

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

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

पत्र	बिषय	प्रश्न संख्या x अंकभार	प्रश्न संख्या	परीक्षा प्रणाली	समय	पूर्णाङ्क	उत्तिर्णाङ्क
प्रथम पत्र	सेवा सम्बन्धी: Civil, Building and Architecture.	५०x२=१००	५०	बस्तुगत बहुउत्तर	१ घण्टा	१००	४०

२. द्वितीय चरण : अन्तर्वार्ता योजना

बिषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	२०	मौखिक

द्रष्टव्य : उम्मेदवारहरूले ध्यान दिनुपर्ने कुराहरू

- लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी दुबै हुन सक्नेछ।
- प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरू मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित हुन पाउनेछन्।
- पाठ्यक्रममा भएका यथासम्भव सबै पाठ्यांशहरूबाट प्रश्न सोधिनेछ।
- यस पाठ्यक्रममा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मितिभन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
- यस भन्दा अगाडि लागु भएको माथि उल्लेखित समूहको पाठ्यक्रम खारेज गरिएको छ।
- पाठ्यक्रम लागु मिति २०७४ आश्विन
- पाठ्यक्रमका एकाईबाट निम्नानुसार प्रश्नहरू सोधिनेछन्।

Part	I Civil Engineering				II Building				III Architecture			
	१	२	३	४	५	६	७	८	९	१०	११	
एकाई	१	२	३	४	५	६	७	८	९	१०	११	
प्रश्न संख्या	५	७	५	७	३	२	५	३	७	२	४	

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Part I Civil Engineering

1 Drawing

1.1 General

- 1.1.1 Importance, aims and objectives of drawing
- 1.1.2 Drawing equipment
- 1.1.3 Architectural discipline
- 1.1.4 Standard drawing sheet sizes
- 1.1.5 Drafting techniques and methods in common practice
- 1.1.6 Scales: Choice, use and conversion

1.2 Measured Drawing

- 1.2.1 Methods of measurement of horizontal and vertical dimensions
- 1.2.2 Sectional measurements
- 1.2.3 Dimensioning of sketches
- 1.2.4 Checking for missing details in field

1.3 Working Drawing

- 1.3.1 Role of working drawing
- 1.3.2 Interrelationship with estimate and specification
- 1.3.3 Construction detailing in plan and section
- 1.3.4 Significance of detailing in terms of accuracy of estimation, bill of quantities and construction supervision
- 1.3.5 Working drawing for private and public buildings, sanitary installation, electrification
- 1.3.6 Structural working drawings

2 Estimating and Costing

2.1 General

- 2.1.1 Purpose of estimating
- 2.1.2 Main items of work
- 2.1.3 Units of measurement and payment of various items of work and materials
- 2.1.4 Degree of accuracy
- 2.1.5 Standard estimate formats of Government of Nepal
- 2.1.6 Data for estimate
- 2.1.7 Preliminary estimate
- 2.1.8 Approximate quantity estimate
- 2.1.9 Detailed estimate
- 2.1.10 Revised estimate

2.2 Rate Analysis

- 2.2.1 Manufacturer's cost
- 2.2.2 Transportation cost
- 2.2.3 Overheads
- 2.2.4 Need for contingencies
- 2.2.5 Use of Government Rate Analysis Norms

2.3 Specifications

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- 2.3.1 Purpose
- 2.3.2 Types
- 2.3.3 Necessity
- 2.3.4 Interpretation of Specifications
- 2.3.5 Septic tank, soak pit, vent and manhole
- 2.3.6 Pipes for different sewage
- 2.3.7 Incinerators
- 2.4 Electricity
 - 2.4.1 General principles of electrical installation and distribution
 - 2.4.2 Wiring systems in private and public building
 - 2.4.3 Ducts for electrical distribution
- 2.5 Safety precautions Estimating
 - 2.5.1 Earthwork
 - 2.5.2 Estimate of buildings
 - 2.5.3 Estimate of sanitary installations
 - 2.5.4 Estimate of electrical wiring and sanitary works
 - 2.5.5 Annual maintenance
- 2.6 Valuation
 - 2.6.1 Purpose of valuation
 - 2.6.2 Methods of valuation
 - 2.6.3 Standard formats used for Property Valuation in Nepal

3 Management

- 3.1 Organization
 - 3.1.1 Need for organization
 - 3.1.2 Building agencies
 - 3.1.3 Structure of the Department of Urban Development and Building construction
 - 3.1.4 Responsibilities of a building subengineer
 - 3.1.5 Relation between owner, contractor and consultants
- 3.2 Accounts
 - 3.2.1 Familiarity with related Nepalese accounting system
 - 3.2.2 Administrative approval and technical sanction
- 3.3 Planning and Control
 - 3.3.1 List of activities
 - 3.3.2 Construction schedule
 - 3.3.3 Equipment and material schedule
 - 3.3.4 Construction stages and operations
 - 3.3.5 Bar Chart
- 3.4 Municipal Building By-laws

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- 3.4.1 Sheetsizes
- 3.4.2 Scales
- 3.4.3 Setback
- 3.4.4 Height controls
- 3.4.5 Other requirements specifies by themunicipalities
- 3.4.6 FAR

4 Building Service

- 4.1 Water Supply
 - 4.1.1 General principle of water supply
 - 4.1.2 Water requirement standard for different buildings
 - 4.1.3 Storage and distribution of water
 - 4.1.4 Heating of water, storage and distribution requirements
- 4.2 Disposal system
- 4.3 Lighting
 - 4.3.1 General principles of lighting
 - 4.3.2 Illumination requirements and standards
 - 4.3.3 Combination of artificial and natural light
 - 4.3.4 Lighting fixtures

Part II Building

5 Surveying

- 5.1 General
 - 5.1.1 Primary divisions of survey
 - 5.1.2 Classification based on instruments and on methods
 - 5.1.3 Basic principle of surveying
 - 5.1.4 Scales, plans and maps
 - 5.1.5 System of field booking of surveying and levelling data
 - 5.1.6 Theodolite survey
- 5.2 Levelling
 - 5.2.1 Classification of levelling work
 - 5.2.2 Methods of levelling
 - 5.2.3 Levelling instruments and accessories
 - 5.2.4 Principles of levelling
 - 5.2.5 Temporary and permanent adjustments of a level
 - 5.2.6 Profile levelling
 - 5.2.7 Booking and reducing levels
- 5.3 Errors and their effects
 - 5.3.1 Kinds of errors
 - 5.3.2 Source of errors in chaining, levelling, plane tabling and compass surveying
 - 5.3.3 Effects of errors
- 5.4 Plane Tabling

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- 5.4.1 Equipment used
- 5.4.2 Working operations
- 5.4.3 Methods of plane tabling
- 5.4.4 Merits and demerits of plane tabling
- 5.5 Contouring
 - 5.5.1 Definitions of terms
 - 5.5.2 Use of contour maps
- 5.6 Setting out
 - 5.6.1 Small buildings
 - 5.6.2 Simple curves
 - 5.6.3 Locating the boundaries of farm lands

6 Construction Materials

- 6.1 Stone
 - 6.1.1 Rocks and their characteristics
 - 6.1.2 Formation and availability of stones in Nepal
 - 6.1.3 Quarrying: excavation, Wedging and blasting
 - 6.1.4 Methods of laying and construction with various stones
- 6.2 Aggregates
 - 6.2.1 Fine aggregates
 - 6.2.2 Coarse aggregates
 - 6.2.3 Availability and practice in Nepal
- 6.3 Cement
 - 6.3.1 Different cements: ingredients, properties and manufacture
 - 6.3.2 Storage and transport
 - 6.3.3 Admixtures
- 6.4 Metals and Alloys
 - 6.4.1 Wrought iron: Properties, use
 - 6.4.2 Steel: composition, properties, appearance, strength, constructional forms and manufacture
 - 6.4.3 Corrosion and its prevention
 - 6.4.4 Brass: uses
- 6.5 Brick
 - 6.5.1 Type
 - 6.5.2 Manufacture
 - 6.5.3 Laying
 - 6.5.4 Availability and practice in Nepal
- 6.6 Lime
 - 6.6.1 Manufacture
 - 6.6.2 Types and properties
 - 6.6.3 Uses
- 6.7 Paints and Varnishes

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- 6.7.1 Type and selection
- 6.7.2 Preparation techniques
- 6.7.3 Uses
- 6.8 Floor Finishes
 - 6.8.1 Punning
 - 6.8.2 Tiles: mosaic, clay, concrete, vinyl
 - 6.8.3 Marble and flagstones
 - 6.8.4 Wooden boarding and parqueting
- 6.9 Wall Finishes
 - 6.9.1 Plasters: cement, lime, mud
 - 6.9.2 Punning: cement, lime
 - 6.9.3 Cladding: wood, stone, tiles
- 6.10 Roofing Materials
 - 6.10.1 Clay tiles, ceramic tiles and states
 - 6.10.2 CGI and UPVC
- 6.11 Miscellaneous Materials
 - 6.11.1 Glass
 - 6.11.2 Plastics
 - 6.11.3 Asphalt and Bitumen
 - 6.11.4 Surkhi
- 7 Structural Design**
 - 7.1 Timber Structures
 - 7.1.1 Allowable stresses
 - 7.1.2 Design of compression members
 - 7.1.3 Design of solid rectangular beams, design of simple steel beams
 - 7.1.4 Types of joints and their connections
 - 7.2 Steel Structures
 - 7.2.1 Rivetted and welded connections: types, uses, detailing
 - 7.2.2 Detailing of simple roof trusses
 - 7.2.3 Detailing of rolled steel beams
 - 7.2.4 Detailing of column bases
 - 7.3 R.C. Sections in Bending
 - 7.3.1 Basis assumptions
 - 7.3.2 Position of neutral axis
 - 7.3.3 Moment of resistance
 - 7.3.4 Under reinforced, over reinforced and balanced sections
 - 7.3.5 Analysis of singly and doubly reinforced rectangular sections
 - 7.3.6 Analysis of singly reinforced flanged sections
 - 7.4 Shear and Bond for Reinforced Concrete (RC) Sections

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- 7.4.1 Behavior of R.C. section inshear
- 7.4.2 Shear resistance of R.C. section
- 7.4.3 Types of shear reinforcement and their design
- 7.4.4 Local and anchorage bond
- 7.4.5 Determination of anchorage length
- 7.4.6 Bar curtailment
- 7.5 Axially Loaded R.C
 - 7.5.1 Short and long columns
 - 7.5.2 Design of a rectangular column section
 - 7.5.3 Reinforcement detailing
- 7.6 Design and Detailing of R.C Structures
 - 7.6.1 IS code requirements
 - 7.6.2 Methods of design
 - 7.6.3 Singly reinforced T and L beams
 - 7.6.4 Simple one-way and two-way slabs
 - 7.6.5 Simple pad footings for columns
 - 7.6.6 Preparation of bar bending for RC design
- 7.7 Earthquake Resistant Design of Non-engineered Structures
 - 7.7.1 History of Earthquake in Nepal and damages
 - 7.7.2 Weakness of existing building
 - 7.7.3 Site consideration
 - 7.7.4 Building form, shape and size
 - 7.7.5 Size and location of openings
 - 7.7.6 Selection of materials
 - 7.7.7 Construction technology
 - 7.7.8 Seismic resistant components : through stone, vertical and horizontal reinforcement, diaphragm, boxing of building, lateral restrainers, unsupported length of wall, corner and junction of wall/connection of building components

8 Building Construction Technology

- 8.1 Foundations
 - 8.1.1 Function and necessity
 - 8.1.2 Subsoil exploration: test pit
 - 8.1.3 Safe bearing capacity of soils and its improvement
 - 8.1.4 Type and suitability of different foundations: shallow, deep (pile and well)
 - 8.1.5 Methods of excavating
 - 8.1.6 Shoring and dewatering
 - 8.1.7 Elements of simple spread foundation
 - 8.1.8 Stone masonry foundations
 - 8.1.9 Raft foundation
- 8.2 Walls

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- 8.2.1 Types of walls: solid wall, partition wall, cavity wall, curtainwall
- 8.2.2 Features and their functions
- 8.2.3 Types of stone masonry: rubble, hammer dressed and ashlar masonry
- 8.2.4 Brick Masonry: English, Flemish, garden rat trap, monk
- 8.2.5 Types of concrete blocks
- 8.2.6 Choosing wall thickness, height to length relation
- 8.2.7 Use of scaffolding
- 8.2.8 Procedure of constructing various masonry walls
- 8.3 Damp Proofing
 - 8.3.1 Source of dampness
 - 8.3.2 Remedial measures to prevent dampness
 - 8.3.3 Vertical and horizontal damp proofing
 - 8.3.4 Damp proofing materials
- 8.4 Concrete Technology
 - 8.4.1 Constituents, mixing and use of lime concrete
 - 8.4.2 Constituents, of cement concrete
 - 8.4.3 Grading of aggregates
 - 8.4.4 Concrete mixes
 - 8.4.5 Water cement ratio
 - 8.4.6 Workability
 - 8.4.7 Concrete laying
 - 8.4.8 Factors affecting strength of concrete
 - 8.4.9 Formwork
 - 8.4.10 Vibrators
 - 8.4.11 Curing
 - 8.4.12 General introduction to Precast RC units
 - 8.4.13 Hydration and segregation
- 8.5 Wood Work
 - 8.5.1 Frame and shutters of doors and windows
 - 8.5.2 Timber construction of upper floors
 - 8.5.3 Design and construction of stairs
 - 8.5.4 Double timber roofs
 - 8.5.5 False ceiling
 - 8.5.6 Sky-light: elements, functions and construction details
- 8.6 Steel Work
 - 8.6.1 Steel work in windows: Standards, elements and functions
 - 8.6.2 Tubular and angle steel roofs
 - 8.6.3 Iron grill and lattice work

Part III Architecture - Maintenance of building

9 Building Design

- 9.1 Analysis of Building Elements

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- 9.1.1 Bed
- 9.1.2 Kitchen/Dining
- 9.1.3 Living Hall
- 9.1.4 ClassRoom
- 9.1.5 Working OfficeSpace
- 9.1.6 Library
- 9.2 DesignConsideration
 - 9.2.1 Specific program: spacerequirements
 - 9.2.2 Site: topography, orientation,environment
 - 9.2.3 Functional relationship betweenactivities
 - 9.2.4 Culture: tradition, values,taste
 - 9.2.5 Economics: efficient use of space andmaterials
 - 9.2.6 Availability to technology andmaterial
 - 9.2.7 Structure type and efficiency
 - 9.2.8 Optimum use of natural light andventilation
 - 9.2.9 Aesthetics
- 9.3 Climatology
 - 9.3.1 Climate: sun, wind, rain,humidity
 - 9.3.2 Orientation of the building with respect to the sun and wind: best, optimum,bad
 - 9.3.3 Determination of length of roof projection to act assunshade

10 ArchitecturalModeling

- 10.1 Modeling Materials andPractices
 - 10.1.1 Use ofmodels
 - 10.1.2 Choice ofmaterials
 - 10.1.3 Modelingtechniques
 - 10.1.4 Accuracy ofmodels
 - 10.1.5 Determination of degree ofdetailing
 - 10.1.6 Model construction of multi-storeybuildings
 - 10.1.7 Contour models ofsites
 - 10.1.8 EquipmentRequired
 - 10.1.9 Choice of cuttingtools
 - 10.1.10 Choice of adhesives
 - 10.1.11 Choice of colour andtone
 - 10.1.12 Choice of paint andbrushes
 - 10.1.13 Miscellaneous tools

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11 Graphics and presentation

- 11.1 Principles of Composition
- 11.2 Balance
 - 11.2.1 Scale
 - 11.2.2 Rhythm
 - 11.2.3 Monotony
 - 11.2.4 Contrast
 - 11.2.5 Unity
 - 11.2.6 Focal point
- 11.3 Tone
 - 11.3.1 Light
 - 11.3.2 Medium
 - 11.3.3 Dark
 - 11.3.4 Flat
 - 11.3.5 Graded
- 11.4 Free Hand Works
 - 11.4.1 Drawing lines
 - 11.4.2 Drawing letters
 - 11.4.3 Three dimensional objects
- 11.5 Presentation
 - 11.5.1 Textures
 - 11.5.2 Exterior and interior objects
 - 11.5.3 Human figures
 - 11.5.4 Shadows
- 11.6 Medium for Presentation
 - 11.6.1 Pencil techniques
 - 11.6.2 Colour history and type: pencil colour, water colour, Poster colour
 - 11.6.3 Primary, secondary and tertiary colours
 - 11.6.4 Warm and cool colours
 - 11.6.5 Properties of colour
 - 11.6.6 Colour circle
 - 11.6.7 Colour scheme: monochromatic, analogous, complementary and triad
- 11.7 Data Presentation in Graphical Forms
 - 11.7.1 Translation of numerical data into diagrams and vice versa
 - 11.7.2 Pie chart, bar chart and XY graphs
- 11.8 Cartography
 - 11.8.1 Tracing of land-use maps
 - 11.8.2 Presentation of land-use maps