

## परिशिष्ट:-४

(दफा-५(५) संग सम्बन्धित)

प्राविधिक सहायकको पाठ्यक्रम

### (क) सेवा सम्बन्धी

#### खण्ड-१:- प्रशासनिक कार्य सम्बन्धी

१. रोजगारीको हकसम्बन्धी ऐन, २०७५ र रोजगारीको हकसम्बन्धी नियमावली, २०७५,
२. प्रधानमन्त्री रोजगार कार्यक्रम संचालन निर्देशिका, २०७५, कामका लागि पारिश्रमिकमा आधारित सामूदायिक आयोजना सञ्चालन तथा व्यवस्थापन कार्यविधि, २०७६ र युवा रोजगारीका लागि रुपान्तरण पहल आयोजना (संचालन तथा व्यवस्थापन) कार्यविधि, २०७६,
३. कामका लागि पारिश्रमिक (Cash for Work) को अवधारणा,
४. स्थानीय तहको बजेट तर्जुमा प्रकृया, खर्च व्यवस्थापन र लेखा परीक्षण तथा गुनासो व्यवस्थापन,
५. सामाजिक परिचालन, सार्वजनिक सुनुवाई, सामाजिक लेखापरीक्षण तथा गुनासो व्यवस्थापन, र
६. आचरण तथा अनुशासन र सुशासन।

#### खण्ड-२:- प्राविधिक कार्य सम्बन्धी

- स्थानीय सेवाको इन्जिनियरिङ् सेवा, सिभिल समूह पाँचौं तह सब-इन्जिनियर पदको लोकसेवा आयोगले निर्धारण गरेको देहाय बमोजिमको पाठ्यक्रमका विषयवस्तुहरु:

### **1. Surveying**

#### 1.1 General

1.1.1 Principle and types of surveying

1.1.2 Units, scales and maps

1.1.3 Field books and Level books

#### 1.2 Levelling

1.2.1 Principles and methods of levelling

1.2.2 Levelling instruments and accessories

#### 1.3 Plane Tabling

1.3.1 Equipments required

1.3.2 Methods of plane tabling

1.3.3 Two and three point problems

- 1.4 Theodolite and Traverse surveying
  - 1.4.1 Basic difference between different theodolites
  - 1.4.2 Temporary adjustments of theodolites
  - 1.4.3 Fundamental lines and desired relations
  - 1.4.4 Tacheometry: stadia method
  - 1.4.5 Trigonometrical levelling
  - 1.4.6 Checks in closed traverse

#### 1.5 Contouring

- 1.5.1 Characteristics of contour lines
- 1.5.2 Method of locating contours
- 1.5.3 Contour plotting

#### 1.6 Setting Out: Small buildings and Simple curves

### **2. Construction Materials**

#### 2.1 Stone

- 2.1.1 Formation and availability of stones in Nepal
  - 2.1.2 Methods of laying and construction with various stones
- #### 2.2 Cement
- 2.2.1 Different cements: Ingredients, properties and manufacture
  - 2.2.2 Storage and transport
  - 2.2.3 Admixtures

#### 2.3 Clay and Clay Products

- 2.3.1 Brick: type, manufacture, laying, bonds

#### 2.4 Paints and Varnishes: Type and selection; preparation techniques and use

#### 2.5 Bitumen: Type, selection and use

### **3. Mechanics of Materials and Structures**

#### 3.1 Mechanics of Materials

- 3.1.1 Internal effects of loading
- 3.1.2 Ultimate strength and working stress of materials

#### 3.2 Mechanics of Beams

- 3.2.1 Relation between shear force and bending moment
- 3.2.2 Shear and bending moment diagrams for statically determinate beams under various types of loading

#### 3.3 Simple Strut Theory

## **4. Hydraulics**

### 4.1 General

4.1.1 Properties of fluid: mass, weight, specific weight, density, specific volume, specific gravity, viscosity

4.1.2 Pressure and Pascal's law

### 4.2 Hydro-Kinematics and Hydro-Dynamics

4.2.1 Energy of flowing liquid: elevation energy, Kinetic energy, potential energy, internal energy

### 4.3 Measurement of Discharge

4.3.1 Weirs and notches

4.3.2 Discharge formulas

### 4.4 Flows: Characteristics of pipe flow and open channel flow

## **5. Soil Mechanics 5.1**

### General

5.1.1 Soil types and classification

5.1.2 Three phase system of soil

5.1.3 Unit Weight of soil mass: bulk density, saturated density, submerged density and dry density

5.1.4 Interrelationship between specific gravity, void ratio, porosity, degree of saturation, percentage of air voids air content and density index

### 5.2 Soil Water Relation

5.2.1 Terzaghi's principle of effective stress

5.2.2 Darcy's law

5.2.3 Factors affecting permeability

### 5.3 Compaction of soil

5.3.1 Factors affecting soil compaction

5.3.2 Optimum moisture content

5.3.3 Relation between dry density and moisture content

### 5.4 Shear Strength of Soils

5.4.1 Mohr-Coulomb failure theory

5.4.2 Cohesion and angle of internal friction

## 5.5 Earth Pressures

5.5.1 Active and passive earth pressures

5.5.2 Lateral earth pressure theory

5.5.3 Rankine's earth pressure theory

## 5.6 Foundation Engineering

5.6.1 Terzaghi's general bearing capacity formulas and their application

## 6. Structures

### 6.1 R.C. Sections in Bending

6.1.1 Under reinforced, over reinforced and balanced sections

6.1.2 Analysis of single and double reinforced rectangular sections 6.2

### Shear and Bond for R.C. Sections

6.2.1 Shear resistance of a R.C. section

6.2.2 Types of Shear reinforcement and their design

6.2.3 Determination of anchorage length

### 6.3 Design and Working System of R.C. Structures

6.4.1 Singly and doubly reinforced rectangular beams

6.4.2 Simple one-way and two-way slabs

6.4.3 Axially loaded short and long columns

## 7. Building Construction Technology

### 7.1 Foundations

7.1.1 Subsoil exploration

7.1.2 Type and suitability of different foundations: Shallow, deep

7.1.3 Shoring and dewatering

7.1.4 Design of simple brick or stone masonry foundations 7.2 Walls

7.2.1 Type and thickness of walls

7.2.2 Use of scaffolding

### 7.3 Damp Proofing

7.3.1 Source of Dampness

7.3.2 Remedial measures for damp proofing

### 7.4 Concrete Technology

7.4.1 Constituents of cement concrete

7.4.2 Grading of aggregates

- 7.4.3 Concrete mixes
- 7.4.4 Water cement ratio
- 7.4.5 Factors affecting strength of concrete
- 7.4.6 Form work
- 7.4.7 Curing

#### 7.5 Wood work

- 7.5.1 Frame and shutters of door and window
- 7.5.2 Timber construction of upper floors
- 7.5.3 Design and construction of stairs

#### 7.6 Flooring and Finishing

- 7.6.1 Floor finishes: brick, concrete, flagstone
- 7.6.2 Plastering

### **8. Water Supply and Sanitation Engineering**

#### 8.1 General

- 8.1.1 Objectives of water supply system
- 8.1.2 Source of water and its selection: gravity and artisan springs, shallow and deep wells; infiltration galleries

#### 8.2 Gravity Water Supply System

- 8.2.1 Design period
- 8.2.2 Determination of daily water demand
- 8.2.3 Determination of storage tank capacity
- 8.2.4 Selection of pipe
- 8.2.5 Pipe line design and hydraulic grade line

#### 8.3 Design of Sewer

- 8.3.1 Quantity of sanitary sewage
- 8.3.2 Maximum, Minimum and self cleaning velocity

#### 8.4 Excreta Disposal and Unsewered Area

- 8.4.1 Pit latrine
- 8.4.2 Design of septic tank

## **9 . Irrigation Engineering**

### 9.1 General

- 9.1.1 Need for irrigation; advantages of irrigation
- 9.1.2 Sources of irrigation: water, river & streams, ground water and others
- 9.1.3 Methods of irrigation: surface, sub-surface and others

### 9.2 Irrigation Water Requirement

- 9.2.1 Crop season, principal crops, and crop water requirements
- 9.2.2 Base period & duty

### 9.3 Irrigation Canals

- 9.3.1 Canal losses and their minimization
- 9.3.2 Irrigation requirements and design discharge of canal permissible velocities for different canals
- 9.3.3 Design of canal based on Manning's & Lacey's formulae
- 9.3.4 Need and location of escapes
- 9.3.5 Components of distribution system

## **10. Highway Engineering**

### 10.1 General

- 10.1.1 Introduction to transportation systems
- 10.1.2 Historic development of roads
- 10.1.3 Classification of road in Nepal
- 10.1.4 Basic requirements of road alignment

### 10.2 Geometric Design

- 10.2.1 Basic design control and criteria for design
- 10.2.2 Elements of cross section, typical cross-section for all roads in filling and cutting
- 10.2.3 Camber
- 10.2.4 Determination of radius of horizontal curves
- 10.2.5 Superlevation
- 10.2.6 Sight distances
- 10.2.7 Gradient
- 10.2.8 Use of Nepal Road Standard and subsequent revision in road design

- 10.3 Drainage System
  - 10.3.1 Importance of drainage system and requirements of a good drainage system
- 10.4 Road Pavement: Pavement structure and its components: subgrade, sub-base, base and surface courses
- 10.5 Road Machineries
  - 10.5.1 Earth moving and compacting machines
- 10.6 Road Construction Technology
- 10.7 Bridge: T-beam bridge and Timber bridges
- 10.8 Road Maintenance and Repair: Type of maintenance works
- 10.9 Tracks and Trails
- 10.10 **Airport Engineering:** Planning and layout of Heliports; Terminal Building and Control Tower; Drainage System for Airports

## **11. Estimating and Costing**

- 11.1 General
  - 11.1.1 Main items of work
  - 11.1.2 Units of measurement and payment of various items of work and material
  - 11.1.3 Standard estimate formats of government offices
- 11.2 Rate Analysis
  - 11.2.1 Basic general knowledge on the use of rate analysis norms prepared by Ministry of Works and Transport and the district rates prescribed by district development committee
- 11.3 Specifications
  - 11.3.1 Interpretation of specifications
- 11.4 Valuation
  - 11.4.1 Methods of valuation
  - 11.4.2 Basic general knowledge of standard formats used by commercial banks and NIDC for valuation

## **12. Construction Management**

- 12.1 Organization
  - 12.1.1 Need for organization
  - 12.1.2 Responsibilities of a civil Sub- engineer
  - 12.1.3 Relation between Owner, Contractor and Engineer

## 12.2 Site Management

- 12.2.1 Preparation of site plan
- 12.2.2 Organizing labor
- 12.2.3 Measures to improve labor efficiency
- 12.2.4 Accident prevention

## 12.3 Procurement and Contract Procedure

- 12.3.1 Contracts and its types
- 12.3.2 Departmental works and day-work
- 12.3.3 Preparation of tender document
- 12.3.4 Tender procedure
- 12.3.5 Contract agreement
- 12.3.6 Conditions of contract
- 12.3.7 Construction supervision

## 12.4 Accounts

- 12.4.1 Administrative approval and technical sanction
- 12.4.2 Familiarity with standard account keeping formats used in governmental organizations
- 12.4.3 Muster roll
- 12.4.4 Completion report

## 12.5 Planning and Control

- 12.5.1 Construction schedule
- 12.5.2 Equipment and materials schedule
- 12.5.3 Construction stages and operations
- 12.5.4 Bar chart

### (ख) कम्प्युटर सम्बन्धी

1. Computer fundamental
2. Operating System
3. Word processing
4. Electronic spreadsheet
5. Database management system
6. Presentation system