द्वितीय पत्र (Paper II): Technical Subject

Section A- 30 Marks

1. Water Resources and Irrigation 10%

1.1 Water resources strategy, development and management, and potentials for irrigation

1.2 GoN current plan, policy and regulations in irrigation development and management

1.3 Definition and function of irrigation and its advantages

1.4 Status of irrigation development in Nepal

2. Irrigation and Drainage Engineering

2.1 Planning Canal Irrigation Schemes (10%)

2.1.1 Soil moisture and crop relationships
- General classification of soil for agricultural purpose
- Soil moisture and crop water requirement
- Factors affecting crop water requirement
- Crop water requirement calculation by Penman method
- Principal crops, their seasons and their water requirement

2.1.2. Estimation of water requirements of selected command area

2.1.3 Considerations in canal alignment and layout

2.1.4 Irrigation duty, delta, base period, kor depth

2.1.5 Classification of canals according to function; types of permanent and inundation canals

2.1.6 Components of the canal system, major canal, branch canal, distributaries and water courses

2.2 Design of Water Conveyance and Control (10%)

2.2.1 Design of open channels

2.2.2 Design of underground pipe conveyance system

2.2.3 Structures for water control, distribution and cross-drainage

2.2.4 Design of lined channels, lining materials and economics of lining

2.2.5 Specific design considerations for hilly irrigation canals

Section B- 30 Marks

2.3 On-Farm Water Management (10%)

2.3.1 Farm irrigation requirements

2.3.2 Soil, plant, climatic factors affecting irrigation scheduling

2.3.3 Methods of applying water in irrigation fields: surface, subsurface and sprinkler

2.3.4 Planning farm irrigation delivery

2.3.5 Hydraulics of gravity irrigation methods- check basin, border, strip and furrow

2.3.6 Hydraulics of pressurized irrigation methods- sprinkler and drip Irrigation

2.3.7 Land development, grading and leveling

2.4 Development and Management of Ground Water and Water Lifting Devices (10%)

2.4.1 Ground water exploration

2.4.2 Aquifer characteristics and ground water yield

2.4.3 Design of wells

2.4.4 Tube-well drilling and well development

2.4.5 Pump classification
2.4.6 Reciprocating, centrifugal, turbine, submersible and propeller pumps
2.4.7 Pumps for small scale irrigation- hydraulic ram, treadle pump
2.4.8 Selection of pumps

2.5 Planning and Management of Irrigation System (10%)

2.5.1 General irrigation system planning
2.5.2 Distribution system : water management and its control ; different types of canal outlets and their design considerations
2.5.3 Organization and irrigation management
2.5.4 Development of a small scale irrigation project
2.5.5 Participatory irrigation management
2.5.6 Operation and maintenance of irrigation systems
2.5.7 Institutional aspects of irrigation system management

Section C- 20 Marks

3. Soil and Water Conservation Engineering 20%

3.1 Mechanics of Soil Erosion and Measures for Soil Erosion Control (10)

3.1.1 Mechanics of water and wind erosion
3.1.2 Forms of soil erosion and their investigation
3.1.3 Causes and mechanics of debris flows and landslides
3.1.4 Soil loss measurement and monitoring- sediment sampling, erosion plot studies, peer catchment's studies
3.1.5 Biological and cultural measures
3.1.6 Mechanical measures- terracing, vegetated waterways
3.1.7 Structural measures- Check-dams for gully control, stream-bank erosion control structures
3.1.8 Bio-engineering measures

3.2 Water Induced Disaster and Mitigation, Specialized Soil and Water Conservation Activities and Watershed Management (10)

3.2.1 Risk, hazard and vulnerability
3.2.2 Debris flows, landslides and their control
3.2.3 Stages of rivers and their meandering process; river training and its necessity
3.2.4 Methods of river training and their designs
3.2.5 Effects of degradation on river structures
3.2.6 Flood control and its necessity, methods of flood control and their designs
3.2.7 Soil and water management in water deficit areas
3.2.8 Systems of water harvesting and recycling
3.2.9 Design of farm ponds
3.2.10 Control and rehabilitation of debris flows, landslides and landslips
3.2.11 Control of mining erosion
3.2.12 Control of roadside erosion
3.2.13 Morphological parameters of watershed
3.2.14 Hydro-meteorological parameters affecting water and sediment yields and their gauging
3.2.15 Investigation and prioritization of watersheds
3.2.16 Remote sensing techniques for evaluation of watershed based natural resources
3.2.17 Development of coherent watershed management plan

Section D- 20 Marks

4 Farm Power and Machinery, and Heavy Equipment 10%

4.1 Farm Power Sources

4.1.1 Human, animal, mechanical and electrical power sources in agriculture
4.1.2 Animal power harnesses
4.1.3 Farm tractors
4.1.4 Internal combustion engines
4.1.5 Non-conventional energy use in agriculture

4.2 Farm Machines and Equipments: Mechanism and Management

4.2.1 Tillage implements
4.2.2 Equipments for seeding, planting and transplanting
4.2.3 Machines and equipments for weeding and intercultural operations
4.2.4 Equipments for plant protection
4.2.5 Harvesting equipments for cereals, roots and tubers
4.2.6 Equipments for threshing and pre-Processing
4.2.7 Irrigation equipments
4.2.8 Machines and equipments for land development
4.2.9 Cost of operation and maintenance of farm machines and equipments
4.2.10 Selection of farm machines

4.3 Introduction to Heavy Equipment

4.3.1 Bulldozer, Wheel loader, Excavator, Dragline, Grader, Static roller & Vibration roller, Truck and their applications
4.3.2 Calculation of production work done by the above equipments, estimation of expenditure incurred/hour to run the above equipments; and operation, maintenance system, and safety measures

5 Farm and Rural Infrastructure and Energy in Irrigation Command 10 %

5.1 Farm Structures

5.1.1 Planning, layout and functional requirements of various farm housings, shelters and storage structures, green house and poly house
5.1.2 Environmental control

5.2 Structures for Fishery and Aquaculture

5.2.1 Design, layout and functional requirements of fish ponds
5.2.2 Functional requirements of hatchery for fish breeding
5.2.3 Equipments and facilities for commercial fish farming

5.3 Rural Roads

5.3.1 Approach to rural road planning
5.3.2 Geometries in the designs of rural roads
5.3.3 Structures for cross-drainage and roadside erosion control

5.4 Rural Water Supply and Sanitation

5.4.1 Approach to planning rural water supply scheme and quality considerations
5.4.2 Structures for intake, storage and distribution systems
5.4.3 Pipe and pipe fittings in water distribution system
5.4.4 Design and construction of Ferro-cement, masonry and RCC tanks
5.4.5 Solid waste disposal by land filling and composting
5.4.6 Design of pit latrine, septic tanks and soak pits

5.5 Suspended and trail bridges

5.6 Rural Energy

5.6.1 Sources of energy and their classification
5.6.2 Rural energy consumption pattern in Nepal
5.6.3 Active and passive use of solar energy in agriculture and conversion devices
5.6.4 Energy from biomass: biomass gasification, anaerobic digestion of biomass
5.6.5 Wind energy harnessing system
5.6.6 Operation and management of micro-hydroelectric systems in Nepal
5.6.7 Planning, installation, operation and management of rural electrical system
5.6.8 Energy auditing and development for rural development

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 ।