Concept of arch dam
- Concrete gravity dam: Concept of concrete gravity dams, Forces acting on a gravity dam and their line of actions, Stability against sliding and overturning, bearing stresses, Preparation of foundations, Deposition of concrete on foundations, Subdivision of the concrete mass, Temperature control, concrete joints and height of concreting lifts, Water stops and seals, Inspection and drainage galleries
- Embankment Dams: Basic knowledge of embankment dams, Types of embankment dams, Basic design principles, Seepage through embankments, Stability of the slopes and foundations, Stability analysis, Influence of pore pressure of stability, Stability on different loading conditions such as:-
 - During and at completion of construction
 - When the reservoir is full
 - During drawdown condition

Special problems associated with earth fill and rockfill dams, Design in earthquake areas, Knowledge of computer aided design and software packages for design, Selection of riprap and filter materials

- Concept of RCC and RFC Dam and their selection and Design

7. Spillway and Flood Control Works:

7.1 Design of spillways and their capacity

7.2 Type of Spillways and their importance in River diversion structure

7.3 Types of flood gates

- Vertical lift gates
- Radial gates
- Drum gates
- Other types of flood gates

7.4 Gate details

- Barrage gates
- Flow control gates

7.5 Automatic control of flood gates

7.6 Energy dissipation

8. Headworks and Equipment:

8.1 Function of Good Headworks

8.2 Types of intakes

8.3 Hydraulic design of intakes

8.4 Construction of low-level intakes

8.5 Size of intake gates

- 8.6 Design of trash rack
- 8.7 Desanding basin and its design
- 8.8 Flushing structures
- 8.9 Gravel traps and its flushing structures
- 8.10 Knowledge of DoED Design Guidelines of Headworks of Hydropower Projects

9. Reservoirs - Problems of Sedimentation:

- 9.1 Influence of forest on rainfall.
- 9.2 Evaporation.
- 9.3 Sources of sedimentation on Reservoir.
- 9.4 Effects of deforestation on soil erosion.
- 9.5 Soil conservation.
- 9.6 Effect of dams on river regime.
- 9.7 Mechanism of reservoir silting.
- 9.8 Function silting basin.

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10. Canals and Free Flow Channels:

- 10.1 Selection of types of canals
- 10.2 Hydraulic design
- 10.3 Uniform flow
- 10.4 Headrace and tailrace canals
- 10.5 Spillway channels
- 10.6 Unsteady flow
- 10.7 Surges and waves

11. Tunnels:

- 11.1 Tunnel Design
- 11.2 Size and cross section area
- 11.3 Tunneling procedure (Drill and Blast, TBM and others)
 - Mechanized drilling
 - Manual drilling
- 11.4 Support Design
 - Shotcrete
 - Rock bolt and Steel Rib
 - Concrete/ steel lining
 - Fore polling and Grouting
- 11.5 Storage and care of explosives

12. Surge Chambers and Transient Analysis:

- 12.1 Types of surge chambers and their function
- 12.2 Design of surge chambers
- 12.3 Behavior of surge chambers
- 12.4 Regulation and stability

13. Penstock and Power Station:

- 13.1 Hydraulic design of penstock
- 13.2 Design of anchor blocks and saddle supports
- 13.3 Concept of underground penstock and its construction
- 13.4 Construction of Surface, semi-surface and underground power House
- 13.5 Powerhouse substructure – its design and construction details
- 13.6 Powerhouse superstructure – its structural framework and building details
- 13.7 Knowledge of DoED Power House Design Guidelines for Hydropower Project, 2018

14. Safety Engineering:

- 15.1 Safety rules and regulations.
- 15.2 Storage and handling of explosives, compressed gases and inflammable substances
- 15.3 Safety precautions
- 15.4 Fire hazards, firefighting techniques and equipment
- 15.5 Noise hazards, its sources, effect on health and control
- 15.6 First aid requirements
- 15.7 Field instrumentation and warning systems.

16. Contract management:

- 16.1 knowledge of Procurement act, regulation and guidelines and standards
- 16.2 Preparation of contract documents, specifications, condition of contract and other contractual procedures.
- 16.3 International Standard Bidding Document, National Standard Bidding Document.

17. Engineering Economics:

- 17.1 Cash flow analysis, Project evaluation indicators,
- 17.2 Project evaluation
- 17.3 Capital investment and payback period
- 17.4 Risk analysis
- 17.5 Energy tariff and regulatory issues

18. General Civil Engineering concept:

- 18.1 Concept of Estimation and valuation
- 18.2 Concept of drawing and its application

- 18.3 Basic knowledge of structural Engineering
- 18.4 Basic knowledge of Soil Mechanics and Foundation Engineering

19. International Treaty and Conventions:

- 19.1 Electricity Exchange 1961
- 19.2 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.

20. Service-Related Manuals:

- 20.1 The Environment Protection Act and Regulation 2019
- 20.2 Manual for public Involvement in Environmental Impact Assessment (EIA) process of Hydropower Projects
- 20.3 Manual for preparing Environmental Management Plan (EPM) for Hydropower Projects
- 20.4 National Environmental Impact Assessment Guidelines, 1993
- 20.5 Safety Guidelines and standards for Generation, Transmission and Distribution of Hydro Electricity.

