लोक सेवा आयोग

नेपाल इन्जिनियरिङ्ग सेवा, सिभिल समूह, हाइड्रोलोजी उपसमूह, रा.प.द्वितीय श्रेणी, खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र -

Technical Subject (Civil Engineering - Hydrology)

Section (A)

1. **Hydrological Principles and Hydrological Measurements**

1.1 **Hydrology in Nepal:** River systems, Water balance, Transboundary rivers, Hydrological development, Hydro-meteorological and sediment database, Hydrological network, Problems and challenges in network design

1.2 **Precipitation:** Solid and liquid precipitation, Intensity Duration Frequency (IDF) curve, Probable Maximum Precipitation (PMP), Depth Area Duration Relationship (DAD) curve, Temporal and spatial variation of precipitation, Precipitation measurements, Errors in measuring precipitation data

1.3 **Losses:** Interception, Depression storage, Evaporation and evapotranspiration measurements, Infiltration and Soil moisture measurements

1.4 **Runoff:** Runoff components, Rainfall-runoff relations, interpretations and limitations, Stage and discharge measurement techniques, Bank operated system of discharge measurement, Rating curve preparation and applications

1.5 **Sedimentation:** Estimation of sediment yield, Sediment measurement techniques, Sediment routing and sediment rating curves, Sediment deposition in reservoirs, Sediment management

1.6 **Water Quality:** Properties of water, Water pollution, Water quality sampling, Water quality simulation

1.7 **Remote Sensing:** Hydrological measurements using telemetry, near real time measurement, measurements using remote sensing, land use change, satellite monitoring of water bodies

1.8 **Data Management:** Data screening, Data quality assessment, Quality management system (QMS), Standard Operating Procedure (SOP) for data analysis and publication, national and international practices in data sharing mechanism, Water resources information system

Section (B)

2. **Hydrologic Analysis**

2.1 **Estimation of Flow in Ungauged River Basin:** Statistical and catchment modeling in national and international practices

2.2 **Flood and Drought Analysis:** Design flood, Probable maximum flood (PMF), Flash flood, Glacier lake outburst flood, landslide dammed outburst flood, cloud burst flood, Unit hydrograph, Flood frequency analysis, Regional and empirical methods, Hydrologic modeling, low flow frequency analysis, regionalization

method of low flow estimation, Hydrological, meteorological and agricultural drought, Flood and drought management in Nepal, Hydrological risk and insurance

2.3 **Hydrologic and Hydraulic Routing:** Linear reservoir model, Muskingum method, Muskingum-Cunge method, Kinematic wave, diffusive wave and dynamic wave method

2.4 **Snow and Glacier Hydrology:** Snow formation and accumulation, Melting of snowpack, Snowmelt indexes, Glacier mass balance, Snow/Glacier melt runoff, Evolution of glacial lakes and glacial lake outburst flood (GLOF)

2.5 **Groundwater Hydrology:** Ground water aquifers and their type, Stream aquifer interaction, Ground water flow equations, Ground water yield, Radial flow towards well in unconfined and semi-confined aquifer, Ground water monitoring network, Recharge of ground water aquifers

2.6 **Urban Hydrology:** Rational method, Issues in urban flooding, Challenges and opportunities in urban hydrology

2.7 **Economics and Water Resources:** Economics of water resources, flood control and multipurpose project, Principles of optimization in planning water resources project, Role of hydrology in integrated water resources management

Section (C)

3. **Hydrological Applications**

3.1 **Hydrologic Modeling:** Classification of hydrologic models, Model components and construction, Model calibration and validation, Application of hydrologic models in Nepal, Practical aspects of modeling, Uncertainties and interpretations techniques in hydrological simulations, Use of global dataset in modeling, Problems and challenges in modeling, Selection of suitable model

3.2 **Flow Forecasting and Dissemination:** Riverine flood forecasting, flash flood forecasting, Low flow forecasting, short range, medium range and seasonal flow forecasting, Flood hazard and risk assessments, Simulation of warning level and danger level, Development of early warning system, Flow forecasting and dissemination in national and international practices, Standard operating procedure for early warning, Flow forecasting and dissemination in transboundary rivers, Problems and challenges in flow forecasting and early warning

3.3 **Modern Techniques in Hydrometeorology:** Remote sensing in hydrometeorological observations in global and national scale, Real time data monitoring system, Big data analysis techniques, Satellite derived rainfall, hydrological assessments using remote sensing

3.4 **Water Induced Disaster:** Types of water induced disaster and their management, Debris flow mechanism, Modeling of debris flow, Snow avalanche and preventive measures, Disaster management cycle, Integrated management of multi-hazard disasters, Fundamental problems associated with disasters, Roles and responsibilities of a hydrologist in disaster management

3.5 **Hydro-Climatic Change:** Climate change studies and scenario simulations, Impacts of climate change on hydrological processes on global and national level, Impact of climate change on snow and glacier system in Nepal's Himalayas, Impact of climate change on rainfall-runoff response in Nepal, Impact of climate change on extreme flows and flow regimes, Climate change adaptation and mitigation measures

Section (D)

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

4.1 जलस्रोत ऐन, २०४९
4.2 जलविद्युत ऐन, २०४९
4.3 सिंचाइ नियमावली, २०५६
4.4 राष्ट्रिय जलस्रोत नीति, २०७७
4.5 राष्ट्रिय जल योजना, २०६२ (National Water Plan, 2005)
4.6 जलस्रोत रणनीति, २०५८ (National Water Strategy, 2002)
4.7 राष्ट्रिय सिंचाइ नीति, २०८०
4.8 जल-विद्युत विकास नीति, २०५८ (Hydropower Policy, 2001)
4.9 नदी तथा जल उत्पन्न विपद् व्यवस्थापन राष्ट्रिय नीति, २०८०
4.10 राष्ट्रिय संरक्षण कार्यनीति (National Conservation Strategy, 1988)
4.11 विश्व मौसम संगठन (WMO) अन्तर्गत "जलस्रोत तथा जलविज्ञान विभागको" नीति तथा चालू कार्यक्रम
4.12 UNESCO अन्तर्गत International Hydrology Programme (IHP) को नीति तथा चालू कार्यक्रम
4.13 UNEP अन्तर्गत जलस्रोत तथा जलवायु परिवर्तन सम्वन्धित विषयहरु
4.14 जलवायु परिवर्तन सम्वन्धी महासन्धि, १९९२ एवं क्योटो प्रोटोकल, १९९७

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