

**काठमाडौं महानगरपालिका**  
**नेपाल इन्जिनियरिङ्ग सेवा, सिभिल समुहका खुला तथा आन्तरिक प्रतियोगितात्मकको**  
**पाँचौं तह (जुनियर इन्जिनियर वा सो सरह) को**  
**लिखित परीक्षाको पाठ्यक्रमको ढाँचा**

यस पाठ्यक्रमलाई दुई भागमा विभाजन गरिएको छ ।

भाग	परीक्षा	विषय	पूर्णाङ्क	प्रश्न संख्या	समय	परीक्षा प्रणाली	उत्तीर्णाङ्क
१	लिखित	सेवा सम्बन्धी	१००	५०	४५ मिनेट	वस्तुगत बहुउत्तर (Multiple Choice)	४०
२	अन्तर्वार्ता		२०				

१. यथासम्भव पाठ्यक्रमका सबै एकाईवाट प्रश्नहरु सोधिनेछन् ।
२. लिखित परीक्षामा गल्ती गरेको प्रश्नोत्तरका लागि २० प्रतिशत अङ्क कट्टा गरिने छ ।
३. यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।

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समय :- ४५ मिनेट

प्रश्न संख्या :- ५०

पूर्णाङ्क :- १००

**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 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**

- 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

**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

4.3.2 Discharge formulas

**4.4 Flows**

4.4.1 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 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 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 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 Superlevation
  - 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 bridge
  - 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

### **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
- 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