

लोक सेवा आयोग
नेपाल इन्जिनियरिङ्ग सेवा, सिभिल समूह, इरिगेशन उपसमूह, राजपत्रांकित द्वितीय श्रेणी, खुला र आन्तरिक
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम
द्वितीय पत्र
Technical Subject (Civil Engineering – Irrigation)

Section (A)

1. **Water Resources Planning, Conservation and Management**
 - 1.1 Water resources potential and water resources development history of Nepal
 - 1.2 Fundamentals of water resources planning, including that for storage, inter-basin diversion and multi-purpose projects
 - 1.3 Mapping the national initiatives of water resources planning and identifying the bottlenecks
 - 1.4 Feasibility studies and investigation for water resources development projects
 - 1.5 Stakeholders' engagement for water resources planning, conservation and management
 - 1.6 International treaties and agreements on water resources to which Nepal is a party
2. **Irrigation Water Storage and Diversion**
 - 2.1 Water storage options: watershed management and soil water storage; groundwater; rain water harvesting and storage; reservoir storage; intermittent storage; need and options for bridging the storage gap, hydrologic computation for irrigation and flood management projects
 - 2.2 Design of headwork: components, design considerations, data and tools, practical challenges, specific considerations for headwork site and type selection in Hills and Terai
 - 2.3 Enhancing resilience of water diversion structures to climate-induced disaster risks: understanding of climate risk, water-induced disaster, and resilience concept; measures for enhancing resiliency of water infrastructure projects to climate-induced disaster risks
 - 2.4 Inter-basin water transfer projects (IBWTP): opportunities and challenges for implementing multi-purpose storage projects in Nepal; rational and potential for developing IBWTPs in Nepal; issues/challenges experienced with ongoing/planned projects; possible ways to overcome the challenges
 - 2.5 Sediment management in irrigation system: sedimentation issues on reservoir and canals and their implications; potential measures for sediment management; system planning, technology and design philosophy for sediment management

Section (B)

3. **Surface Water Irrigation System**
 - 3.1 Understanding of surface irrigation system: layout of a surface irrigation system with key components and their names; functions of key components; guiding principles for selection and prioritization of surface irrigation system; practical challenges for surface irrigation systems

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- 3.2 Designing irrigation system : design considerations, tools and data for surface irrigation system design; headworks, canals, cross-drainage works, water regulating structures, farm drainage and drainage structures, specific features in designing irrigation systems in hills and mountains
 - 3.3 Water availability assessment: estimation of inflows in headwork, rainfall-runoff relationships, water balance analysis
 - 3.4 Water demand assessment: soil plant and water relationships, crop water requirements, irrigation water requirements, irrigation efficiencies, other uses of irrigation water
 - 3.5 Irrigation system failure: design success and failure stories of surface irrigation systems in Nepal; possible types and causes of failures of irrigation headworks and associated hydraulic structures (case analysis)
4. **Water Resources/Irrigation Project Implementation**
- 4.1 Project cycle for water resources/irrigation projects
 - 4.2 Economics: financial and economic analysis of irrigation projects, various economic indicators
 - 4.3 Resources mobilization: need and mobilization of human, financial and other resources
 - 4.4 Challenges for implementation of irrigation and water resources management projects: land acquisition cost and design of irrigation system for reducing land acquisition, urbanization and its effects in irrigation; and related other challenges
 - 4.5 Physical, social, environmental and institutional dimensions for developing water resources projects in Nepal

Section (C)

5. **Groundwater (GW) Irrigation System**
- 5.1 Components and functions of a groundwater irrigation system; practical challenges for implementing groundwater irrigation systems
 - 5.2 Design considerations, tools and data for groundwater irrigation system design; design of water wells (deep, shallow)
 - 5.3 Well construction and development
 - 5.4 Groundwater exploration techniques
 - 5.5 Factors affecting groundwater irrigation: power tariff policy; food security concerns, water-use efficiency, and groundwater conservation and management
 - 5.6 Management of GW systems in single and cluster mode of development: Agency Management, Water User's Association (WUA) Management, Irrigation Management Company, Irrigation Management Board, etc.
6. **Irrigation Technologies**
- 6.1 Field application technologies: furrow, border, basin, sprinkler and drip irrigation systems: concept, pros and cons, design consideration, data and tools, practical challenges

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- 6.2 Lift irrigation system: concept, potential, applicability, intake site selection, operation and maintenance challenges, past experience and ongoing initiatives
- 6.3 Canal lining: types, pros and cons, economics, development of canal lining technology (earthen, treated soil lined, membrane lined, concrete lined, geo-cell lined, shotcreting, etc.)
- 6.4 Tunnel boring machine (TBM) technology: concept, relevancy for water resources projects, Nepal's experience, future applicability
- 6.5 Irrigation modernization: concept, components, examples, challenges, Nepal's experience

Section (D)

7. Institutional and Policy Landscape

- 7.1 Overview of water resources, irrigation and closely related policies and effectiveness of their implementation
- 7.2 Overview of institutional set-up/mechanism and critical reflection on appropriate institutional set-up in view of federalism
- 7.3 Evolution of policy and institutional reforms along with progress in water resources and irrigation development in Nepal
- 7.4 Inter-sectoral coordination: need, complexities, unravelling the issue in connection with policies, programs and institutional linkage between federal, provincial and local bodies in Nepal
- 7.5 Strategic Environmental and Social Assessment (SESA): concept, principles, process/phases, country experience and challenges

8. Irrigation Management and Sustainability

- 8.1 General concepts: water allocation, irrigation management, system operation and maintenance, operation/ regulation of headwork, irrigation systems classification based on management & performance
- 8.2 Performance assessment of irrigation systems: physical system, institutional/social system and their inter-relation in irrigation system performance; Joint management concept and sustainability issues; WUAs
- 8.3 Irrigation management transfer: concept, process, expected outcomes, challenges, Nepal's experience and ways ahead
- 8.4 Management tools: Philosophy and parameters for preparation of canal operation plan (COP), canal maintenance plan (CMP), and asset management plan (AMP), resources mobilization/financing for irrigation system operation and management; irrigation water pricing (concept, policy measures, regional experiences, Nepal's efforts and status); indigenous and local knowledge of managing FMIS in Nepal; practical challenges of implementing management tools in the context of decreasing availability of manpower in irrigation and agricultural sector and need of promoting use of farm equipment
- 8.5 Harmonizing the efforts of three tiers of government for Management Operation and Maintenance (MOM) of irrigation system

Section (E)

9. Irrigation as an Interdisciplinary Issues

- 9.1 Conjunctive use management: concept, design consideration and challenges
- 9.2 Evolution of interdisciplinary approaches: River Basin Management (RBM), Integrated Water Resources Management (IWRM), Resources Nexus; Nature-Based Solution (NBS)
- 9.3 Environmental and social issues: various types of assessments for environmental and social aspects, environmental benefits of irrigation, irrigation contribution to livelihood
- 9.4 Climate change and irrigation: challenges and extent of climate change impacts on irrigation water availability, demand, crop yield, and river management; adaptation to climate change in irrigation and river management practices
- 9.5 Contribution of irrigation to food security, water security and ecosystem security

10. River Management

- 10.1 River morphology, river hydraulics and sediments management plan
- 10.2 River training/management works: purpose, types, design considerations, data and tools; practical challenges for construction of river training/management works; causes of failure of river training works and potential solutions for strengthening; erosion and landslide management and use of Sabo technology
- 10.3 River training technology: parameters of design and appropriateness of Embankment, spur, stud, big boulder riprap, sheet pile, toe protection, concrete block riprap, bio-engineering etc.
- 10.4 Addressing inundation problem: causes, institutional efforts to mitigate, existing bilateral mechanisms and their effectiveness
- 10.5 River health: concept of river health, river materials extraction, water way (or right of way of river); strategies for ensuring healthy rivers
- 10.6 Early warning systems, flood fighting and emergency river control works: flood forecasting; bamboo piling, poly/geo cell bag riprap, early warning system; community's role in disaster management

Section (F)

11. Service/Group/Sub-group related- Specific (Acts, Rules and Policies)

- 11.1 जलश्रोत ऐन, २०४९
- 11.2 जलश्रोत नियमावली, २०५०
- 11.3 सिंचाइ नियमावली, २०५६
- 11.4 राष्ट्रिय जलस्रोत नीति, २०७७
- 11.5 राष्ट्रिय सिंचाइ नीति, २०८०
- 11.6 नदी तथा जल उत्पन्न विपद् व्यवस्थापन राष्ट्रिय नीति, २०८०
- 11.7 राष्ट्रिय जल योजना, २०६२ (National Water Plan, 2005)

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11.8 राष्ट्रिय जलस्रोत रणनीति, २०५८ (National Water Strategy, 2002)

11.9 कृषि विकास रणनीति, २०६१ (Agriculture Development Strategy, 2015)

11.10 सिंचाइ गुरु योजना (Irrigation Master Plan, 2019)

नोट : यस पत्रमा माथि उल्लिखित पाठ्यक्रमको खण्ड (F) बाहेकका प्रत्येक खण्ड (Section) बाट कम्तीमा एक प्रश्न समावेश हुने गरी लिखित परीक्षामा देहाय बमोजिमको संख्या र अङ्कभारका प्रश्नहरू सोधिने छ। तर खण्ड (F) बाट ५ अङ्कभारको छोटो उत्तर आउने एक प्रश्न र १० अङ्कभारको लामो उत्तर आउने एक प्रश्न गरी दुई प्रश्नहरू सोधिने छ।

पत्र	विषय	पूर्णाङ्क	उर्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या × अङ्क	समय
द्वितीय	Technical Subject	१००	४०	विषयगत (Subjective)	1 × 5 & 1 × 10 = 15 (Short & Long Answers) 3 × 15 = 45 (Critical Analysis) 2 × 20 = 40 (Problem Solving)	३ घण्टा

पाठ्यक्रम लागू मिति :- २०८१/०३/३० देखि