लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, बिल्डिङ्ग एण्ड आर्किटेक्ट उप-समुह, राजपत्र अनंकित प्रथम श्रेणी, सव इञ्जिनियर/सिनियर कार्पेन्टर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :– लिखित परीक्षा (Written Examination) पूर्णाङ्क :– २००

द्वितीय चरण :- अन्तर्वार्ता (Interview) पूर्णाङ्क :– ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण :लिखित परीक्षा (Written Examination) **पूर्णाङ्क :– २००**

पत्र	विषय	पूर्णाङ्क	उर्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या ×अङ्क	समय
प्रथम	सामान्य ज्ञान र सामान्य अभिक्षमता परीक्षण (General Awareness & General Aptitude Test)	१००	४०	वस्तुगत (Objective)	बहुवैकल्पिक प्रश्न (MCQs)	२५ प्रश्न ×२ अङ्क	४५ मिनेट
	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)					२५ प्रश्न ×२ अङ्क	
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)	१००	४०	विषयगत (Subjective)	छोटो उत्तर (Short Answer) लामो उत्तर (Long Answer)	१२ प्रश्न × ५ अङ्क ४ प्रश्न ×१० अङ्क	२ घण्टा १५ मिनेट

द्वितीय चरण : अन्तर्वार्ता (Interview) **पूर्णाङ्क :– ३०**

पत्र /विषय	पूर्णाङ्क	उर्तीर्णाङ्क	परीक्षा प्रणाली	समय
अन्तर्वार्ता (Interview)	३०		बोर्ड अन्तर्वार्ता (Board Interview)	-

द्रष्टव्य :

१. यो पाठ्यक्रमको योजनालाई प्रथम चरण र द्वितीय चरण गरी दुई भागमा विभाजन गरिएको छ ।

२. लिखित परीक्षाको प्रश्नपत्रको माध्यम भाषा पाठ्यक्रमको विषयवस्तु जुन भाषामा दिइएको छ सोही भाषाको आधारमा नेपाली वा अंग्रेजी मध्ये कुनै एक मात्र भाषा हुनेछ । तर विषयवस्तुलाई स्पष्ट गर्नुपर्ने अवस्थामा दुवै भाषा समेत प्रयोग सकिने छ ।

३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।

४. प्रथम पत्र र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ । तर एकैदिनमा परीक्षा लिइनेछ ।

५. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

६. वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षरहरु (Capital letters): A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षरहरु (Small letters): a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।

७. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।

८. परीक्षामा परीक्षार्थीले मोबाइल वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।

९. विषयगत प्रश्नहरुको हकमा तोकिएको अंकको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरु (Short notes) सोध्न सकिने छ ।

१०. विषयगत प्रश्न हुनेका हकमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोहीखण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

११. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिइए अनुसार हुनेछ ।
१२. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।
१३. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
१४. यस भन्दा अगाडि लागु भएका माथि उल्लेखित सेवा, समूहको पाठ्यक्रम खारेज गरिएको छ ।
१५. **पाठ्यक्रम लागू मिति : - २०७८/१०/२४**

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, बिल्डिङ्ग एण्ड आर्किटेक्ट उप-समुह, राजपत्र अनंकित प्रथम श्रेणी, सव इञ्जिनियर/सिनियर कार्पेन्टर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम पत्र (Paper I) :-

सामान्य ज्ञान र सामान्य अभिक्षमता परीक्षण तथा सेवा सम्बन्धित कार्य-ज्ञान

भाग (Part I) :

सामान्य ज्ञान र सामान्य अभिक्षमता परीक्षण

(General Awareness and General Aptitude Test)

खण्ड (Section - A) : (१५ प्रश्न× २ अङ्क = ३० अङ्क)

1. **सामान्य ज्ञान (General Awareness)** (१६ अङ्क)
   - 1.1 नेपालको भौगोलिक अवस्था, प्राकृतिक स्रोत र साधनहरु
   - 1.2 नेपालको ऐतिहासिक, सांस्कृतिक र सामाजिक अवस्था सम्वन्धी जानकारी
   - 1.3 नेपालको आर्थिक अवस्था र चालु आवधिक योजना सम्वन्धी जानकारी
   - 1.4 जैविक विविधता, दिगो विकास, वातावरण, प्रदुषण, जलवायु परिवर्तन र जनसंख्या व्यवस्थापन
   - 1.5 मानव जीवनमा प्रत्यक्ष प्रभाव पार्ने विज्ञान र प्रविधिका महत्वपूर्ण उपलब्धिहरु
   - 1.6 जनस्वास्थ्य, रोग, खाद्य र पोषण सम्बन्धी सामान्य जानकारी
   - 1.7 नेपालको संविधान (भाग १ देखि ५ सम्म र अनुसूचीहरू)
   - 1.8 संयुक्त राष्ट्रसंघ र यसका विशिष्टीकृत संस्था सम्वन्धी जानकारी
   - 1.9 क्षेत्रीय संगठन (सार्क, बिमस्टेक, आसियान र युरोपियन संघ) सम्वन्धी जानकारी
   - 1.10 राष्ट्रिय र अन्तर्राष्ट्रिय महत्वका समसामयिक गतिविधिहरु

2. **सार्वजनिक व्यवस्थापन (Public Management)** (१४ अङ्क)
   - 2.1 कार्यालय व्यवस्थापन (Office Management)
     - 2.1.1 कार्यालय (Office) : परिचय, महत्व, कार्य र प्रकार
     - 2.1.2 सहायक कर्मचारीका कार्य र गुणहरु
     - 2.1.3 कार्यालय स्रोत साधन (Office Resources): परिचय र प्रकार
     - 2.1.4 कार्यालयमा सञ्चारको महत्व, किसिम र साधन
     - 2.1.5 कार्यालय कार्यविधि (Office Procedure) : पत्र व्यवहार (Correspondence), दर्ता र चलानी (Registration & Dispatch), परिपत्र (Circular), तोक आदेश (Order), टिप्पणी लेखन र टिप्पणी तयार पार्दा ध्यान दिनुपर्ने कुराहरु
     - 2.1.6 अभिलेख व्यवस्थापन (Record Management)
   - 2.2 निजामती सेवा ऐन र नियमावलीमा भएका देहायका व्यवस्थाहरु
     - 2.2.1 निजामती सेवाको गठन, संगठन संरचना, पदपूर्ति गर्ने तरिका र प्रक्रियाहरु
     - 2.2.2 कर्मचारीको नियुक्ति, सरुवा, बढुवा, बिदा, विभागीय सजाय र अवकाश
     - 2.2.3 कर्मचारीले पालन गर्नुपर्ने आचरण र कर्तव्यहरु
   - 2.3 सरकारी बजेट, लेखा र लेखापरीक्षण प्रणाली सम्बन्धी सामान्य जानकारी
   - 2.4 सार्वजनिक सेवा प्रवाहको अर्थ, सेवा प्रवाह गर्ने निकाय, तरिका र माध्यमहरु
   - 2.5 सार्वजनिक बडापत्र (Public Charter) : महत्व र आवश्यकता
   - 2.6 व्यवस्थापनको अवधारणा तथा सार्वजनिक व्यवस्थापनमा निर्देशन, नियन्त्रण, समन्वय, निर्णय प्रक्रिया, उत्प्रेरणा र नेतृत्व सम्वन्धी जानकारी
   - 2.7 मानवीय मूल्य मान्यता (Human Values), नागरिक कर्तव्य र दायित्व तथा अनुशासन

खण्ड (Section - B) : (१० प्रश्न× २ अङ्क = २० अङ्क)

3. **सामान्य अभिक्षमता परीक्षण (General Aptitude Test)**

3.1 **शाव्दिक अभिक्षमता परीक्षण (Verbal Aptitude Test) :** यस परीक्षणमा शब्दज्ञान, अनुक्रम, समरुपता, वर्गीकरण, कोडिङ-डिकोडिङ, दिशा र दुरी ज्ञान परीक्षण (direction & distance sense test), तर्क विचार सम्बन्धी (logical reasoning), पंक्तिक्रम (ranking order) आदि विषयवस्तुबाट प्रश्नहरु समावेश गरिनेछ ।

3.2 **संख्यात्मक अभिक्षमता परीक्षण (Numerical Aptitude Test) :** यस परीक्षणमा अनुक्रम, समरुपता, वर्गीकरण, कोडिङ, मेट्रिक्स, अंकगणितीय तर्क /क्रिया सम्बन्धी, प्रतिशत, भिन्न, अनुपात, औसत, समय र काम, आदि विषयवस्तुबाट प्रश्नहरु समावेश गरिनेछ ।

3.3 **अशाव्दिक अभिक्षमता परीक्षण (Non-Verbal/Abstract Aptitude Test) :** यस परीक्षणमा अनुक्रम, समरुपता, वर्गीकरण, भेन चित्र, मेट्रिक्स, त्रिभुज र वर्गहरुको रचना, चित्र वा आकृति बनावट र विश्लेषण, आदि विषयवस्तुबाट प्रश्नहरु समावेश गरिनेछ ।

3.4 **रुजु गर्ने (Verification test) र फाइलिङ अभिरुचि परीक्षण (Filing aptitude test):** रुजु गर्ने (Verification test) परीक्षणमा तथ्यांक, संख्या वा शाब्दिक सूचनालाई जाँच गर्ने वा त्रुटी पत्ता लगाउने अथवा समानता वा भिन्नता पत्ता लगाउने किसिमका प्रश्नहरु समावेश हुनेछन । फाइलिङ अभिरुचि परीक्षण (Filing aptitude test) मा शाब्दिक र संख्यात्मक फाइलिङ वस्तु वा प्रक्रियालाई वर्णमालाक्रम, संख्यात्मकक्रम वा कालक्रम अनुसार समाधान गर्ने किसिमका प्रश्नहरु समावेश हुनेछन

3.5 **निर्देशन अनुसरण गर्ने (Follows the instructions) र विश्लेषणात्मक तार्किकता परीक्षण (Analytical reasoning test):** निर्देशन अनुसरण गर्ने (Follows the instructions) परीक्षणमा दिइएको लिखित निर्देशनलाई हुबहु अनुसरण गरी समाधान गर्ने किसिमका प्रश्नहरु समावेश हुनेछन । विश्लेषणात्मक तार्किकता परीक्षण (Analytical reasoning test) मा शाब्दिक वा संख्यात्मक वा अशाब्दिक (चित्रात्मक) किसिमका विश्लेषणात्मक तार्किकता सम्बन्धी प्रश्नहरु समावेश हुनेछन ।

भाग (Part II) :-

सेवा सम्बन्धित कार्य-ज्ञान (Job Based - Knowledge)

(२५ प्रश्न× २ अङ्क = ५० अङ्क)

A. Civil Engineering

1. Drawing

1.1 General
- 1.1.1 Importance, aims and objectives of drawing
- 1.1.2 Drawing equipments
- 1.1.3 Architectural discipline
- 1.1.4 Standard drawing sheets 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 Manufactures' 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
2.3.1 Purpose
2.3.2 Types
2.3.3 Necessity
2.3.4 Interpretation of Specifications

2.4 Estimating
2.4.1 Earthwork
2.4.2 Estimate of buildings
2.4.3 Estimate of sanitary installations
2.4.4 Estimate of electrical wiring and sanitary works
2.4.5 Annual maintenance

2.5 Valuation
2.5.1 Purpose of valuation
2.5.2 Methods of valuation
2.5.3 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 sub engineer
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 materials schedule
- 3.3.4 Construction stages and operations
- 3.3.5 Bar Chart

3.4 Municipal Building By-laws
- 3.4.1 Sheet sizes
- 3.4.2 Scales
- 3.4.3 Setback
- 3.4.4 Height controls
- 3.4.5 Other requirements specifies by the municipalities
- 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
- 4.2.1 Septic tank, soak pit, vent and manhole
- 4.2.2 Pipes for different sewage
- 4.2.3 Incinerators

4.3 Electricity
- 4.3.1 General principles of electrical installation and distribution
- 4.3.2 Wiring systems in private and public building
- 4.3.3 Ducts for electrical distribution
- 4.3.4 Safety precautions

4.4 Lighting
- 4.4.1 General principles of lighting
- 4.4.2 Illumination requirements and standards
- 4.4.3 Combination of artificial and natural light
- 4.4.4 Lighting fixtures

B. Building

5. Surveying

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- 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
- 5.1.4 System of field booking of surveying and levelling data
- 5.1.5 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
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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

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5.4.1 Equipments 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 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

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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
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
7.4.1 Behaviour of R.C. section in shear
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
7.6.5 Simple one-way and two-way stabs
7.6.6 Simple pad footings for columns
7.6.8 Preparation of bar bending for RC design

7.7 Earthquake Resistant Design of Non-engineered Structures
7.6.1 History of Earthquake in Nepal and damages
7.6.2 Weakness of existing building
7.6.3 Site consideration
7.6.4 Building form, shape and size
7.6.5 Size and location of openings
7.6.6 Selection of materials
7.6.7 Construction technology
7.6.8 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
8.2.1 Types of walls: solid wall, partition wall, cavity wall, curtain wall
8.2.2 Features and their functions
8.2.3 Types of stone masonry: rubble, hammer dressed and ashlars 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
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8.4.8 Factors affecting strength of concrete
8.4.9 Form work
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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

C. Architecture -Maintenance of building

9. Building Design

9.1 Analysis of Building Elements
9.1.1 Bed
9.1.2 Kitchen/Dining
9.1.3 Living Hall
9.1.4 Class Room
9.1.5 Working Office Space
9.1.6 Library

9.2 Design Consideration
9.2.1 Specific program: space requirements
9.2.2 Site: topography, orientation, environment
9.2.3 Functional relationship between activities
9.2.4 Culture: tradition, values, taste
9.2.5 Economics: efficient use of space and materials
9.2.6 Availability to technology and material
9.2.7 Structure type and efficiency
9.2.8 Optimum use of natural light and ventilation
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 as sunshade

10. Architectural Modelling

10.1 Modelling Materials and Practices
- 10.1.1 Use of models
- 10.1.2 Choice of materials
- 10.1.3 Modelling techniques
- 10.1.4 Accuracy of models
- 10.1.5 Determination of degree of detailing
- 10.1.6 Model construction of multi-storey buildings
- 10.1.7 Contour models of sites

10.2 Equipments Required
- 10.2.1 Choice of cutting tools
- 10.2.2 Choice of adhesives
- 10.2.3 Choice of colour and tone
- 10.2.4 Choice of paint and brushes
- 10.2.5 Miscellaneous tools

11. Graphics and presentation

11.1 Principles of Composition
- 11.1.1 Balance
- 11.1.2 Scale
- 11.1.3 Rhythm
- 11.1.4 Monotony
- 11.1.5 Contrast
- 11.1.6 Unity
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11.2 Tone
- 11.2.1 Light
- 11.2.2 Medium
- 11.2.3 Dark
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11.3 Free Hand Works
- 11.3.1 Drawing lines
- 11.3.2 Drawing letters
- 11.3.3 Three dimensional objects

11.4 Presentation
- 11.4.1 Textures
- 11.4.2 Exterior and interior objects
- 11.4.3 Human figures
- 11.4.4 Shadows

11.5 Medium for Presentation
- 11.5.1 Pencil techniques
- 11.5.2 Colour history and type: pencil colour, water colour, Poster colour
- 11.5.3 Primary, secondary and tertiary colours
- 11.5.4 Warm and cool colours
- 11.5.5 Properties of colour
- 11.5.6 Colour circle
- 11.5.7 Colour scheme: monochromatic, analogous, complementary and triad

11.6 Data Presentation in Graphical Forms
- 11.6.1 Translation of numerical data into diagrams and vice versa

11.6.2 Pie chart, bar chart and XY graphs

11.7 Cartography

11.7.1 Tracing of land-use maps

11.7.2 Presentation of land-use maps

प्रथम पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरु सोधिने छ ।

प्रथम पत्र (वस्तुगत)					
भाग	**खण्ड**	**विषयबस्तु**	**परीक्षा प्रणाली**	**अङ्कभार**	**प्रश्न संख्या × अङ्क**
I	**(A)**	सामान्य ज्ञान (General Awareness)	बहुवैकल्पिक प्रश्न (MCQs)	३०	१५ प्रश्न × २ अङ्क = ३०
	(B)	सामान्य अभिक्षमता परीक्षण (General Aptitude Test)		२०	१० प्रश्न × २ अङ्क = २०
II	-	सेवा सम्बन्धित कार्य-ज्ञान (Job Based -knowledge)		५०	२५ प्रश्न × २ अङ्क = ५०

प्रथम पत्रको **<u>भाग (Part II)</u>** सेवा सम्बन्धित कार्य-ज्ञान (Job based -knowledge) को पाठ्यक्रमका एकाइबाट परीक्षामा यथासम्भव देहाय बमोजिम प्रश्नहरु सोधिने छ ।

	Civil Engineering				Building				Architecture		
एकाई	1	2	3	4	5	6	7	8	9	10	11
प्रश्न संख्या	2	3	2	3	2	1	3	2	3	2	2

द्वितीय पत्र (Paper II) :-

सेवा सम्बन्धित कार्य-ज्ञान (Job based-knowledge)

खण्ड (Section) (A) : - ५० अङ्क

1. Drawing

1.1 General
- 1.1.1 Importance, aims and objectives of drawing
- 1.1.2 Drawing equipments
- 1.1.3 Architectural discipline
- 1.1.4 Standard drawing sheets 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 Manufactures' 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
- 2.3.1 Purpose
- 2.3.2 Types
- 2.3.3 Necessity
- 2.3.4 Interpretation of Specifications

2.4 Estimating
- 2.4.1 Earthwork
- 2.4.2 Estimate of buildings
- 2.4.3 Estimate of sanitary installations
- 2.4.4 Estimate of electrical wiring and sanitary works
- 2.4.5 Annual maintenance

2.5 Valuation
- 2.5.1 Purpose of valuation
- 2.5.2 Methods of valuation
- 2.5.3 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 sub engineer
- 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 materials schedule
- 3.3.4 Construction stages and operations
- 3.3.5 Bar Chart

3.4 Municipal Building By-laws
- 3.4.1 Sheet sizes
- 3.4.2 Scales
- 3.4.3 Setback
- 3.4.4 Height controls
- 3.4.5 Other requirements specifies by the municipalities
- 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
- 4.2.1 Septic tank, soak pit, vent and manhole
- 4.2.2 Pipes for different sewage
- 4.2.3 Incinerators

4.3 Electricity
- 4.3.1 General principles of electrical installation and distribution
- 4.3.2 Wiring systems in private and public building
- 4.3.3 Ducts for electrical distribution
- 4.3.4 Safety precautions

4.4 Lighting
- 4.4.1 General principles of lighting
- 4.4.2 Illumination requirements and standards
- 4.4.3 Combination of artificial and natural light
- 4.4.4 Lighting fixtures

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
- 5.1.4 System of field booking of surveying and levelling data
- 5.1.5 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

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- 5.4.1 Equipments 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 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

खण्ड (Section) (B) : - ५० अङ्क

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
- 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
7.4.1 Behaviour of R.C. section in shear
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
7.6.5 Simple one-way and two-way stabs
7.6.6 Simple pad footings for columns
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7.6.1 History of Earthquake in Nepal and damages
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7.6.5 Size and location of openings
7.6.6 Selection of materials
7.6.7 Construction technology
7.6.8 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
8.2.1 Types of walls: solid wall, partition wall, cavity wall, curtain wall
8.2.2 Features and their functions
8.2.3 Types of stone masonry: rubble, hammer dressed and ashlars 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

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8.3.1 Source of dampness
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8.3.4 Damp proofing materials

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8.4.1 Constituents, mixing and use of lime concrete
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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

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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

9. Building Design

9.1 Analysis of Building Elements
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9.2.4 Culture: tradition, values, taste
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9.2.7 Structure type and efficiency
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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 as sunshade

10. Architectural Modelling

10.1 Modelling Materials and Practices
10.1.1 Use of models
10.1.2 Choice of materials
10.1.3 Modelling techniques
10.1.4 Accuracy of models
10.1.5 Determination of degree of detailing
10.1.6 Model construction of multi-storey buildings
10.1.7 Contour models of sites

10.2 Equipments Required
10.2.1 Choice of cutting tools
10.2.2 Choice of adhesives
10.2.3 Choice of colour and tone
10.2.4 Choice of paint and brushes
10.2.5 Miscellaneous tools

11. Graphics and presentation

11.1 Principles of Composition
11.1.1 Balance
11.1.2 Scale
11.1.3 Rhythm
11.1.4 Monotony
11.1.5 Contrast
11.1.6 Unity
11.1.7 Focal point

11.2 Tone
11.2.1 Light
11.2.2 Medium
11.2.3 Dark
11.2.4 Flat
11.2.5 Graded

11.3 Free Hand Works
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11.3.2 Drawing letters
11.3.3 Three dimensional objects
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11.5 Medium for Presentation
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11.6.1 Translation of numerical data into diagrams and vice versa
11.6.2 Pie chart, bar chart and XY graphs
11.7 Cartography
11.7.1 Tracing of land-use maps
11.7.2 Presentation of land-use maps

द्वितीय पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरु सोधिनेछ ।

द्वितीय पत्र (विषयगत)					
पत्र	**विषय**	**खण्ड**	**अङ्कभार**	**छोटो उत्तर**	**लामो उत्तर**
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based-Knowledge)	**(A)**	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०
		(B)	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०