लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, हाइड्रोपावर उपसमूहको राजपत्राङ्कित तृतीय श्रेणी पदको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र :– हाइड्रोपावर सम्वन्धी विषय

1. Hydrology and sedimentation 20%

1.1 Methods and estimation of rain fall and run-off; Rainfall runoff correlation and rating curve; Velocity and discharge measurements; Stage discharge curve and its use

1.2 General concept and use of flow duration curve and reservoir area capacity curve

1.3 Definition, types, and usage of Hydrograph; Hydrograph analysis

1.4 Flood Frequency Analysis, Flood routing, recurrence interval, and their role in planning

1.5 Definition and usage of Probable Maximum Flood (PMF) and Probable Maximum Precipitation (PMP) in design of hydraulic structures.

1.6 Erosion process and factors affecting erosion; Concepts of suspended and bed load transport; Sediment data, measurement and their significance in development of hydropower projects; Concepts of sediment rating curve and sediment yield; Reservoir Sedimentation.

2. Hydraulics 10%

2.1 Boundary layers, Uniform flow, Steady flow, Laminar and Turbulent flow

2.2 Principles of open channel flow and pipe flow; Reynold's Number, Froude Number, and their usage

2.3 Concept of head loss, friction loss, local loss, total head, and net head

2.4 Hydraulic Jumps and its types, flow profiles

2.5 Bernoullies Equation and its applications

3. Hydropower 60%

3.1 General and Project Planning 10%

3.1.1 General:

3.1.1.1 Historical development in national and international context

3.1.1.2 Concepts of different types of power (Thermal, Hydro, Wind, Solar, and others); Current Situation of hydropower development in the country

3.1.1.3 Future prospect of hydropower development in Nepal considering both national and regional context

3.1.1.4 Importance of micro-hydropower, mini-hydropower and rural electrification.

3.1.2 Project Planning:

3.1.2.1 Concepts and different phases of studies-Reconnaissance, Pre-feasibility, Feasibility, Detail Design

3.1.2.2 General concepts/principles of Environmental Studies i.e. Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA), in the Development of hydropower and transmission line projects

3.1.2.3 General concept of multipurpose water resources development; Concept of River basin development and Integrated Water Resource Management

3.1.2.4 Hydrological and Geological investigations in hydropower planning

3.1.2.5 Different types of hydropower projects/plants and their choice with respect to site condition and economy; Types of hydropower development/schemes (Run of the river, Storage, and Pump Storage)

3.1.2.6 General concept of transmission lines and substation

3.1.2.7 Power demand and forecast.

3.2 Power Regulation and Project Layout 10%

3.2.1 Power Regulation:

3.2.1.1 Definition and determination of potential and firm power, maximum power output, firm energy, surplus energy, seasonal energy, and average annual energy

3.2.1.2 General concept of load, load curve, capacity factor, load factor, and utilization factor

3.2.1.3 Power demand variation - daily, weekly, monthly, seasonal, and annual

3.2.1.4 Role of different types of hydropower project in meeting power demand as per the load curve.

3.2.2 Project Layout:

3.2.2.1 General layout of different types of hydropower projects: Reservoir/Poundage, diversion structures, de-sanding basin, water conveyance system, fore-bay, surge tank, penstock, power house, draft tube, tailrace, switch yard, and auxiliary structures.

3.3 Water Retaining Structures, Spillway, and Intake 10%

3.3.1 Water Retaining Structures:

3.3.1.1 Dam classification and their usage based on – functionality, acting forces, and construction material

3.3.1.2 Selection of dam based on – construction material, topography, and economy and purpose

3.3.1.3 Concrete Gravity Dams: Forces on gravity dams, their line of actions; stability against sliding, overturning, and floating

3.3.1.4 Embankment Dams: Earth and Rock-fill Dams; Basic design principles; Concept of Seepage through embankments; Considerations in foundation and slope stability

3.3.1.5 Concept of Cofferdams and their usage.

3.3.2 Spillway:

3.3.2.1 Purpose, Types, and Design of Spillways

3.3.2.2 Types of Spillway gates, location, and their functions

3.3.2.3 Energy dissipation necessity; Energy dissipation methods; Types of energy dissipaters

3.3.2.4 Design concept of Stilling Basin and Aprons.

3.3.3 Intake:

3.3.3.1 Intakes: Types of intakes; Location of intake; Design of intake, trash rack, gravel traps, and approach canal.

3.4 De-sanding Basin and Water Conveyance 10%

3.4.1 De-sanding Basin:

3.4.1.1 De-sanding Basin: Importance, Types, Location, and Usage of De-sanding basin; Suspended Sediment Characteristics; Sediment velocities to be considered in de-sanding basin design; Design of de-sanding basin, Flushing of sediments from de-sanding basin.

3.4.2 Water Conveyance:

3.4.2.1 Hydraulic Tunnels: Pressure and non-pressure tunnels, Tunnel cross-section and size; Head losses in tunnels; Concept of tunnel stability and protection measures; Tunnel linings

3.4.2.2 Canals and Conduits: Selection and Design.

3.5 Fore-bay and Surge Tank; Penstock; and Power House and Tailrace 10%

3.5.1 Fore-bay and Surge Tank:

3.5.1.1 Importance and selection criteria; location and design; Concept of water hammer; Hydrodynamic pressure calculations; Design of fore-bay basin.

3.5.2 Penstock:

3.5.2.1 Importance, locations, and application; Anchor Blocks and Saddle Supports.

3.5.3 Power House and Tailrace:

3.5.3.1 Under ground and surface power houses and their selection criteria; Power House Dimensions; Considerations in selection of underground power house

3.5.3.2 Tailrace and its importance.

3.6 Hydro-mechanical and Electro-mechanical Installations 10%

3.6.1 Hydro-mechanical Installation:

3.6.1.1 Types of turbines and their usage and selection criteria; Concept of specific speed; General concept of Gates and Valves, Draft Tube; Need and working principle of governors

3.6.2 Electro-mechanical Installations:

3.6.2.1 Types of hydro-generators and their usage; Transformers and Auxiliary Equipments.

4. Policy, Acts, and Regulation 10%

4.1 Over View of:

4.1.1 Hydropower Development Policy, 2058

4.1.2 Water Resources Act, 2049 and Water Resources Regulations, 2050

4.1.3 Electricity Act, 2049 and Electricity Regulation, 2050

4.1.4 Environmental Protection Act, 2053, Environmental Protection Regulation, 2054.

द्वितीय पत्रको एकाईहरुको प्रश्नसंख्या निम्नानुसार हुनेछ

द्वितीय पत्रका एकाई	1	2	3.1	3.2	3.3	3.4	3.5	3.6	4
प्रश्न संख्या	2	1	1	1	1	1	1	1	1

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, हाइड्रोपावर उपसमूहको राजपत्राङ्कित तृतीय श्रेणी पदको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

विषयगत नमूना प्रश्नहरु (Sample questions)

1. What is Unit Hydrograph? What are its Assumptions and Limitations?

2. What is Flow Duration Curve? How it can be used in Hydropower Project Planning?

3. Write Short notes on:
   Head Loss, Friction Loss, Total Head, and Net Head

4. There have been arguments about Nepal's initiatives in development of large-scale hydropower development for the export of electricity. Give your comments with justification.

5. What is Load Curve? How are the Load Factor, Capacity Factor, and Utilization Factor interrelated?

6. Draw forces acting on a typical gravity dam and state the Conditions of Stability?

7. What is the importance of a de-sanding basin in a hydropower project, and what are the considerations to be taken care of in its design? Identify a de-sander in a typical exhibit of headwork arrangement.

8. What are the surges in water conveyance structures, and how they are mitigated?

9. What are the types of turbines used in hydropower projects and what are their selection criteria?

10. Environmental Impact Assessment Process, for some one is been an impediment in the development of hydro-projects. Give your reply to them with justifications.