त्रिभुवन विश्वविद्यालय
सेवा आयोग

प्राविधिक सेवा, प्राविधिक समूह, अधिकृत तृतीय श्रेणी, प्राविधिक अधिकृत (इन्जिनियरिङ) पदको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

लिखित परीक्षा योजना

लिखित परीक्षा : **कुल पूर्णाङ्क :** २००

पत्र/विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या × अङ्क	समय
प्रथम	१००	४०	वस्तुगत - बहुवैकल्पिक प्रश्न (MCQs)	१०० प्रश्न × १ अङ्क	१ घण्टा ३० मिनेट
द्वितीय	१००	४०	विषयगत प्रश्न	८ प्रश्न × १० अङ्क ४ प्रश्न × ५ अङ्क	३ घण्टा

द्रष्टव्य :

1. लिखित परीक्षाका लागि १००/१०० पूर्णाङ्कका दुई पत्रहरु हुनेछन् ।
2. प्रथमपत्र र द्वितीय पत्रको लिखित परीक्षा पाठ्यक्रमको विषयवस्तु एउटै हुनेछ ।
3. प्रथमपत्र र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
4. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नको विकल्प छनौट गर्दा गलत विकल्प छानेमा ऋणात्मक मूल्याङ्कन (Negative Marking) गरिने छ । अर्थात् यसरी मूल्याङ्कन गर्दा प्रत्येक गलत उत्तरको लागि २० प्रतिशत अङ्ककट्टा गरिनेछ । बहुवैकल्पिक प्रश्नको २० प्रतिशत अङ्क प्राप्ताङ्कबाट घटाइनेछ । (उदाहरणका लागि परीक्षार्थीले २० अङ्कको बहुवैकल्पिक प्रश्नमा १५ प्रश्नको सही उत्तर र ५ प्रश्नको गलत उत्तर दिएमा निजको प्राप्ताङ्क (०.२० × ५=१.००) अर्थात् १५–१= १४ अङ्क हुनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
5. विषयगत प्रश्नको हकमा एउटै प्रश्नका दुई वा दुईभन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ ।
6. विषयगत प्रश्नमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । उम्मेदवारले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
7. प्रत्येक पत्रको उत्तीर्णाङ्क पूर्णाङ्कको ४० प्रतिशत हुनेछ ।
8. भाषा विषयबाहेक अन्य विषयका लागि उत्तरको माध्यम अङ्ग्रेजी वा नेपाली हुनेछ ।

प्रथम र द्वितीय पत्र :
Section (A): 50 Marks

1. **Engineering Survey and Drawing Techniques**
   - 1.1 Surveying: introduction and basic principles of surveying
   - 1.2 Linear measurements techniques; representation of measurement and common scales; sources of errors; slope and slope correction; Abney level and clinometers
   - 1.3 Compass and plane table surveying: type of compass; problems and sources of errors of compass survey; principles and methods of plane tabling
   - 1.4 Levelling and contouring: principle of levelling; longitudinal and cross sectioning; reciprocal levelling; trigonometric levelling; contour interval and characteristics of contours; methods of contouring
   - 1.5 Theodolite traversing: adjustment of closed traverse; closing errors
   - 1.6 Uses of total station and electronic distance measuring instruments
   - 1.7 Suitable scales, site plans, preliminary drawings, working drawings
   - 1.8 Drafting conventions and symbols, drafting tools, equipment and software

2. **Construction Materials and Concrete Technology**
   - 2.1 Construction materials: properties of materials and their uses
   - 2.2 Stones: characteristics and requirements of stones as a construction material
   - 2.3 Cementing materials: types and properties of lime and cement, cement mortar tests
   - 2.4 Sand and aggregates
   - 2.5 Brick: types and testing of bricks
   - 2.6 Metals: steel, alloys of steel, aluminium
   - 2.7 Timber and wood: timber trees in Nepal, types and properties of wood.
   - 2.8 Ceramic materials: ceramic tiles, mosaic tiles
   - 2.9 Miscellaneous materials: asphaltic materials (asphalt, bitumen and tar), paints, varnishes, glass, insulating and plastic materials, soils, prefab materials
   - 2.10 Constituents and properties of concrete, grade and strength of concrete
   - 2.11 Water cement ratio and its effect on the quality and strength of concrete
   - 2.12 Concrete mix design, testing of concrete
   - 2.13 Use of steel reinforced concrete and its applicability
   - 2.14 Different chemical admixtures in concrete, high strength concrete, pre-stressed concrete technology
   - 2.15 Concrete durability and quality control

3. **Soil Mechanics, Foundation Engineering and Hydraulics**
   - 3.1 Properties of soils, three-phase diagram of soil, basic definitions of phase relationships, index properties of soil, determination of various index properties
   - 3.2 Consolidation and settlements; behavior of soil under compressive loads, settlement of structures resting on soil: its nature, causes and remedial measures, primary and

secondary consolidation, compressibility of soil, stability of slopes; causes of slope movements and failures, types of slope and slope failures, critical surfaces and factor of safety, method of stability analysis and stability number

3.3 Bearing capacity of soils; types of bearing capacity and factors influencing bearing capacity, effects of various factors on bearing capacity, modes of foundation failure, Terzaghi's general bearing capacity theory, ultimate bearing capacity of cohesionless and cohesive soil

3.4 Fluid properties: viscosity, surface tension, compressibility, vapor pressure

3.5 Equation of fluid flow: type of flow, continuity equation, Bernoulli's equation and momentum equation.

3.6 Viscous effects: Reynolds number, boundary layer, pipe flow

Section (B) : 50 Marks

4. **Structural Analysis and Design**

4.1 Types of structures based on the material used

4.2 Concept of reinforced concrete structures, working stress and limit state methods

4.3 Analysis of beams, columns and frames: bending moment, shear force and frictional forces, basic concepts of deflection, deflection of beams and frames: determinate structure - energy methods; three hinged systems, indeterminate structures- slope deflection method and moment distribution method; use of influence line diagrams for simple beams, unit load method

4.4 Reinforced concrete structures: difference between working stress and limit state philosophy, analysis and design of RC beams and slabs in bending, shear, deflection, bond and end anchorage, design of axially loaded columns; isolated and combined footings, introduction to pre-stressed concrete

4.5 Steel structures : types of steel structure, advantages and disadvantages of steel structures, physical and mechanical properties of steel for structural member, steel member jointing (riveted, bolted, pinned and welded)

5. **Transportation Engineering**

5.1 Highway planning and survey: classification of roads; highway alignment and controlling factors; evaluating alternate alignments; road standards of Nepal

5.2 Geometric design of highway: basic design control and criteria; elements of highway cross-section; highway curves; super elevation; average and ruling gradients; stopping sight distance; design considerations for horizontal and vertical alignments, extra widening, and set back distance; design considerations for hill roads

5.3 Highway materials: types of aggregates and tests on their gradation, strength, durability; binding materials and their tests; design of asphalt mixes; evaluation of subgrade soil

5.4 Traffic engineering and safety: impact of human and vehicular characteristics on traffic planning; traffic operations and regulations; traffic control devices; traffic lights; factors influencing night visibility, road safety measures.

5.5 Road pavement: different types of pavements; design methods for flexible and rigid pavements (DOR guidelines); loads and other factors controlling pavement design;

5.6 Road construction and maintenance: activities, techniques, tools, equipment and plants used in road construction; preparation of road subgrade; road maintenance, repair and rehabilitation; laboratory equipment and tests related to transportation engineering

6. **Water Supply, Sanitation and Environment**

6.1 Water sources, water quality and water demand: water source selection; impurities in water; water-related diseases and prevention measures; drinking water quality standards; laboratory equipment and tests for water

6.2 Intake and distribution systems: types of intakes; factor affecting while selection of location of intake; types and purposes of pipe materials, joints, valves and fittings; brake pressure tanks; service reservoirs and their capacity determination; design of branch and looped water distribution systems

6.3 Water treatment process and technologies: various treatment process and their purposes; screening; sedimentation; flocculation; filtration; disinfection; softening; and miscellaneous treatments (aeration, removal of iron and manganese, removal of color /odour / taste)

6.4 Design and construction of sewers: estimation of quantity of wastewater; sewerage system and types; design criteria of sewers

6.5 Treatment and disposal of wastewater: characteristics and examination of sewage; decomposition of wastewater; primary treatment processes and design of grit chamber; sludge and solid waste disposal methods; latrine and septic tank.

6.6 Concept of environmental assessment: BES; IEE; EIA; types of disaster and its mitigation

7. **Construction Management and Professional Ethics**

7.1 Project planning and scheduling: project classifications; project life cycle phases; project planning process; project scheduling (Bar Chart, CPM, PERT); resources levelling and smoothing; monitoring/evaluation/controlling

7.2 Project management: information system; project risk analysis and management; project financing, tender and its process, and contract management

7.3 Estimating, costing, and valuation: type of estimates; methods of estimating; rate analysis; specifications (purpose, importance and types), valuation

7.4 Ethics and professionalism: perspective on morals, codes of ethics and guidelines of professional engineering practice; legal aspects of engineering profession in Nepal; Nepal Engineering Council Act, 2055 and Rules, 2056

8. **त्रि.वि ऐन र नियम सम्बन्धी सामान्य जानकारी**

8.1 त्रि.वि ऐन, २०४९

8.2 त्रि.वि शिक्षक कर्मचारी सेवा सम्बन्धी नियम, २०५०

प्राविधिक सेवा, प्राविधिक समूह, अधिकृत तृतीय श्रेणी, प्राविधिक अधिकृत (इन्जिनियरिङ) पदको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

(Specification Chart)

२०८१

प्रथम पत्र : वस्तुगत - बहुवैकल्पिक प्रश्न

पूर्णाङ्क : १०० **समय : १ घण्टा ३० मिनेट**

खण्ड	एकाइ	विषय शीर्षक	अङ्क	प्रश्न सङ्ख्या	प्रश्न सङ्ख्या × अङ्क भार
A	1.	Engineering Survey and Drawing Techniques	50	100	100 प्रश्न × 1 अङ्क
	2.	Construction Materials and Concrete Technology			
	3.	Soil Mechanics, Foundation Engineering and Hydraulics			
B	4.	Structural Analysis and Design	50		
	5.	Transportation Engineering			
	6.	Water Supply, Sanitation and Environment			
	7.	Construction Management and Professional Ethics			
	8.	त्रि.वि ऐन र नियम सम्बन्धी सामान्य जानकारी			
कुल जम्मा			100	100	

द्वितीय पत्र : विषयगत

पूर्णाङ्क : १०० **समय : ३ घण्टा**

खण्ड	एकाइ	विषय शीर्षक	अङ्क	प्रश्न सङ्ख्या	प्रश्न सङ्ख्या × अङ्कभार
A	1.	Engineering Survey and Drawing Techniques	50	8 + 4	8 प्रश्न × 10 अङ्क 4 प्रश्न × 5 अङ्क
	2.	Construction Materials and Concrete Technology			
	3.	Soil Mechanics, Foundation Engineering and Hydraulics			
B	4.	Structural Analysis and Design	50		
	5.	Transportation Engineering			
	6.	Water Supply, Sanitation and Environment			
	7.	Construction Management and Professional Ethics			
	8.	त्रि.वि ऐन र नियम सम्बन्धी सामान्य जानकारी			
कुल जम्मा			100	12	