

नेपाल विद्युत प्राधिकरण

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

द्वितीय पत्र: सेवा सम्बन्धी विस्तृत ज्ञान (१०० पुर्णाङ्क)

खण्ड क: (२×१५=३०, १×२०=२०) - ५० अंक

1. Hydrological and Sedimentological Studies

1.1. Hydrology;

1.1.1 Drainage Area;

- Basic knowledge of drainage area and its characteristics
- Rainfall and stream flow data
- Analysis of rainfall and stream flow data
- Determination of low flows and high flows

1.1.2 Floods;

- Causes and occurrence of floods
- Flood hydrographs.
- Flood estimates

1.1.3 River discharge;

- Methods of flow measurement
- Area capacity curve
- Rating curves
- Flow duration curve

1.2. Glacier lake outburst flood;

1.2.1 Basic knowledge of snow and glacier hydrology

1.2.2 Glacier lake outburst flood (GLOF) and its phenomena

1.3. Sedimentation;

1.3.1 Basic knowledge of sedimentation, sediment transportation and its effect

1.3.2 Sediment sampling

1.3.3 Estimates of sediment volume and its construction

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;

- 2.5.1 General reconnaissance
- 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
- 2.6 Project preparation for implementation and justification of the Project.
- 2.7 Types of Hydropower Projects.
- 3. Optimization Study**
 - 3.1 Optimization of installed capacity, firm capacity of plant and dependable capacity.
 - 3.2 Determination of load factor, utilization factor and plant capacity factor.
 - 3.3 Firm energy, useable energy and secondary energy.
 - 3.4 Daily pondage basin and its importance for run-off-river schemes.
- 4. Hydraulics and Hydraulic Model Tests**
 - 4.1 Flow in natural channels, open channels and closed conduits
 - 4.2 hydraulic Transients
 - 4.3 Basic knowledge of; Hydraulic gradient, Friction lossess, 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 Storage reservoirs
 - 5.6 Downstream compensation water release
 - 5.7 Fish passing facilities
 - 5.8 Stations "In Cascade"
- 6. Dam and its Structure**
 - 6.1 Concrete Dam
 - 6.1.1 Concept of arch dam
 - 6.1.2 Concrete gravity dam
 - a. Concept of concrete gravity dams
 - b. Forces acting on a gravity dam and their line of actions
 - c. Stability against sliding and overturning

- d. Bearing stresses
- e. Preparation of foundations
- f. Deposition of concrete on foundations
- g. Subdivision of the concrete mass
- h. Temperature control, concrete joints and height of concreting lifts
- i. Water stops and seals
- j. Inspection and drainage galleries

6.1.3 Embankment Dams

- a. Basic knowledge of embankment dams
- b. Types of embankment dams
- c. Basic design principles
- d. Seepage through embankments
- e. Stability of the slopes and foundations
- f. Stability analysis
- g. Influence of pore pressure of stability
- h. Stability on different loading conditions such as:
 - During and at completion of construction
 - When the reservoir is full
 - During drawdown condition
- i. Special problems associated with earthfill and rockfill dams
- j. Design in earthquake areas
- k. Knowledge of computer aided design and software packages for design
- l. Selection of riprap and filter materials

7. Spillway and Flood Control Works

- 7.1 Conditions affecting the design of spillway works
- 7.2 Determination of the required spillway capacity
- 7.3 Fied crest spillways
- 7.4 Ogee crest spillways
- 7.5 Siphon spillways
- 7.6 Types of flood gates
 - 7.6.1 Vertical lift gates
 - 7.6.2 Radial gates tilting flap gates
 - 7.6.3 Drum gates
 - 7.6.4 Other types of flood gates
- 7.7 Gate details
 - 7.7.1 Barrage gates

7.7.2 Flow control gates

7.8 Automatic control of flood gates

7.9 Energy dissipation

8. Headworks and Equipment

8.1 Types of intakes

8.2 Hydraulic design of intakes

8.3 Construction of low level intakes

8.4 Size of intake gates

8.5 Design of trash rack

8.6 Desanding basin

8.7 Flushing structures

8.8 Gravel traps and its flushing structures

9. Reservoirs - Problems of Sedimentation

9.1 Influence of forest on rainfall.

9.2 Evaporation.

9.3 Sedimentation and causes of erosion.

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 Control of silting.

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10. Canals and Free Flowing Channels

10.1 Selection of types of canal

10.2 Basic 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 Location and hydraulic design

11.2 Cross sectional form and size

11.3 Tunneling procedure, TBM

11.4 Temporary supporting and permanent supporting

11.4.1 Shotcreting

11.4.2 Rockbolting

11.4.3 Conrete lining

11.4.4 Grouting

11.5 Storage and care of explosives

12. Surge Chambers

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 Powerhouse substructure – its design and construction details

13.5 Powerhouse superstructure – its structural framework and building details

13.6 Construction of underground power stations

14. Maintenance of Civil Engineering Works

14.1 Maintenance and its requirement.

14.2 Maintenance processes.

14.3 Scheduling and programming of preventive maintenance.

14.4 Maintenance squad.

14.5 Maintenance of;

14.5.1 Reservoirs

14.5.2 Dams and spillways

14.5.3 Hydraulic equipment

14.5.4 Canals and forebays

14.5.5 Tunnels

14.5.6 Pipelines

14.5.7 Powerstation

15. Safety Engineering

15.1 Safety rules and regulations.

15.2 Storage and handling of explosives, compressed gases and inflammable substances

15.3 Safety precautions in handling electrical installations in construction premises, earthing and shielding techniques

15.4 Fire hazards, fire fighting techniques and equipment

15.5 Noise hazards, its sources, effect on health and control

15.6 First aid requirements in case of health hazards

15.7 Field instrumentation and warning systems.

16. Contract management

16.1 Familiarization with Procurement guidelines and standards of World Bank & Asian Development Bank

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 Method

17.3 Criteria for capital investment decision, Payback period

17.4 Risk analysis

17.5 Energy tariff and regulatory issues

18. International Treaty and Conventions

18.1 Electricity Exchange 1961

18.2 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.

19. Service Related Manuals

19.1 Manual for public Involvement in Environmental Impact Assessment (EIA) process of Hydropower Projects

19.2 Manual for preparing Environmental Management Plan (EPM) for Hydropower Projects

19.3 National Environmental Impact assessment Guidelines, 1993

19.4 Safety Guidelines and standards for Generation, Transmission and Distribution of Hydro Electricity.

The end