सब - इन्जिनियर

प्रदेश लोक सेवा आयोग

प्रदेश नं. १, विराटनगर

स्थानीय सरकारी सेवा अन्तर्गत प्राविधिक तर्फ इञ्जिनियरिङ्ग सेवा, सिभिल समूह, सहायकस्तर पाँचौं तह (सब-इञ्जिनियर) पदको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

पत्र/विषय :- सेवा सम्बन्धी

1. Surveying — ५

1.1 General
- 1.1.1 Principle and types of surveying
- 1.1.2 Units, scales and maps
- 1.1.3 Field books and Level books

1.2 Levelling
- 1.2.1 Principles and methods of levelling
- 1.2.2 Levelling instruments and accessories

1.3 Plane Tabling
- 1.3.1 Equipments required
- 1.3.2 Methods of plane 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: Small buildings and Simple curves

2. Construction Materials — ५

2.1 Stone and aggregate
- 2.1.1 Formation and availability of stones in Nepal
- 2.1.2 Methods of laying and construction with various stones
- 2.1.3 Fine aggregates and Coarse aggregates

2.2 Cement
- 2.2.1 Different cements: Ingredients, properties and manufacture
- 2.2.2 Storage and transport
- 2.2.3 Admixtures

2.3 Clay and Clay Products

2.3.1 Brick: type, manufacture, laying, bonds

2.4 Paints and Varnishes: Type and selection; preparation techniques and use

2.5 Bitumen: Type, selection and use

2.6 Metals and Alloys
2.7 Timber and Wood

3. Mechanics of Materials and Structures — 4

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 Shear and bending moment diagrams for statically determinate beams under various types of loading

3.3 Simple Strut Theory

4. Hydraulics — 4

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
- 4.3.2 Discharge formulas

4.4 Flows: Characteristics of pipe flow and open channel flow

5. Soil Mechanics — 4

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. Structures — 4

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 Design and Working System 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 — 4

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 and thickness of walls
- 7.2.2 Use of scaffolding

7.3 Damp Proofing
- 7.3.1 Source of Dampness
- 7.3.2 Remedial measures for damp proofing

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 — 4

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

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9. Irrigation Engineering

9.1 General
- 9.1.1 Need for irrigation; advantages of irrigation
- 9.1.2 Sources of irrigation: water, river & streams, ground water and others
- 9.1.3 Methods of irrigation: surface, sub-surface and others

9.2 Irrigation Water Requirement
- 9.2.1 Crop season, principal crops, and crop water requirements
- 9.2.2 Base period & duty

9.3 Irrigation Canals
- 9.3.1 Canal losses and their minimization
- 9.3.2 Irrigation requirements and design discharge of canal permissible velocities for different canals
- 9.3.3 Design of canal based on Manning's & Lacey's formulae
- 9.3.4 Need and location of escapes
- 9.3.5 Components of distribution system

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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 Superelevation
10.2.6 Sight distances
10.2.7 Gradient
10.2.8 Use of Nepal Road Standard 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: 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: T-beam bride and Timber bridges

10.8 Road Maintenance and Repair: Type of maintenance works

10.9 Tracks and Trails

10.10 Airport Engineering: Planning and layout of Heliports; Terminal Building and Control Tower; Drainage System for Airports

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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 – 2

12.1 Organization
12.1.1 Need for organization
12.1.2 Responsibilities of a civil Sub- engineer
12.1.3 Relation between Owner, Contractor and Engineer

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 Safety Management at site

12.3 Procurement and Contract Procedure
12.3.1 Contracts and its types

12.3.2 Departmental works and day-work
12.3.3 Preparation of tender document
12.3.4 Tender procedure
12.3.5 Contract agreement
12.3.6 Conditions of contract
12.3.7 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. General information about legislations — 2

13.1 नेपालको संविधान (भाग १, २, ३, १७ र १८ तथा अनुसुचीहरु) (The Constitution of Nepal (From Parts 1, 2, 3, 17 & 18, and Schedules))

13.2 स्थानीय सरकार सञ्चालन ऐन, २०७४ मा पूर्वाधार विकास सम्बन्धी व्यवस्था (Local Government Operation Act, 2074 (related to local infrastructures development))

13.3 Nepal National Building Code, 2060, Levels of Application and Mandatory Rules of Thumb

13.4 बस्ती विकास, सहरी योजना तथा भवन निर्माण सम्बन्धी मापदण्ड, २०७२