Bhdhiganga Hydropower Project (BHP)

Service : Engineering
Sub group: Hydropower
Position: **Sub- Engineer**

Group : Civil
Level: NG – I

Syllabus for Interview

In interview, the General, Subject Matter, Knowledge, Skill, Attitude testing shall be carried out. In addition to this, the knowledge of subject matter in the following area shall be examined.

1 Surveying

1.1 General

1.1.1 Classifications
1.1.2 Principle of surveying
1.1.3 Selection of suitable method
1.1.4 Scales, plans and maps
1.1.5 Entry into survey field books and level books

1.2 Levelling

1.2.1 Methods of levelling
1.2.2 Levelling instruments and accessories
1.2.3 Principles of levelling

1.3 Plane Tabling

1.3.1 Equipments required
1.3.2 Methods of palne tabling
1.3.3 Two and three point problems

1.4 Theodolite and Traverse surveying

1.4.1 Basic difference between different theodolites
1.4.2 Temporary adjustments of theodolites
1.4.3 Fundamental lines and desired relations
1.4.4 Tacheometry: stadia method
1.4.5 Trigonometrical levelling
1.4.6 Checks in closed traverse

1.5 Contouring

1.5.1 Characteristics of contour lines
1.5.2 Method of locating contours
1.5.3 Contour plotting

1.6 Setting Out

1.6.1 Small buildings
1.6.2 Simple curves

2. Construction Materials

2.1 Stone

2.1.1 Formation and availability of stones in Nepal

2.1.2 Methods of laying and construction with various stones

2.2 Cement

2.2.1 Different cements: Ingredients, properties and manufacture

2.2.2 Storage and transport

2.2.3 Admixtures 3

2.3 Clay and Clay Products

2.3.1 Brick: type, manufacture, laying, bonds

2.4 Paints and Varnishes

2.4.1 Type and selection

2.4.2 Preparation techniques

2.4.3 Use

2.5 Bitumen

2.5.1 Type

2.5.2 Selection

2.5.3 Use

3. Mechanics of Materials and Structures

3.1 Mechanics of Materials

3.1.1 Internal effects of loading

3.1.2 Ultimate strength and working stress of materials

3.2 Mechanics of Beams

3.2.1 Relation between shear force and bending moment

3.2.2 Thrust, shear and bending moment diagrams for statically determinate beams under various types of loading

3.3 Simple Strut Theory

4. Hydraulics

4.1 General

4.1.1 Properties of fluid: mass, weight, specific weight, density, specific volume, specific gravity, viscosity

4.1.2 Pressure and Pascal's law

4.2 Hydro-Kinematics and Hydro-Dynamics

4.2.1 Energy of flowing liquid: elevation energy, Kinetic energy, potential energy, internal energy

4.3 Measurement of Discharge

4.3.1 Weirs and notches

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4.3.2 Discharge formulas

4.4 Flows

4.4.1Characteristics of pipe flow and open channel flow

5. Soil Mechanics

5.1 General

5.1.1 Soil types and classification

5.1.2 Three phase system of soil

5.1.3 Unit Weight of soil mass: bulk density, saturated density, submerged density and dry density

5.1.4 Interrelationship between specific gravity, void ratio, porosity, degree of saturation, percentage of air voids air content and density index

5.2 Soil Water Relation

5.2.1 Terzaghi's principle of effective stress

5.2.2 Darcy's law

5.2.3 Factors affecting permeability

5.3 Compaction of soil

5.3.1 Factors affecting soil compaction

5.3.2 Optimum moisture content

5.3.3 Relation between dry density and moisture content

5.4 Shear Strength of Soils

5.4.1 Mohr-Coulomb failure theory

5.4.2 Cohesion and angle of internal friction

5.5 Earth Pressures

5.5.1 Active and passive earth pressures

5.5.2 Lateral earth pressure theory

5.5.3 Rankine's earth pressure theory

5.6 Foundation Engineering

5.6.1 Terzaghi's general bearing capacity formulas and their application

6. Structural Design

6.1 R.C. Sections in Bending

6.1.1 Under reinforced, over reinforced and balanced sections

6.1.2 Analysis of single and double reinforced rectangular sections

6.2 Shear and Bond for R.C. Sections

6.2.1 Shear resistance of a R.C. section

6.2.2 Types of Shear reinforcement and their design

6.2.3 Determination of anchorage length

6.3 Axially Loaded R.C. Columns

6.3.1 Short and long columns
6.3.2 Design of a rectangular column section

6.4 Design and Drafting of R.C. Structures

6.4.1 Singly and doubly reinforced rectangular beams
6.4.2 Simple one-way and two-way slabs
6.4.3 Axially loaded short and long columns

7. Building Construction Technology

7.1 Foundations

7.1.1 Subsoil exploration
7.1.2 Type and suitability of different foundations: Shallow, deep
7.1.3 Shoring and dewatering
7.1.4 Design of simple brick or stone masonry foundations

7.2 Walls

7.2.1 Type of walls and their functions
7.2.2 Choosing wall thickness, Height to length relation
7.2.3 Use of scaffolding

7.3 Damp Proofing

7.3.1 Source of Dampness
7.3.2 Remedial measures to pr-went dampness

7.4 Concrete Technology

7.4.1 Constituents of cement concrete
7.4.2 Grading of aggregates
7.4.3 Concrete mixes
7.4.4 Water cement ratio
7.4.5 Factors affecting strength of concrete
7.4.6 Form work
7.4.7 Curing

7.5 Wood work

7.5.1 Frame and shutters of door and window
7.5.2 Timber construction of upper floors
7.5.3 Design and construction of stairs

7.6 Flooring and Finishing

7.6.1 Floor finishes : brick, concrete, flagstone
7.6.2 Plastering

8. Water Supply and Sanitation Engineering

8.1 General

8.1.1 Objectives of water supply system

8.1.2 Source of water and its selection: gravity and artisan springs, shallow and deep wells; infiltration galleries.

8.2 Gravity Water Supply System

8.2.1 Design period

8.2.2 Determination of daily water demand

8.2.3 Determination of storage tank capacity

8.2.4 Selection of pipe

8.2.5 Pipe line design and hydraulic grade line

8.3 Design of Sewer

8.3.1 Quantity of sanitary sewage

8.3.2 Maximum, Minimum and self cleaning velocity

8.4 Excreta Disposal and Unsewered Area

8.4.1 Pit latrine

8.4.2 Design of septic tank

9. Irrigation Engineering

9.1 General

9.1.1 Advantages and Disadvantages of irrigation

9.2 Water Requirement

9.2.1 Crop season and principal crops

9.2.2 Base period

9.3 Flow irrigation Canals

9.3.1 Canal losses and their minimization

9.3.2 Maximum and minimum velocities

9.3.3 Design of irrigation canal section based on manning's formula

9.3.4 Need and location of spillways

9.3.5 Head works for small canals

10. Highway Engineering

10.1 General

10.1.1 Introduction to transportation systems

10.1.2 Historic development of roads

10.1.3 Classification of road in Nepal

10.1.4 Basic requirements of road alignment

10.2 Geometric Design

10.2.1 Basic design control and criteria for design

10.2.2 Elements of cross section, typical cross-section for all roads in filling and cutting

10.2.3 Camber

10.2.4 Determination of radius of horizontal curves

10.2.5 Super-elevation

10.2.6 Sight distances

10.2.7 Gradient

10.2.8 Use of Nepal Road Standard, 2027 (First Revision 2045) and subsequent revision in road design

10.3 Drainage System

10.3.1 Importance of drainage system and requirements of a good drainage system

10.4 Road Pavement

10.4.1 Pavement structure and its components: subgrade, sub-base, base and surface courses

10.5 Road Machineries

10.5.1 Earth moving and compacting machines

10.6 Road Construction Technology

10.7 Bridge

10.7.1 T-beam bride

10.7.2 Timber bridges

10.8 Road Maintenance and Repair

10.8.1 Type of maintenance Works

10.9 Tracks and Trails

11. Estimating and Costing

11.1 General

11.1.1 Main items of work

11.1.2 Units of measurement and payment of various items of work and material

11.1.3 Standard estimate formats of government offices

11.2 Rate Analysis

11.2.1 Basic general knowledge on the use of rate analysis norms prepared by Ministry of Works and Transport and the district rates prescribed by district development committee

11.3 Specifications

11.3.1 Interpretation of specifications

11.4 Valuation

11.4.1 Methods of valuation

11.4.2 Basic general knowledge of standard formats used by commercial banks and NIDC for valuation

12. Construction Management

12.1 Organization

12.1.1 Need for organization

12.1.2 Responsibilities of a civil overseer

12.1.3 Relation between Owner, Contractor and Engineer

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12.2 Site Management

12.2.1 Preparation of site plan
12.2.2 Organizing labor
12.2.3 Measures to improve labor efficiency
12.2.4 Accident prevention

12.3 Contract Procedure

12.3.1 Contracts
12.3.2 Departmental works and day-work 8
12.3.3 Types of contracts
12.3.4 Tender and tender notice
12.3.5 Earnest money and security deposit
12.3.6 Preparation before inviting tender
12.3.7 Agreement
12.3.8 Conditions of contract
12.3.9 Construction supervision

12.4 Accounts

12.4.1 Administrative approval and technical sanction
12.4.2 Familiarity with standard account keeping formats used in governmental organizations
12.4.3 Muster roll
12.4.4 Completion report

12.5 Planning and Control

12.5.1 Construction schedule
12.5.2 Equipment and materials schedule
12.5.3 Construction stages and operations
12.5.4 Bar chart

13. Hydropower Engineering

13.1 Introduction

13.1.1 Historical development of hydropower
13.1.2 Installed capacity
13.1.3 Calculation of power and energy
13.1.4 Firm and secondary energy
13.1.5 Load and load curve

13.2 Hydropower type, layout and design

13.2.1 Classification of hydropower project
13.2.2 Types hydropower project layout
13.2.3 Hydropower project components
13.2.4 Types and design of hydropower component (headworks, settling basin, forebay, surge tank, penstock)