काठमाण्डौ उपत्यका खानेपानी व्यवस्थापन बोर्ड
प्राविधिक सेवा, इञ्जिनियरिङ समूह, सिभिल इन्जिनियरिङ उपसमूह ५ तह, सव इञ्जिनियर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रुपरेखा :– यस पाठ्यक्रमको आधारमा निम्नानुसारका चरणमा परीक्षा लिइने छ :

प्रथम चरण :– लिखित परीक्षा पूर्णाङ्क :– १००

द्वितीय चरण :– अन्तर्वार्ता पूर्णाङ्क :– ५०

परीक्षा योजना (Examination Scheme)

१. प्रथम चरण : लिखित परीक्षा (Written Examination) **पूर्णाङ्क :- १००**

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या X अङ्क	समय
प्रथम	सेवा समूह सम्बन्धी	१००	४०	वस्तुगत बहुवैकल्पिक (Multiple Choice)	५० प्रश्न X २ अङ्क	५० मिनेट

२. द्वितीय चरण : अन्तर्वार्ता (Interview) **पूर्णाङ्क :- ५०**

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	५०	मौखिक

द्रष्टव्य :

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी हुनेछ ।
२. लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईबाट प्रश्नहरु सोधिनेछ ।
३. 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 ।
४. 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 ।
५. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
६. पाठ्यक्रम लागू मिति :–

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प्राविधिक सेवा, इञ्जिनियरिङ समूह, सिभिल इन्जिनियरिङ उपसमूह ५ तह, सव इञ्जिनियर पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पत्र/विषय :– सेवा समूह सम्बन्धी

1. **Surveying**
   - 1.1 Introduction and basic principles
   - 1.2 Linear measurements: techniques; chain, tape, ranging rods and arrows; representation of measurement and common scales; sources of errors
   - 1.3 Compass and plane table surveying: bearings; types of compass; problems and sources of errors of compass survey; principles and methods of plane tabling
   - 1.4 Leveling and contouring: principle of leveling; temporary and permanent adjustment of level; bench marks; booking methods and their reductions; longitudinal and cross sectioning; reciprocal leveling; trigonometric leveling; contour interval and characteristics of contours; methods of contouring
   - 1.5 Theodolite traversing
   - 1.6 Uses of Total Station

2. **Construction Engineering**
   - 2.1 Technical terms (crown, span intrudes, extrudes, rise and abutments)
   - 2.2 Different types of arch construction (flat, semicircular, segmental relieving arches)
   - 2.3 Properties of building materials: physical, chemical, constituents, thermal
   - 2.4 Construction materials found in Nepal; suitability of different building materials for different zones, strength and quality production
   - 2.5 Rocks/stone: types of rocks, their characteristics and properties of good stone
   - 2.6 Metal and alloys: Ferrous metals and non-ferrous, steel (composition and properties); alloys (properties and uses); corrosion and its prevention
   - 2.7 Brick: types of bricks and sizes of bricks available in Nepal
   - 2.8 Lime and Surkhi: types, properties and its uses
   - 2.9 Timber and wood products: Structural classification - Soft wood and hard wood-defects in timber- seasoning of timber - preservation of timber, timber trees in Nepal, types and properties of wood
   - 2.10 Miscellaneous materials: Asphaltic materials (Asphalt, Bitumen and Tar); paints and varnishes; polymers
   - 2.11 Masonry: Classification- Stone masonry - Brick masonry - Laterite masonry - composite masonry. Different types of stone masonry - General principles and specifications for stone masonry as per relevant codes
   - 2.12 Brick work: Brickwork preparation of trench plan methods of trench layout, different types of walls and their function, mortars for stone and brickwork, causes of dampness in building and remedies, terms used in brickwork (queen closer, king closer, meander, stretcher etc) different types of board, tools for laying bricks
   - 2.13 Cements: Composition, Compounds present, manufacturing methods-characteristics of cement, Types of cement- Properties of each-characteristics of cement-Tests on cement- Consistency test, fineness test. Sp. gravity test, setting time test, Soundness test. Puzzolona- definition-Common puzzolonas used as admixtures in cement

2.14 Aggregates: Sand: Sources of sand-River sand, Sea sand and pit sand-Limitations of mining of sand from rivers and sea shore- M-sand, alternatives of sand

2.15 Reinforced cement concrete- Qualities of materials-Types of reinforcement used characteristics of reinforcing material- waterproofing compounds

2.16 Concrete and reinforced concrete works: Constituents and properties of concrete, Water cement ratio, Grade and strength of concrete, concrete mix design, testing of concrete, preparation of mixing, placing compacting, curing and frameworks

2.17 Mortar: Preparation of lime and cement mortar-Proportions of mortar for various items of work-tests on cement mortar

2.18 Ornamental materials for finishing: Paints and Varnishes: Types – Constituents - Preparation characteristics and application

2.19 Plastics: types-characteristics and properties of PVC – uses and limitations

2.20 Rubber: Characteristics, properties and uses

2.21 Glass: Types, properties and uses / structural applications

2.22 Chimneys principle and construction of chimneys

2.23 Plastering work: function, preparation of mix, surface preparation, paints and white washes in walls and ceiling, stuff works

2.24 Flooring: introduction, types of flooring (mud, brick, cement, flagstone, mosaic, floor-boards)

3. **Soil Mechanics**

3.1 General : Soil types and classification; Three phase system of soil, Unit Weight of soil mass: bulk density, saturated density, submerged density and dry density; Interrelationship between specific gravity, void ratio, porosity, degree of saturation, percentage of air voids air content and density index

3.2 Compaction of soil: Factors affecting soil compaction; Optimum moisture content; Relation between dry density and moisture content

3.3 Earth Pressures: Active and passive earth pressures, Lateral earth pressure

4. **Structural Design**

4.1 R.C. Sections in Bending: Under reinforced, over reinforced and balanced sections; Analysis of single and double reinforced rectangular sections

4.2 Shear and Bond for R.C. Sections: Shear resistance of a R.C. section; Types of Shear reinforcement and their design; Determination of anchorage length

4.3 Axially Loaded R.C. Columns: Short and long columns; Basic design of a rectangular column section

4.4 Design of R.C. Structures: Singly and doubly reinforced rectangular beams; Simple one-way and two-way slabs; Axially loaded short and long columns

5. **Hydraulics and Fluid Mechanics**

5.1 General

5.1.1 Properties of fluid: mass. Weight, specific weight, density. specific volume, specific gravity , viscosity

5.1.2 Pressure and Pascal's law

5.2 Hydro-Kinematics and Hydro-dynamics

5.2.1 Energy of flowing liquid: elevation energy, kinetics energy, potential energy, internal energy

5.3 Measurements of Discharge
- 5.3.1 Weirs and Notches
- 5.3.2 Discharge formulae

5.4 Flows: Characteristics of pipe flow and open channel flow

6. **Water supply Engineering**

6.1 Quantity of water
- 6.1.1 Design Period
- 6.1.2 Per capita demand
- 6.1.3 Population forecasting
- 6.1.4 Total water demand

6.2 Source of water supply
- 6.2.1 Surface source: River, spring
- 6.2.2 Groundwater source: tubewell, infiltration gallery

6.3 Gravity Water supply system
- 6.3.1 Objectives of water supply system
- 6.3.2 Source of Water and its selection: gravity and artesian spring, shallow and deep wells
- 6.3.3 Design period
- 6.3.4 Determination of daily water demand
- 6.3.5 Determination of storage tank capacity
- 6.3.6 Selection of pipe
- 6.3.7 Pipe line design and hydraulic grade line

6.4 Pump and pumping
- 6.4.1 Necessity of pumps
- 6.4.2 Classification of pumps
- 6.4.3 Working principles of pumps

6.5 Quality of Water
- 6.5.1 Physical, chemical, and biological impurities
- 6.5.2 Water Borne diseases

6.6 Purification of water
- 6.6.1 Sequence of water treatment
- 6.6.2 Sedimentation, coagulation and filtration
- 6.6.3 Disinfection of water

6.7 Distribution System
- 6.7.1 Water Pressure in Distribution system
- 6.7.2 Layout
- 6.7.3 Simple design criteria
- 6.7.4 Appurtenances in the distribution system

7. **Sanitary Engineering**

7.1 Introduction to sewage, sewer, and sewerage
7.2 Sewer
  7.2.1 Types of sewer
  7.2.2 Design of sewer:
  7.2.3 quantity of sanitary sewage, maximum,
  7.2.4 minimum and cleansing velocity
7.3 Surface and storm water drainage
  7.3.1 Factors affecting storm water drainage
  7.3.2 Determination of storm water flow
  7.3.3 Laying and construction
7.4 Sewer appurtenances
  7.4.1 Manholes (drop manhole, lamphole)
  7.4.2 Street inlet, catch drains
  7.4.3 grease traps
7.5 Sewerage disposal and treatment
  7.5.1 Excreta disposal in unsewered area
  7.5.2 pit latrine
  7.5.3 design of septic tank

8. **Estimating and Costing**
8.1 Units of measurement and payments for various items of building
8.2 Types of estimates and their specific uses
8.3 Methods of calculating quantities
8.4 Key components of estimating norms and rate analysis
8.5 Preparation of bill of quantities
8.6 Purpose, types and importance of specification
8.7 Purpose, principles and methods of valuation
8.8 Standard estimate formats of Government of Nepal

9. **Construction Management**
9.1 Construction scheduling and planning: network techniques (CPM and PERT)
9.2 Contractual procedure and management: types of contract, tender and tender notice, preparation of bidding (tender) document, contractors pre-qualification, evaluation of tenders and selection of contractor, contract acceptance, condition of contract; quotation and direct order, classifications of contractors; dispute resolution; muster roll
9.3 Material management: procurement procedures and materials handling

10. **Engineering Drawing**
10.1 Drawing sheet composition and its essential components
10.2 Suitable scales, site plans, preliminary drawings, working drawings etc
10.3 Theory of projection drawing: perspective, orthographic and axonometric projection; first and third angle projection
10.4 Drafting tools and equipments

10.5 Drafting conventions and symbols
10.6 Topographic, electrical, plumbing and structural drawings
10.7 Techniques of free hand drawing

11. **खानेपानी व्यवस्थापन सम्बन्धी**
    11.1 काठमाण्डौ उपत्यका खानेपानी व्यवस्थापन वोर्डको परिचय, काम, कर्तव्य र अधिकार
    11.2 काठमाण्डौ उपत्यका भित्र खानेपानी उत्पादन, प्रशोधन तथा वितरण प्रणाली सम्वन्धी जानकारी
    11.3 काठमाण्डौ उपत्यका खानेपानी व्यवस्थापन वोर्ड र काठमाण्डौ उपत्यका खानेपानी लिमिटेड बीचको अन्तरसम्बन्ध
    11.4 खानेपानी महशुल निर्धारणका प्रकृया
    11.5 सार्वजनिक नीजि साझेदारी (PPP) को अवधारणा
    11.6 खानेपानी र सरसफाई सम्वन्धी दिगो विकास लक्ष्य (Sustainable Development Goals)
    11.7 काठमाण्डौ उपत्यकामा फोहोरमैला व्यवस्थापन, सरसफाई र ढल निकास वर्तमान अवस्था, सम्भावना र चुनौतीहरु
    11.8 काठमाण्डौ उपत्यकामा खानेपानी चुहावट र नियन्त्रणका उपायहरु
    11.9 खानेपानी गुणस्तर मापदण्ड, गुणस्तर नियन्त्रण सम्वन्धी विद्यमान ऐन नियमका प्रावधानहरु

12. **संबिधान, ऐन, नियम र नीति**
    12.1 नेपालको संविधान
    12.2 खानेपानी व्यवस्थापन वोर्ड ऐन, २०६३
    12.3 काठमाडौ उपत्यका खानेपानी व्यवस्थापन बोर्ड नियमावली, २०६४
    12.4 काठमाण्डौ उपत्यका खानेपानी व्यवस्थापन वोर्ड कर्मचारी प्रशासन नियमावली
    12.5 टैंकर व्यवसाय संचालन सम्वन्धी अनुमतिपत्र जारी गर्ने निर्देशिका २०७३
    12.6 काठमाण्डौ उपत्यका भूमिगत जलश्रोत व्यवस्थापन नीति, २०६९
    12.7 भूमिगत श्रोतको पानी निकाल्न तथा उपयोग गर्न अनुमती पत्र जारी गर्ने निर्देशिका, २०७१
    12.8 राष्ट्रिय खानेपानी गुणस्तर मापदण्ड, २०६२
    12.9 खानेपानी महशुल निर्धारण आयोग ऐन, २०६३
    12.10 उपभोक्ता संरक्षण ऐन, २०५४ र उपभोक्ता संरक्षण नियमावली, २०५५
    12.11 वातावरण संरक्षण ऐन, २०५३ र वातावरण संरक्षण नियमावली २०५४
    12.12 जलश्रोत ऐन, २०४९ र जलश्रोत नियमावली, २०५०
    12.13 भ्रष्टाचार निवारण ऐन, २०५९
    12.14 सार्वजनिक खरिद ऐन, २०६३ र सार्वजनिक खरिद नियमावली, २०६४