

काठमाडौं उपत्यका खानेपानी लिमिटेड
प्राविधिक सेवा, सिभिल समूह, ५ तह, ओभरसियर पदको खुल्ला तथा समावेशि र आन्तरीक
प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

१. प्रथम चरण : लिखित परीक्षाको योजना (Examination Scheme)

| पत्र | विषय | प्रश्न संख्या x अंकभार | प्रश्न संख्या | परीक्षा प्रणाली | समय | पूर्णाङ्क | उत्तिर्णाङ्क |
|------------|-------------------------------------|------------------------|---------------|------------------|---------|-----------|--------------|
| प्रथम पत्र | सेवा सम्बन्धी: Civil Engineering | ५०x२=१०० | ५० | बस्तुगत बहुउत्तर | १ घण्टा | १०० | ४० |

२. द्वितीय चरण : अन्तर्वार्ता योजना

| विषय | पूर्णाङ्क | परीक्षा प्रणाली |
|------------------------|-----------|-----------------|
| व्यक्तिगत अन्तर्वार्ता | २० | मौखिक |

द्रष्टव्य : उम्मेदवारहरुले ध्यान दिनुपर्ने कुराहरु

- लिखित परीक्षाको माध्यम नेपाली/अग्रेजी दुवै हुन सक्नेछ ।
- प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरु मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित हुन पाउनेछन् ।
- पाठ्यक्रममा भएका यथा सम्भव सबै पाठ्यांशहरुबाट प्रश्न सोधिनेछ । पाठ्यक्रमका इकाईहरु बाट सोधिने प्रश्नहरुको संख्या सम्बन्धित इकाईहरुमै उल्लेख गरिएको छ ।
- यस पाठ्यक्रममा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका ऐन, नियमहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्भन्नु पर्दछ ।
- यस भन्दा अगाडि लागु भएको माथि उल्लेखित समूहको पाठ्यक्रम खारेज गरिएको छ ।
- पाठ्यक्रम लागु मिति २०७४ आश्विन

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प्रथम पत्र
सेवा सम्बन्धी: **Civil Engineering**

1. Surveying (5 x2=10)
 - 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
 - 1.7 Basic introduction to Geographical Information System (GIS)
 - 1.7.1 Information on overview of GIS software
 - 1.7.2 GIS and Map
2. Construction Materials (3x2=6)
 - 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

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- 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 (2x2=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 moments
 - 3.2.2 Thrust, shear, and bending moments diagrams for statically determinate beams under various types of loading
- 4. Fluid Mechanics/Hydraulics (5x2=10)
 - 4.1 General
 - 4.1.1 Properties of fluid: Mass density, specific weight, specific volume, specific gravity, viscosity and capillarity.
 - 4.1.2 Pressure and its measurements, Pascal's, Pressure force
 - 4.2 Hydro-Kinematics and Hydro-dynamics
 - 4.2.1 Energy of flowing liquid: Equation Bernoulli, its physical meaning and application
 - 4.3 Measurements of Discharge
 - 4.3.1 Weirs and Notches
 - 4.3.2 Discharge formulae
 - 4.4 Flows: Characteristics of pipe and open channel flows
- 5. Soil Mechanics (5x2=10)
 - 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 principles of effective stress
 - 5.2.2 Darcy's Law

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- 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 (5x2=10)
 - 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 (5x2=10)
 - 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

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- 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 (10x2=20)
 - 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: tube well, infiltration gallery
 - 8.3 Gravity Water supply system
 - 8.2.1 Objectives of 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

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- 8.7.3 Simple design criteria
- 8.7.4 Appurtenances in the distribution system
- 8.8 Introduction to Supervisory Control and Data Acquisition (SCADA)
- 9. Sanitary Engineering (5 x2=10)
 - 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, lamp hole)
 - 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 (2x2=4)
 - 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 (3x2=6)
 - 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

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- 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