

नेपाल बैंक लिमिटेड
उप प्रबन्धक, तह ७, सिभिल-हाईड्रोपावर इन्जिनियर पदको प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसारका चरणमा परीक्षा लिइने छ :

प्रथम चरण :- लिखित परीक्षा

पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता

पूर्णाङ्क :- ५०

परीक्षा योजना (Examination Scheme)

१. प्रथम चरण : लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २००

| पत्र | विषय | पूर्णाङ्क | उत्तीर्णाङ्क | परीक्षा प्रणाली | प्रश्नसंख्या X अङ्क | समय |
|---------|----------------|-----------|--------------|-----------------|--------------------------------|---------|
| प्रथम | Engineering I | १०० | ५० | विषयगत | १० प्रश्न X १० अङ्क = १०० अङ्क | ३ घण्टा |
| द्वितीय | Engineering II | १०० | ५० | विषयगत | १० प्रश्न X १० अङ्क = १०० अङ्क | ३ घण्टा |

२. द्वितीय चरण : अन्तर्वार्ता (Interview)

पूर्णाङ्क :- ५०

| विषय | पूर्णाङ्क | उत्तीर्णाङ्क | परीक्षा प्रणाली |
|------------------------|-----------|--------------|-----------------|
| व्यक्तिगत अन्तर्वार्ता | ५० | २५ | मौखिक |

द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईवाट प्रश्नहरु सोधिनेछ ।
- विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- 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 पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।

प्रथम पत्र :- Engineering I

Section (A): 50 Marks

1. Structural Analysis and Design

- 1.1 Stress and strain; theory of torsion and flexure; moment of inertia
- 1.2 Analysis of beams and frames: bending moment, shear force and 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
- 1.3 Reinforced concrete structure: Difference between working stress and limit state philosophy, analysis 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
- 1.4 Steel and timber structures: Standard and built-up sections - design of riveted, bolted and welded connections, design of simple elements - ties, struts, axially loaded and eccentric columns bases; Design principles on timber beams and columns

2. Construction Materials

- 2.1 Properties of building materials: physical, chemical, constituents, thermal
- 2.2 Stones - characteristics and requirements of stones as a building materials
- 2.3 Ceramic materials: ceramic tiles, mosaic tile, brick types and testing
- 2.4 Cementing materials: types and properties of lime and cement; cement mortar tests
- 2.5 Metals: Steel - types and properties; alloys
- 2.6 Timber and wood: timber trees in Nepal, types and properties of wood
- 2.7 Miscellaneous materials: Asphaltic materials; paints and varnishes; polymers
- 2.8 Soil properties and its parameters

3. Concrete Technology

- 3.1 Constituents and properties of concrete
- 3.2 Water cement ratio
- 3.3 Grade and strength of concrete, concrete mix design, testing of concrete
- 3.4 Mixing, transportation pouring and curing of concrete
- 3.5 Admixtures
- 3.6 High strength concrete
- 3.7 Pre-stressed concrete technology

4. Construction Management

- 4.1 Construction scheduling and planning: networks techniques(CPM and PERT) and bar charts
- 4.2 Contractual procedure and management: types of contract, tender and tender notice, preparation of binding (tender) document, contractors pre-qualification, evaluation of tenders and selection of contractor, contract acceptance, condition of contract; classification of contractors; dispute resolution; muster roll
- 4.3 Material management: procurement procedures and materials handling

- 4.4 Quality Control Plan, Cost Control and Quality Control Mechanisms
- 4.5 Project maintenance
- 4.6 Project monitoring and evaluation
- 4.7 Technical Auditing
- 4.8 Variation, alteration and omissions
- 4.9 Occupational health and safety

Section (B): 50 Marks

5. Drawing Techniques

- 5.1 Drawing sheet composition and its essential components
- 5.2 Suitable scales, site plans, preliminary drawings, working drawings
- 5.3 Theory of projection drawing: perspective, orthographic and axonometric projection; first and third angle projection
- 5.4 Drawing tools and equipments
- 5.5 Drafting conventions and symbols
- 5.6 Topographic, electric, plumbing and structural drawings
- 5.7 Techniques of free hand drawing

6. Estimating and Costing Valuation and Specification

- 6.1 Types of estimates and their specific uses
- 6.2 Methods of calculating quantities
- 6.3 Key components of estimating norms and rate analysis
- 6.4 Preparation of bill of quantities
- 6.5 Purpose, types and importance of specification
- 6.6 Purpose, principles and methods of valuation

7. Engineering Survey

- 7.1 Introduction and basic principles
- 7.2 Linear measurements: techniques; chain, tape, ranging rods and arrows; representation of measurements and common scales; sources of errors; effect of slope and slope correction; correction for chain and tape measurements; Abney level and clinometers
- 7.3 Compass and plane table surveying: bearings; types of compass; problems and sources of errors of compass survey; principles and methods of plane tabling
- 7.4 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; method of contouring
- 7.5 Theodolite traversing :need of traverse and its significance; computation of coordinates; adjustment of closed traverse ;closing errors
- 7.6 Use of Total Station and Electronic Distance Measuring Instruments

8. Engineering Economics

- 8.1 Benefit cost analysis, cost classification, sensitivity analysis, internal rate of return, time value of money,
- 8.2 Economic equilibrium, demand, supply and production, net present value, financial and economic evaluation

9. Engineering Professional Practices

- 9.1 Ethics and professionalism: code of conduct and guidelines for professional engineering practices
- 9.2 Nepal Engineering Council Act, 2055 and Regulation, 2056
- 9.3 Relation with clients, contractor and fellow professionals

10. Technology and Environment

- 10.1 Technological development in Nepal
- 10.2 Promotion of local technology and its adaptation
- 10.3 Initial Environmental Examination (IEE)
- 10.4 Environmental Impact Assessment (EIA), role of EIA and EIA principles
- 10.5 Government rules and Regulation and procedures for EIA
- 10.6 General concept of global climate change phenomenon
- 10.7 National, Local and Sectoral Adaption Plan of Action (NAPA, LAPA and SAPA)

द्वितीय पत्र :- Engineering II

Section (A): 50 Marks

1. Transportation and Trail Bridge

- 1.1. Transportation system and its classification
- 1.2. Road transport and road construction in Nepal
- 1.3. Classification of roads in Nepal (NRS and IRC)
- 1.4. General principles of road network planning
- 1.5. Feasibility study of road projects
- 1.6. Alignment, engineering survey and its stages
- 1.7. Geometric design of roads: map study, element of cross-section and highway alignment, design of horizontal curve, super elevation, transition curve, vertical curves, right of way
- 1.8. Drainage consideration in roads: Introduction and design of culverts and minor bridges, cross drainage structures, subsurface drainage system
- 1.9. Special consideration in hill roads design: problems associated with hill roads construction; route location, hairpin bends and special structures
- 1.10. Road Pavement: Types of pavement and their applicability in hill roads, design of pavement
- 1.11. Bioengineering practices along hill side
- 1.12. Activities and techniques in road construction in rural roads
- 1.13. Maintenance, repair and rehabilitation of roads
- 1.14. Basic knowledge on design, construction and maintenance of suspended and suspension bridge in Nepal
- 1.15. Low-cost road construction

2. Water Supply and Sanitation

- 2.1 Rural and community based water supply system
- 2.2 Water supply sources and their management : surface and ground water
- 2.3 Selection of source
- 2.4 Water quantity and treatment, water demand and supply, source protection
- 2.5 Intakes, collection chamber and break pressure tanks
- 2.6 Reservoir and distribution system : Intakes, pipeline design, design of transmission and distribution system, reservoir design
- 2.7 Pipe and fittings: pipe materials, pipe laying and fittings
- 2.8 Operation and maintenance of water supply systems
- 2.9 Sanitation, wastewater and solid waste management:
 - 2.9.1 On-site sanitation system
 - 2.9.2 Types of sewerage system, design and construction of sewers
 - 2.9.3 Types, characteristics, sources, quantity, generation, collection, transportation and disposal of solid wastes
 - 2.9.4 Sanitary landfill, incineration, composting
- 2.10 Environment health engineering – epidemiology, pathogens (bacteria, virus, helminthes, protozoa)

3. Energy System

- 3.1 Hydrological study, planning and design of hydropower projects
- 3.2 Stages of hydropower development: Reconnaissance, Pre-feasibility, feasibility studies and detailed engineering design
- 3.3 Head works and design of ROR, PROR and storage type hydropower power plant
- 3.4 Intake, settling basin, forebay, penstock and its basic design
- 3.5 Head works, dams, spillways, surge tanks, stilling basin and its basic design
- 3.6 Selection of turbine
- 3.7 Generators and their types
- 3.8 Sediment concentration in hydropower project and its impact
- 3.9 River diversion works
- 3.10 Biogas and alternative energy systems in Nepal

4. Irrigation and River Training Works

- 4.1 Status of irrigation development in Nepal
- 4.2 Methods of irrigation and their suitability
- 4.3 Design of irrigation canals
- 4.4 Operation and maintenance of irrigation systems
- 4.5 Management of farmers managed irrigation system
- 4.6 Preventive and remedial measures of water logging
- 4.7 Flood control, its necessity and flood mitigation measures
- 4.8 River training works
- 4.9 Design, operation and management of hill irrigation systems

5. Housing, Building and Urban Planning

- 5.1 Present status and practices of building construction in Nepal
- 5.2 Specific considerations in design and construction of buildings in Nepal
- 5.3 Indigenous technology in building design and construction
- 5.4 Local and modern building construction material in Nepal
- 5.5 Community buildings (school and hospital) and their design considerations
- 5.6 Urban planning needs and challenges in Nepal

Section (B): 50 Marks

6. Water Resources and Hydrology

- 6.1 General aspects of hydrology
- 6.2 Infiltration, Runoff and Hydrograph
- 6.3 Planning and design of water storage reservoir
- 6.4 Floods, flood routing and flood control measures

7. Soil Mechanics and Foundations

- 7.1 Soil characteristics, classification, permeability and well hydraulics
- 7.2 Compressibility, consolidation and compaction
- 7.3 Earth pressure theories

- 7.4 Terzaghi's bearing capacity theories and their applications
- 7.5 Water-water relationship

8. Fluid Mechanics and Hydraulic Machinery

- 8.1 Fluid properties, Hydrostatic forces and Fluid kinematics
- 8.2 Fluid dynamics, Flow measurement, Notches and Weir, Viscous flow theory
- 8.3 Fluid through pipes, Turbulent flow, Boundary Layer theory
- 8.4 Open channel flow
- 8.5 Pumps, Jets and Turbines
- 8.6 Hydraulic Jumps and its types, flow profiles
- 8.7 Bernoulli's equation and its applications

9. Hydropower

- 9.1 Concepts of different types of power (Thermal, Hydro, Wind, Solar, and others)
- 9.2 Current situation and future prospect of hydropower development in Nepal
- 9.3 Importance of micro-hydropower, mini-hydropower and rural electrification
- 9.4 Project Planning:
 - 9.4.1 Concept and different phases of studies-reconnaissance, pre-feasibility, feasibility, detail design
 - 9.4.2 General concepts/principles of environmental studies in the development of hydropower and transmission line projects
 - 9.4.3 General concept of multipurpose water resources development; Concept of River basin development and Integrated Water Resource Management
 - 9.4.4 Hydrological and Geological investigations in hydropower planning
 - 9.4.5 Different types of hydropower projects/plants and their choice with respect to site condition and economy; Types of hydropower development/schemes
 - 9.4.6 General concept of transmission lines and substation
 - 9.4.7 Power demand and forecast
- 9.5 Power Regulation and Project Layout
 - 9.5.1 Power Regulation: Definition and determination of potential and firm power, maximum power output, firm energy, surplus energy, seasonal energy, and average annual energy; General concept of load, load curve, capacity factor, load factor, and utilization factor; Power demand variation - daily, weekly, monthly, seasonal, and annual; Role of different types of hydropower project in meeting power demand as per the load curve
 - 9.5.2 Project Layout: General layout of different types of hydropower projects: Reservoir/Poundage, diversion structures, de-sanding basin, water conveyance system, fore-bay, surge tank, penstock, power house, draft tube, tailrace, switch yard, and auxiliary structures
- 9.6 Water Retaining Structures, Spillway, and Intake
 - 9.6.1 Water Retaining Structures: Dam classification and their usage based on – functionality, acting forces, and construction material; Selection of dam based on – construction material, topography, and economy and purpose; Concrete Gravity Dams: Forces on gravity dams, their line of actions;

- stability against sliding, overturning, and floating; Embankment Dams: Earth and Rock-fill Dams; Basic design principles; Concept of Seepage through embankments; Considerations in foundation and slope stability; Concept of Cofferdams and their usage
- 9.6.2 Spillway: Purpose, Types, and Design of Spillways; Types of Spillway gates, location, and their functions; Energy dissipation necessity; Energy dissipation methods; Types of energy dissipaters; Design concept of Stilling Basin and Aprons
- 9.6.3 Intake: Types of intakes; Location of intake; Design of intake, trash rack, gravel traps, and approach canal
- 9.7 De-sanding Basin and Water Conveyance
- 9.7.1 De-sanding Basin: Importance, Types, Location, and Usage of De-sanding basin; Suspended Sediment Characteristics; Sediment velocities to be considered in de-sanding basin design; Design of de-sanding basin, Flushing of sediments from de-sanding basin
- 9.7.2 Water Conveyance: Pressure and non-pressure tunnels, Tunnel cross-section and size; Head losses in tunnels; concept of tunnel stability and protection measures; Tunnel linings; Canals and Conduits: Selection and Design
- 9.8 Fore-bay and Surge Tank; Penstock; and Power House and Tailrace
- 9.8.1 Fore-bay and Surge Tank: Importance and selection criteria; location and design; Concept of water hammer; Hydrodynamic pressure calculations; Design of fore-bay basin
- 9.8.2 Penstock: Importance, locations, and application; Anchor Blocks and Saddle Supports
- 9.8.3 Power House and Tailrace: Underground and surface power houses and their selection criteria; Power House Dimensions; Considerations in selection of underground power house; Tailrace and its importance
- 9.9 Hydro-mechanical and Electro-mechanical Installations
- 9.9.1 Hydro-mechanical Installation: Types of turbines and their usage and selection criteria; Concept of specific speed; General concept of Gates and Valves, Draft Tube; Need and working principle of governors
- 9.9.2 Electro-mechanical Installations: Types of hydro-generators and their usage; Transformers and Auxiliary Equipments

10. Constitution, Act and Regulations

- 10.1 Present Constitution of Nepal
- 10.2 Bank and Financial Institution Act, 2063
- 10.3 Personnel Bylaws of Nepal Bank Limited
- 10.4 Financial Bylaws of Nepal Bank Limited
- 10.5 Public Procurement Act, 2063; and Public Procurement Regulation, 2064
- 10.6 Water Resources Act, 2049 and Water Resources Regulation, 2050
- 10.7 Electricity Act, 2049 and Electricity Regulation, 2050
- 10.8 Environment Protection Act, 2053 and Environment Protection Regulation, 2054