लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, हाइड्रोलोजी उपसमूहको राजपत्राङ्कित तृतीय श्रेणी पदको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र (Paper II): Technical Subject

Section A- 30 Marks

1. Hydrological observations (instruments and methods) 20%

1.1. Precipitation: gauge location; non-recording and recording gauges; snowfall measurement; observations by satellite

1.2. Snow cover: water equivalent; depth and extent of snow cover; ground surveys; radioisotope snow gauges; snow pillows; natural gamma radiation

1.3. Evaporation and evapotranspiration: pan evaporation; soil evaporimeters; lysimeters; snow evaporimeters; short and long wave radiation; indirect methods

1.4. Water levels of rivers, lakes and reservoirs: gauges and procedures for measurement of stage; frequency of stage measurements

1.5. Discharge measurements : current meters; float method; dilution method; ultrasonic method; electromagnetic method; indirect methods; measurement under ice cover

1.6. Stream gauging stations: selection of site; control sections; stage-discharge relationships

1.7. Water temperature: infra-red radiation thermometer; measurement of water surface temperature for lake and reservoir evaporation

2. Design of hydro-meteorological network (Unit 2 & 3:10%)

2.1. General principles for design of networks: general requirements; optimum network; minimum network; optimum use of existing stations in organizing a minimum network; data to be considered in determining network density; quality of data to be collected

2.2. Density of observation stations for a minimum network: factors affecting the density; minimum density limit of climatological networks; hydrometric network of minimum density

2.3. Integration of bench-mark stations and representative basins in the network

3. Snow and glacial hydrology

3.1. Formation of snow and ice; methods of observation

3.2. Basic concept of glaciers, variation of glaciers, process of snow and glacier melting; monitoring of glaciers

3.3. Glacier Lake Outburst Floods (GLOFs)

Section B- 20 Marks

4. Collection, processing and publication of hydro-meteorological data 10%

4.1. Collection: observational procedures; transmission of hydrological observations; quality control; storage of data

4.2. Special data collection: weather radar data and extreme rainfall; extreme river stages and discharges

4.3. Stream flow computation: computation of average gauge height; computation of average discharge; computation of average discharge under ice cover; quality control of stream flow data; data processing through computer software

4.4. Publication: purposes; requirements of hydrology; frequency of publication; contents and formats

5. Ground water hydrology 10%

5.1. Occurrence and distribution of ground water; geological formations (aquifers, aquicludes; aquitards); artesian - gravity well
5.2. Flow equations for confined and unconfined aquifers; Dupit's assumption
5.3. Water wells and their types; testing of wells
5.4. Well hydraulics; Darcy's law; permeability; steady and unsteady flow; specific capacity and well efficiency; well losses
5.5. Soil moisture: weight method and electrical resistance method

Section C- 30 Marks

6. Hydrological analysis 30%

6.1. Catchment characteristics and their effects to surface runoff
6.2. Interpretation of precipitation data: adjustment of data, double-mass cure analysis, evaluation of physiographic effects; average depth over a catchment; storm rainfall studies; depth-area-duration analysis, probable maximum precipitation (PMP); rainfall frequencies; drought severity; rainfall intensities
6.3. Interpretation of stream flow data: adjustment of data; spatial distribution, maps of average annual run-off; temporal distribution of runoff volume, unit hydrograph, stream flow routine, low flow analysis, flow duration curves, low for frequencies, statistical analysis of droughts, recession curve analysis, flood frequencies, statistical analysis of floods, regional generalization of flood characteristics; long period trends
6.4. Evaporation and evapotranspiration: water budget method, energy budget method aerodynamic approach, combination of aerodynamic and energy balance equations, pan coefficient method
6.5. Runoff relations with rainfall and snowmelt: regressions analysis; runoff by storm periods, antecedent-moisture index method, initial base flow as index to rainfall runoff, moisture accounting techniques; runoff from short period snowmelt; monthly, seasonal and annual water budget
6.6. Hydrological analysis: estimation of required reservoir storage capacity, multipurpose storage requirements; reservoir system design; environmental effects.
6.7. Design of urban and small rural watershed drainage works: regional method; unit hydrograph and time area curves; distributed system models; rainfall data required for design of drainage works
6.8. Influences of hydrological factors on water quality : general causes of water quality changes, reaction to pollutants; eutrophication; self-purification; absorption and accumulation; rise in water temperature

Section D- 20 Marks

7. Sediment measurement techniques and analysis 10%

7.1. Source of sediment; geo-morphology of rivers; seasonal variation of sediment load; types of sediment; physical and chemical characteristics of water (turbidity, color, conductivity etc.)
7.2. Measurement of sediment; bed load; suspended load
7.3. Sediment yields; sediment yield modeling; Musgrave equation; Universal Soil-Loss Equation (USLE); runoff-sediment relation; sediment concentration graph; unit sediment graph; reservoir and lake sedimentation
7.4. Estimation of bed load and suspended load; estimation of sediment load in the absence of local data

8. Hydrological forecasting **10%**

8.1 Hydrological forecasts and warnings: classification of hydrological forecasts, types of warnings

8.2 Hydrological forecasting services: operation; organization; collection of data and issue of forecasts and warnings; data requirements accuracy and frequency of data measurements, operational data acquisition, use of radar observations for hydrological forecasting, use of snow and ice observations from meteorological satellites, technical equipment for hydrological forecasting services

8.3 Forecast method: seasonal and annual flow forecasts; stages and flows, flood forecasts, rainfall runoff computations, conceptual catchment models, stream flow simulation; short and long term forecasts of ice formation and break up

8.4 Evaluation and verification of hydrological forecasts: formulation of hydrological forecasts; evaluation of forecasting method; verification of operational forecasts; relation between meteorological and hydrological forecasting; benefit-cost analysis for hydrological forecasting

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नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, हाइड्रोलोजी उपसमूहको राजपत्राङ्कित तृतीय श्रेणी पदको खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

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 ।