नेपाल खानेपानी संस्थान
प्राधिक सेवा, सिभिल समूह, पाञ्च तह, सव-ईन्जीनियर/सुपरभाइजर पदको खुला,
आन्तरिक प्रतियोगितालग्न लिखित परीक्षाको पाठ्यक्रम

1. परीक्षाको योजना (Examination Scheme)

<table>
<thead>
<tr>
<th>भाग</th>
<th>परीक्षा</th>
<th>विषय</th>
<th>पूर्णाङ्क</th>
<th>प्रश्न संख्या</th>
<th>समय</th>
<th>परीक्षा प्रणाली</th>
<th>उत्तरांश</th>
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<tr>
<td>1</td>
<td>लिखित</td>
<td>सेवा</td>
<td>100</td>
<td>50</td>
<td>45 मिनेट</td>
<td>बहुउत्तर (Multiple Choice)</td>
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<td>2</td>
<td>अल्पविर्त</td>
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2. पाठ्यक्रममा रहेका एकाइबाट देखाइ अनुसार प्रश्नहरू सोधिनेछन्:

<table>
<thead>
<tr>
<th>पाठ्यक्रमको एकाइ</th>
<th>प्रश्नसंख्य</th>
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<tbody>
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<td>२</td>
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<tr>
<td>जुमला-</td>
<td>५०</td>
</tr>
</tbody>
</table>

3. भाग १ को लिखित परीक्षाबाट छलौट भएका उपमेदवारहरू मात्र भाग २ को अन्तर्वासिया सममिलित हुन पाउनेछन्।

4. लिखित परीक्षाको माध्यम अंग्रेजी भाषा हुनेछ।

5. गलती गरेको प्रश्नोत्तरको लागि २० प्रतिशत अंक कटौ गरिनेछ।

6. यस पाठ्यक्रममा जसै लेखिएको भए तालिका पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको भिति भन्ना ३ महिना अगाडि (संशोधन भएका वा संशोधनमैटेक एका वा वही गरी संशोधनमैटेक) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्बन्धमा पर्दछ।
1. Surveying
   1.1 General
      1.1.1 Classifications
      1.1.2 Principles 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 Leveling instruments and accessories
      1.2.3 Principles of Levelling
   1.3 Plane Tabling
      1.3.1 Equipments required
      1.3.2 Methods of plane tabling
      1.3.3 Two and Three points problems
   1.4 Theodolite and Traverse Surveying
      1.4.1 Basic difference between difference theodolities
      1.4.2 Temporary adjustment of theodolities
      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 Layout
      1.6.1 Small building
      1.6.2 Simple curves

2. Construction Materials
   2.1 Stone
      2.1.1 Formation & availability of stone 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
   2.3 Clay and clay products
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 moments
    3.2.2 Thrust, shear, and bending moments diagrams for statically
determinate beams under various types of loading

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, kinetics energy,
potential energy, internal energy
  4.3 Measurements of Discharge
    4.3.1 Weirs and Notches
    4.3.2 Discharge formulae
  4.4 Flows: Characteristics 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 Tezaghi's principles 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 Pressure
5.5.1 Active and Passive earth pressure
5.5.2 Lateral earth pressure theory
5.5.3 Rankin's earth pressure theory
5.6 Foundation Engineering
5.6.1 Tezaghi's general bearing capacity formulae 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 singles and double reinforced rectangular sections
6.2 Shear and Bond for RC sections
6.2.1 Shear resistance of RC section
6.2.2 Types of shear reinforcement and their design
6.2.3 Determination of anchorages length
6.3 Axially loaded RC columns
6.3.1 Short and long column
6.3.2 Design of a rectangular column section
6.4 Design and drafting of RC structures
6.4.1 Singly and doubly reinforced rectangular beams
6.4.2 Simple one way and two way slab
6.4.3 Axially loaded short and long column

7. Building construction Technology
7.1 Foundations
7.1.1 Subsoil exploration
7.1.2 Type and suitability of different foundations: shallow and deep
7.1.3 Shoring and dewatering
7.1.4 Design of simple brick or stone masonry foundations
7.2 Walls
7.2.1 Types 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 prevent 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 doors and window
7.5.2 Timber construction or upper floors
7.5.3 Design and construction of stairs
7.6 Flooring and finishing
7.6.1 Floor finishes: bricks, concrete, flag stone
7.6.2 Plastering
8. Water supply Engineering
8.1 Quantity of water
8.1.1 Design Period
8.1.2 Per capita demand
8.1.3 Population forecasting
8.1.4 Total water demand
8.2 Source of water supply
8.2.1 Surface source: River, spring
8.2.2 Groundwater source: tubewell, infiltration gallery
8.3 Gravity Water supply system
8.2.2 Source of Water and its selection: gravity and artesian spring, shallow and deep wells,
8.2.3 Design period
8.2.4 Determination of daily water demand
8.2.5 Determination of storage tank capacity
8.2.6 Selection of pipe
8.2.7 Pipe line design and hydraulic grade line
8.4 Pump and pumping
8.4.1 Necessity of pumps
8.4.2 Classification of pumps
8.4.3 Working principles of pumps
8.5 Quality of Water
8.5.1 Physical, chemical, and biological impurities
8.5.2 Water Borne diseases
8.6 Purification of water
8.6.1 Sequence of water treatment
8.6.2 Sedimentation, coagulation and filtration
8.6.3 Disinfection of water
8.7 Distribution System
8.7.1 Water Pressure in Distribution system
8.7.2 Layout
8.7.3 Simple design criteria
8.7.4 Appurtenances in the distribution system
9. Sanitary Engineering
9.1 Introduction to sewage, sewer, and sewerage
9.2 Sewer
9.2.1. Types of sewer
9.2.2. Design of sewer:
9.2.3. quantity of sanitary sewage, maximum,
9.2.4. minimum and cleansing velocity

9.3. Surface and storm water drainage
9.3.1. Factors affecting storm water drainage
9.3.2. Determination of storm water flow
9.3.3. Laying and construction

9.4. Sewer appurtenances
9.4.1. Manholes (drop manhole, lamphole)
9.4.2. Street inlet, catch drains
9.4.3. grease traps

9.5. Sewerage disposal and treatment
9.5.1. Excreta disposal in unsewered area
9.5.2. pit latrine
9.5.3. design of septic tank

10. Estimating and Costing
10.1. General
10.1.1. Main items of work
10.1.2. Units of measurement and payment of various items of work and materials
10.1.3. Standard estimate formats of government offices

10.2. Rate Analysis
10.2.1. Basic general knowledge on the use of rate analysis norms prepared by Ministry of Physical Planning and Works and the districts rates prescribed.

10.3. Specification
10.3.1. Interpretation of specification

10.4. Valuation
10.4.1. Methods of valuation
10.4.2. Basic general knowledge of standard formats used by commercial banks for valuation.

11. Construction Management
11.1. Organization
11.1.1. Need for organization
11.1.2. Responsibilities of an civil overseer
11.1.3. Relation between Owner, contractor

11.2. Site Management
11.2.1. Preparation of site plan
11.2.2. Organizing labor
11.2.3. Measures to improve labor efficiency
11.2.4. Accident prevention

11.3. Contract Procedure
11.3.1. Contracts
11.3.2. Departmental works and day works
11.3.3. Types of contracts
11.3.4 Tender and tender notice
11.3.5 Earnest money and security deposit
11.3.6 Preparation before inviting tender
11.3.7 Agreement
11.3.8 Conditions of contract
11.3.9 Construction supervision

11.4 Accounts
11.4.1 Administrative approval and technical sanction
11.4.2 Familiarity with standard account keeping formats used in government organizations
11.4.3 Muster roll
11.4.4 Completion report

11.5 Planning and control
11.5.1 Construction schedule
11.5.2 Equipment and materials schedules
11.5.3 Construction stages and operations
11.5.4 Bar chart