

Section A- 30 Marks

- 1. General Introduction** **10%**
- 1.1 Definition of soil
 - 1.2 The soil profile & its horizons (A,B. and C)
 - 1.3 Surface, subsoil and substratum
 - 1.4 Mineral vs organic soils
 - 1.5 Four major components of soils
 - 1.6 The mineral constituents of soils
 - 1.7 The soil organic matter
 - 1.8 The soil air
 - 1.9 The soil water
 - 1.10 Weathering and soil forming processes
 - 1.11 Factors of soil formation and important processes
- 2. Physical Properties of Soils** **10%**
- 2.1 Soil texture (sand, silt & clay), its determination and classification
 - 2.2 Soil structure and its classes
 - 2.3 Density and porosity of soils
 - 2.4 Soil consistency (moist, wet and dry)
 - 2.5 Soil temperature and heat movement mechanism
 - 2.6 Importance of soil physical properties in the management of irrigation, soil fertility and crop productivity
 - 2.7 Simple classification of clay (1:2, 2:1 and mixed type) and properties
- 4. Chemical Properties of Soils** **10%**
- 4.1 Soil reaction (pH) and factors affecting pH
 - 4.2 Soil pH ranges and plant nutrients availability
 - 4.3 The buffering capacity of soil
 - 4.4 Importance of buffering
 - 4.5 Electric conductivity (EC)
 - 4.6 Sodium absorption ratio (SAR)
 - 4.7 The relation of higher plants to soil reaction
 - 4.8 Cation and anion exchange and cation exchange capacity (CEC) of soils
 - 4.9 Importance of soil pH, CEC and PBS in soil fertility, fertilizers and liming management

Section B- 20 Marks

- 3. Soil-Water** **10%**
- 3.1 Hydrological cycle
 - 3.2 Water infiltration and percolation
 - 3.3 Soil permeability
 - 3.4 Hydraulic conductivity
 - 3.5 Saturation percentage, permanent wilting point and plant available soil water
 - 3.6 Field capacity of soil, soil moisture measurements (tensiometer, probe, oven dry weight method).
 - 3.7 Soil moisture retention curve
 - 3.8 Crop water requirements, evapo-transpiration and irrigation requirements, water balance

- 5. Soil Acidity and Liming** **10%**
- 5.1 Determination of soil pH and lime requirements
 - 5.2 Why acid soil should be limed
 - 5.3 How lime reduces soil acidity
 - 5.4 Desirable pH ranges for major crops grown in Nepal
 - 5.5 Amount, time, methods, and frequency of lime application
 - 5.6 Factors affecting the frequency of liming
 - 5.7 Liming materials and selecting a suitable liming material
 - 5.8 Crop responses to lime application
 - 5.9 Economic and ecological relevance of lime application to raise the productivity of soil of Nepal

Section C- 30 Marks

- 6. Biological Properties of Soils** **10%**
- 6.1 Soil macro-animals
 - 6.2 Earthworms and vermicomposting
 - 6.3 Soil microorganisms: algae, fungi, actinomycetes and soil bacteria
 - 6.4 Role of soil microorganisms in ammonification, nitrification, denitrification, biological nitrogen fixation (Symbiotic & non-symbiotic)
 - 6.5 Soil organic matter and carbon nitrogen ratio
 - 6.6 Importance of soil organic matter
 - 6.7 Management of soil organic matter by the Nepalese farmers
 - 6.8 Nitrogen fixers, azolla, mycorrhizae, (phosphate solubilizing microbes)
- 7. Soil Fertility and Plant Nutrition** **10%**
- 7.1 Essential plant nutrients
 - 7.2 Visual symptoms of nutrient deficiencies and indicator plants
 - 7.3 Functions of essential plant nutrients in Plants
 - 7.4 Nutrient cycle (C,N,P, and S.) and its component and the soil, environmental and management factors
 - 7.5 Nutrient requirements and uptake and balance
 - 7.6 General soil fertility status of major Nepalese soils
 - 7.7 Soil testing, plant analysis and diagnostic techniques for improved soil fertility management
 - 7.8 Concepts of fertilizer use, integrated plant nutrient systems (IPNS) and organic farming and their significance in sustainable soil management in the Nepalese context
- 8. Manures and Fertilizers** **10%**
- 8.1 Sources and types of organic manures
 - 8.2 Farmyard manure (FYM), compost and their preparation, storage and applications
 - 8.3 Bio-fertilizers, inoculants and their use in Nepalese agriculture
 - 8.4 Green manures, their desirable characteristics, benefits and constraints
 - 8.5 Mineral fertilizers and their history in the Nepal
 - 8.6 Types of commercial fertilizers (straight, compound complexes, micronutrient) and their nutrient contents
 - 8.7 Fertilizers available in Nepalese Market

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नेपाल कृषि सेवा, स्वायत्त साइन्स समूह, राजपत्राङ्कित तृतीय श्रेणीका पदहरूको खुला र आन्तरिक प्रतियोगितात्मक
लिखित परीक्षाको पाठ्यक्रम

- 8.8 Behavior of N.P. & K. fertilized & their responses to crops in the Nepalese context
- 8.9 Fertilizer recommendation for their application techniques for major crops in Nepal
- 8.10 Fertilizer handling and storage situation in rural Nepal
- 8.11 Fertilizer regulation, marketing and quality control mechanism in Nepal

Section D- 20 Marks

- 9. Soil Survey and Classification 10%**
- 9.1 Importance of soil survey
 - 9.2 Soil survey types
 - 9.3 General soil classification
 - 9.4 Major soils of Nepal and their characteristics in suborder/great group levels of USDA taxonomy
 - 9.5 Use of geographic information system (GIS) & Remote sensing (RS) in agriculture research development
- 10. Soils and Water Conservation 10%**
- 10.1 Problems and causes of soil erosion in Nepal
 - 10.2 Importance of soil and water conservation in Nepal
 - 10.3 Factors affecting the soil erosion
 - 10.4 Methods of soil and water conservation
 - 10.5 Watershed management approach for soil and water conservation
 - 10.6 Institutions involved in soil and water conservations
 - 10.7 Examples of success and failure stories in soil water conservation in Nepal

द्वितीय पत्रको एकाईहरूको प्रश्नसंख्या निम्नानुसार हुनेछ

द्वितीय पत्रका खण्ड	A			B		C			D	
द्वितीय पत्रका एकाई	1	2	4	3	5	6	7	8	9	10
प्रश्न संख्या	1	1	1	1	1	1	1	1	1	1

विषयगत नमूना प्रश्नहरू (Sample questions)

1. What do you understand by integrated plant nutrient system (IPNS) concept and how it is disseminated to farmers in Nepal?
2. Discuss with examples the types of phosphate fertilizers and their suitability according to the soil types for crop production
3. Draw a diagram of a Nitrogen Cycle (showing their major components) in a soils and plant system representing a typical hill farming system of Nepal
4. List the major soils that found in Nepal and discussion their distribution, production potentiality and management constraints
5. What is soil acidity? State the effects of liming and factors affecting the application
6. What types of erosion is most active and problematic in the hills and mountainous region of Nepal?
7. What is soil survey? Describe in brief the type of soil survey and their application for various purposes