लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सर्भे समूह, राजपत्रांकित तृतीय श्रेणीका पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र (Paper II): Technical Subject

Section A – 30 Marks

1. Fundamentals of Surveying

1.1 Introduction
- 1.1.1 Historical Background
- 1.1.2 Objectives
- 1.1.3 Principles of surveying
- 1.1.4 Classification
- 1.1.5 Linear and Angular Measurements
- 1.1.6 Survey computations: Bearing, Coordinates, Reduced Level, Area & Volume
- 1.1.7 Units, Standardization and Conversion
- 1.1.8 Application of Surveying
- 1.1.9 Role of International Surveying and Mapping Communities

1.2 Surveying and Mapping Technology
- 1.2.1 Selection, Use, Feasibility, Sustainability, Transfer and Development
- 1.2.2 Instruments, Hardware, Software, Procuring, Maintaining and Upgrading

1.3 Survey Management
- 1.3.1 Surveying Need Assessment
- 1.3.2 Terms of Reference
- 1.3.3 Survey Design, Specification and Costing
- 1.3.4 Tasks, Identification and distribution
- 1.3.5 Tools, Equipment and accessories
- 1.3.6 Checking and Adjusting Instruments
- 1.3.7 Supervision
- 1.3.8 Production
- 1.3.9 Reports
- 1.3.10 Problems of Field Surveying in Nepal
- 1.3.11 Safety Management
- 1.3.12 Professional Ethics, Code and Conduct
- 1.3.13 Community Skill of Surveyor
- 1.3.14 Coordination of Institutional Resources
- 1.3.15 Governmental, Non Governmental and International Non Governmental Organization
- 1.3.16 Public Private Parternership
- 1.3.17 User Groups
- 1.3.18 Public Relations

1.4 Statistical Concepts
- 1.4.1 Introduction and Application
- 1.4.2 Measure of Central Tendency: Mean, Median, Mode, Standard Deviation
- 1.4.3 Variance, Co-Variance
- 1.4.4 Correlation and Regression
- 1.4.5 Probability, Normal Distribution

1.5 Error and Adjustments
- 1.5.1 Introduction
- 1.5.2 Fundamentals of Theory of Measurement Errors
- 1.5.3 Accuracy and Precision
- 1.5.4 Least Square Adjustments
- 1.5.5 Propagation of Errors

2. Cadastre

2.1 Land Registration
- 2.2.1 Land Rights and Land Records
- 2.2.2 Land Transfers
- 2.2.3 Registration of Deeds
- 2.2.4 Registration of Titles
- 2.2.5 Fragmentation and Consolidation
- 2.2.6 Horizontal Sub division
- 2.2.7 Systematic Adjudication
- 2.2.8 Land Tenure
- 2.2.9 Land Record in Nepal
- 2.2.10 Land Registries

2.2 Cadastral Surveying
- 2.2.1 Cadastral Concepts
- 2.2.2 Principles of cadastral Surveying
- 2.2.3 Boundaries
- 2.2.4 Parcel
- 2.2.5 Cadastral Survey Methods
- 2.2.6 Cadastral System
- 2.2.7 Cadastral Interface
- 2.2.8 Maintenance of cadastre
- 2.2.9 Land Laws
- 2.2.10 Cadastral Surveys in Nepal

2.3 Land Management
- 2.3.1 Principles of Management
- 2.3.2 Cadastral Organization
- 2.3.3 Land Development Planning
- 2.3.4 Financial Aspects
- 2.3.5 Land Use
- 2.3.6 Land Management
- 2.3.7 GIS Applications
- 2.3.8 Land Administration
- 2.3.9 Overview of Land related Acts and Rules of Nepal

2.4 Land Information System (LIS)
- 2.4.1 Need for LIS
- 2.4.2 Concept of LIS
- 2.4.3 Need for coordination: Structure
- 2.4.4 Parcel based LIS: The Multipurpose Cadastre
- 2.4.5 The Economics of LIS

Section B – 20 Marks

3. Geodesy

3.1 Introduction to Control Surveying
- 3.1.1 Horizontal Controls
- 3.1.2 Vertical Controls

3.2 Methods of Control Surveying
- 3.2.1 Leveling: Geodetic and Ordinary Leveling
- 3.2.2 Triangulation and Trilateration: Principle, Figure and Strength, Procedures, Computation

3.2.3 Traversing: Principle, Procedures, Computation
3.2.4 Intersection and Resection: Importance, Procedures, Computation

3.3 Elementary Geodesy and Astronomy
3.3.1 Concepts
3.3.2 Geodetic Datum and Reference Ellipsoid, Deflection of Vertical, Laplace Equation
3.3.3 Coordinate Systems: Spherical, Geodetic and Astronomical Coordinates
3.3.4 Transformations of Coordinates and Datum Transformation
3.3.5 Celestial Sphere, Celestial Elements, Astronomical Triangle and Time Systems
3.3.6 Astronomical Positioning:Determination of Azimuth, Latitude and Longitude

3.4 Physical Geodesy
3.4.1 Concepts
3.4.2 Gravity Force, Gravity Potential, Measured and Normal Gravity, Gravity Anomaly
3.4.3 Equipotential Surface, Orthometric Height and Dynamic Height
3.4.4 Absolute and Relative Gravimeters

3.5 Global Positioning System
3.5.1 Introduction to Space Geodesy
3.5.2 Principle of Global Positioning System (GPS)
3.5.3 GPS Signals
3.5.4 Satellite Geometry and Accuracy
3.5.5 GPS Positioning
3.5.6 Static and Kinematic Observations
3.5.7 Geocentric Coordinates and WGS 84
3.5.8 GPS Data Processing

Section C – 20 Marks

4. Photogrammetry and Remote Sensing

4.1 Introduction
4.1.1 Basic Principles of Photogrammetry
4.1.2 Definitions of some terms used in Photogrammetry

4.2 Aerial Camera
4.2.1 Introduction
4.2.2 Parts of Aerial Camera
4.2.3 Types of Camera
4.2.4 Characteristics of Aerial Camera

4.3 Aerial Photography
4.3.1 Types of Aerial Photography
4.3.2 Scale of Aerial Photography
4.3.3 Format of the Photograph
4.3.4 Flight Planning
4.3.5 Aerial Photo Processing
4.3.6 Relief Displacement
4.3.7 Tilt Displacement

4.4 Binocular Vision
4.4.1 Stereoscopic Vision
4.4.2 Pseudoscopic Vision
4.4.3 Anaglyph System

- 4.4.4 Parallax
- 4.5 Photo Interpretations
  - 4.5.1 Steps in Photo Interpretation
  - 4.5.2 Elements of Photo Interpretation
- 4.6 Rectification
  - 4.6.1 Introduction
  - 4.6.2 Conventional Rectification
  - 4.6.3 Differential Rectification
  - 4.6.4 Ortho-photo
  - 4.6.5 Photo-mosaics
- 4.7 Photo Control and Aerial Triangulation
  - 4.7.1 Selection of Photo Control Points
  - 4.7.2 Pre-marking and Post-marking
  - 4.7.3 Point Transfer
  - 4.7.4 Introduction to aerial Triangulation
  - 4.7.5 Phases of Aerial Triangulation
  - 4.7.6 Methods of Aerial Triangulation Adjustment
- 4.8 Analogue Photogrammetry
  - 4.8.1 Introduction to Analogue Plotters
  - 4.8.2 Types of Stereo Plotters
  - 4.8.3 Principles of Stereo Plotters
  - 4.8.4 Orientations: Inner, Relative and Absolute Orientation
  - 4.8.5 Data Acquisition
- 4.9 Analytical Photogrammetry
  - 4.9.1 Introduction
  - 4.9.2 Mathematical relationship between image and object space
  - 4.9.3 Spatial Orientation and Measurements
- 4.10 Digital Photogrammetry
  - 4.10.1 Introduction and Concepts
  - 4.10.2 Image Acquisition
  - 4.10.3 Processing
  - 4.10.4 Feature Extraction
- 4.11 Remote Sensing
  - 4.11.1 Introduction
  - 4.11.2 Brief History of Remote Sensing
  - 4.11.3 Concepts of Satellite Remote Sensing
- 4.12Image Processing and Interpretation
  - 4.12.1 Geo-referencing
  - 4.12.2 Processing: Geometric and Radiometric Processing
  - 4.12.3 Image Interpretation and Analysis
  - 4.12.4 Errors

5. Engineering Survey

- 5.1 Introduction
  - 5.1.1 Control and Detail Surveys
  - 5.1.2 Route Surveying-Plan and Profiles
  - 5.1.3 Curves- Types, Geometry Setting out and Application
  - 5.1.4 Area and Volume
- 5.2 Construction Surveys
  - 5.2.1 Buildings

5.2.2 Pipelines
5.2.3 Roads and Highways
5.2.4 Tunnels
5.2.5 Hydropower-Intake, Reservoir, Dam, Powerhouse
5.2.6 Bridges
5.2.7 Canals
5.2.8 Transmission Lines
5.2.9 Setting out Surveys

5.3 Hydrographic Surveys
5.3.1 Discharge
5.3.2 Bathymetric Survey

Section D – 30 Marks

6. Cartography

6.1 Introduction
6.1.1 Historical Background
6.1.2 Scope of Cartography and Earth as a Cartographic Problem
6.1.3 Cartographic Concepts
6.1.4 Conventional and Digital Cartography
6.1.5 Map Production: Map Compilation and Map Reproduction
6.1.6 Topographic Cartography: Large Scale and Base Map
6.1.7 Small Scale mapping
6.1.8 Thematic Cartography

6.2 Geo Information
6.2.1 Data (Geometric and Attribute)
6.2.2 Information & Information System
6.2.3 Geographical Information System (GIS)
6.2.4 Database (Basic Concepts, Design and Principles)

6.3 Data Acquisition, Processing, Analysis, Visualization and Presentation (Conventional and Digital Environments)
6.3.1 Data Acquisition**:** Data Sources- Maps, Records (Tables, Texts), Digital Data, Ground Surveys, GPS, Aerial Photography, Satellite Imagery, Documents; Toponomy; Digitization
6.3.2 Data Processing: Geo-referencing; Map Projection (Introduction, Classification, Choice and Uses); Data Integration; Editing, Spatial Relationship and Topology; Spatial Analysis (Merge, Buffer Overly); Attribute Database (Topographic and Thematic)
6.3.3 Visualization and Presentation: Spatial and Attribute data; Statistical Surface; Classification of Data; Measurement Level of Data (Nominal, Ordinal, Interval and Ratio); Map design (Principles); Mapping Methods -Symbols; Generalization – conceptual and graphical; Graphic Variables; Typography-Map in and for www (Web Cartography)

6.4 Map Reproduction
6.4.1 Map Reproduction in Conventional Environment - Photography, Copying and Printing
6.4.2 Map Reproduction in Digital Environment

7. Spatial Information System and Digital Terrain Model (SIS and DTM)

7.1 Data Structure, Spatial-Non Spatial Data Source
7.1.1 Vector Data and Raster Data

- 7.1.2 Resolution of Raster Image
- 7.1.3 Object oriented Vector Data
- 7.1.4 Topological Vector Data
- 7.1.5 Data Integration

7.2 Spatial Database Management
- 7.2.1 Introduction
- 7.2.2 Data Modeling
- 7.2.3 Database Design and Maintenance
- 7.2.4 6.2.4 Storage and Archives, Data Security

7.3 Data Standards and Quality
- 7.3.1 Data/Metadata standards: Standardization Format and Accuracy
- 7.3.2 Data quality Administration
- 7.3.3 Copyright

7.4 Geographical Information System (GIS)
- 7.4.1 Introduction to GIS
- 7.4.2 GIS components
- 7.4.3 Data Model
- 7.4.4 GIS Operations and Spatial Analysis

7.5 National Spatial Database Infrastructure
- 7.5.1 Metadata
- 7.5.2 Data Sharing
- 7.5.3 Clearinghouse
- 7.5.4 Spatial Information Service

7.6 Digital Terrain Model (DTM)
- 7.6.1 Introduction
- 7.6.2 Data Collection, Processing and Creation of DTM
- 7.6.3 Storage and Presentation: Triangulated Irregular Network (TIN), Grid and Contours
- 7.6.4 Resolution, Error and Implications
- 7.6.5 Application: Flythrough, View shed, Overlay

7.7 Global Mapping

7.8 Information Communication Technology (ICT) Applications
- 7.8.1 Introduction to Web and Internet
- 7.8.2 Client server computing
- 7.8.3 Data dissemination through web
- 7.8.4 Web Maps: Static, Dynamic and Interactive

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प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र लिइने
सामूहिक परीक्षण (Group Test) को लागि

सामूहिक छलफल (Group Discussion)

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफल (Leaderless Group Discussion) को रुपमा अवलम्वन गरिने छ । दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहवीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति (Individual Presentation) गर्नु पर्नेछ । यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसारको ३ जनाको समिति रहनेछ ।

आयोगका अध्यक्ष वा सदस्य	-	अध्यक्ष
मनोविज्ञ	-	सदस्य
दक्ष/विज्ञ (१ जना)	-	सदस्य

सामूहिक छलफलमा दिइने नमुना प्रश्न वा Topic

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, स्वास्थ्य बीमा, खाद्य सुरक्षा, प्रतिभा पलायन जस्ता Topics मध्ये कुनै एक Topic मात्र दिइनेछ ।