लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, जियोलोजी समूह अन्तर्गतका जनरल जियोलोजी, हाड्रोजियोलोजी र इन्जिनियरिङ्ग जियोलोजी उपसमूह, राजपत्र अनंकित प्रथम श्रेणीका पदहरूको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :– लिखित परीक्षा (Written Examination) पूर्णाङ्क :– २००

द्वितीय चरण :- अन्तर्वार्ता (Interview) पूर्णाङ्क :– ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण : लिखित परीक्षा (Written Examination) **पूर्णाङ्क :– २००**

पत्र	विषय	पूर्णाङ्क	उर्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या ×अङ्क	समय
प्रथम	सामान्य ज्ञान र सार्वजनिक व्यवस्थापन (General Awareness & Public Management)	१००	४०	वस्तुगत (Objective)	बहुवैकल्पिक प्रश्न (MCQs)	२० प्रश्न ×२ अङ्क	४५ मिनेट
	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)					३० प्रश्न ×२ अङ्क	
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)	१००	४०	विषयगत (Subjective)	छोटो उत्तर (Short Answer) लामो उत्तर (Long Answer)	१२ प्रश्न × ५ अङ्क ४ प्रश्न ×१० अङ्क	२ घण्टा १५ मिनेट

द्वितीय चरण : अन्तर्वार्ता (Interview) **पूर्णाङ्क :– ३०**

पत्र /विषय	पूर्णाङ्क	उर्तीर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता (Interview)	३०		मौखिक (Oral)

द्रष्टव्य :

१. यो पाठ्यक्रमको योजनालाई प्रथम चरण र द्वितीय चरण गरी दुई चरणमा विभाजन गरिएको छ ।

२. लिखित परीक्षाको प्रश्नपत्रको माध्यम भाषा पाठ्यक्रमको विषयवस्तु जुन भाषामा दिइएको छ सोही भाषाको आधारमा नेपाली वा अंग्रेजी मध्ये कुनै एक मात्र भाषा हुनेछ । तर विषयवस्तुलाई स्पष्ट गर्नुपर्ने अवस्थामा दुवै भाषा समेत प्रयोग सकिने छ ।

३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।

४. प्रथम पत्र र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ । तर एकैदिनमा परीक्षा लिइनेछ ।

५. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

६. वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षरहरु (Capital letters): A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षरहरू (Small letters): a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।

७. बहुवैकल्पिक प्रश्न हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।

८. विषयगत प्रश्नहरुको हकमा तोकिएको अंकको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुईभन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिने छ ।

९. विषयगत प्रश्न हुनेका हकमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोहीखण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

१०. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिइए अनुसार हुनेछ ।

११. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।

१२. प्रथम चरणको परीक्षाबाट छनोट भएका उम्मेदवारलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।

१३. यस भन्दा अगाडि लागू भएको माथि उल्लेखित सेवा, समूहको पाठ्यक्रम खारेज गरिएको छ ।

१४. पाठ्यक्रम लागू मिति : - २०८०/१०/२२

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, जियोलोजी समूह अन्तर्गतका जनरल जियोलोजी, हाड्रोजियोलोजी र इन्जिनियरिङ्ग जियोलोजी उपसमूह, राजपत्र अनंकित प्रथम श्रेणीका पदहरूको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम पत्र (Paper I) :-

सामान्य ज्ञान र सार्वजनिक व्यवस्थापन तथा सेवा सम्बन्धित कार्य-ज्ञान

भाग (Part I) :

सामान्य ज्ञान र सार्वजनिक व्यवस्थापन

(General Awareness and Public Management)

खण्ड (Section - A) : (१० प्रश्न× २ अङ्क = २० अङ्क)

1. **सामान्य ज्ञान (General Awareness)**
   - 1.1 नेपालको भौगोलिक अवस्था, प्राकृतिक स्रोत र साधनहरू
   - 1.2 नेपालको ऐतिहासिक, सांस्कृतिक र सामाजिक अवस्था सम्वन्धी जानकारी
   - 1.3 नेपालको आर्थिक अवस्था र चालु आवधिक योजना सम्वन्धी जानकारी
   - 1.4 जैविक विविधता, दिगो विकास, वातावरण, प्रदुषण, जलवायु परिवर्तन र जनसंख्या व्यवस्थापन
   - 1.5 मानव जीवनमा प्रत्यक्ष प्रभाव पार्ने विज्ञान र प्रविधिका महत्वपूर्ण उपलब्धिहरू
   - 1.6 जनस्वास्थ्य, रोग, खाद्य र पोषण सम्बन्धी सामान्य जानकारी
   - 1.7 नेपालको संविधान (भाग १ देखि ५ सम्म र अनुसूचीहरू)
   - 1.8 संयुक्त राष्ट्रसंघ र यसका विशिष्टीकृत संस्था सम्वन्धी जानकारी
   - 1.9 क्षेत्रीय संगठन (सार्क, बिमस्टेक, आसियान र युरोपियन संघ) सम्वन्धी जानकारी
   - 1.10 राष्ट्रिय र अन्तर्राष्ट्रिय महत्वका समसामयिक गतिविधिहरू

खण्ड (Section - B) : (१० प्रश्न× २ अङ्क = २० अङ्क)

2. **सार्वजनिक व्यवस्थापन (Public Management)**
   - 2.1 कार्यालय व्यवस्थापन (Office Management)
     - 2.1.1 कार्यालय (Office) : परिचय, महत्व, कार्य र प्रकार
     - 2.1.2 सहायक कर्मचारीका कार्य र गुणहरु
     - 2.1.3 कार्यालय स्रोत साधन (Office Resources): परिचय र प्रकार
     - 2.1.4 कार्यालयमा सञ्चारको महत्व, किसिम र साधन
     - 2.1.5 कार्यालय कार्यविधि (Office Procedure) : पत्र व्यवहार (Correspondence), दर्ता र चलानी (Registration & Dispatch), फाइलिङ (Filing), परिपत्र (Circular), तोक आदेश (Order), टिप्पणी लेखन र टिप्पणी तयार पार्दा ध्यान दिनुपर्ने कुराहरू
     - 2.1.6 अभिलेख व्यवस्थापन (Record Management)
   - 2.2 निजामती सेवा ऐन र नियमावलीमा भएका देहायका व्यवस्थाहरू
     - 2.2.1 निजामती सेवाको गठन, संगठन संरचना, पदपूर्ति गर्ने तरिका र प्रक्रियाहरू
     - 2.2.2 कर्मचारीको नियुक्ति, सरुवा, बढुवा, बिदा, विभागीय सजाय र अवकाश
     - 2.2.3 कर्मचारीले पालन गर्नुपर्ने आचरण, नैतिक दायित्व र कर्तव्यहरू
   - 2.3 संघीय मामिला तथा सामान्य प्रशासन मन्त्रालय सम्बन्धी जानकारी
   - 2.4 संवैधानिक निकाय सम्बन्धी जानकारी
   - 2.5 सरकारी बजेट, लेखा र लेखापरीक्षण प्रणाली सम्बन्धी सामान्य जानकारी
   - 2.6 सार्वजनिक सेवा प्रवाहको अर्थ, सेवा प्रवाह गर्ने निकाय, तरिका र माध्यमहरु
   - 2.7 मानव अधिकार, सुशासन र सूचनाको हक सम्वन्धी सामान्य जानकारी
   - 2.8 सार्वजनिक बडापत्र (Public Charter)
   - 2.9 व्यवस्थापनको अवधारणा तथा सार्वजनिक व्यवस्थापनमा निर्देशन, नियन्त्रण, समन्वय, निर्णय प्रक्रिया, उत्प्रेरणा र नेतृत्व सम्वन्धी जानकारी
   - 2.10 मानवीय मूल्य मान्यता (Human Values), नागरिक कर्तव्य र दायित्व तथा अनुशासन

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, जियोलोजी समूह अन्तर्गतका जनरल जियोलोजी, हाड्रोजियोलोजी र इन्जिनियरिङ्ग जियोलोजी उपसमूह, राजपत्र अनंकित प्रथम श्रेणीका पदहरूको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

भाग (Part II) :-

सेवा सम्बन्धित कार्य-ज्ञान (Job Based - Knowledge)

(३० प्रश्न× २ अङ्क = ६० अङ्क)

1. **Physical Geology and Geology of Nepal Himalaya**
   - 1.1 The science of geology and its branches
   - 1.2 Geologic time scale; hydrologic cycle and rock cycle
   - 1.3 Internal structure of the earth, the crust, mantle and core, lithosphere and asthenosphere, pressure and temperature inside the earth
   - 1.4 Earthquakes and faults; mechanism of earthquake, seismic waves; seismograph, magnitude and intensity of earthquakes, liquefaction, forecast and prediction of earthquakes, earthquakes in Nepal
   - 1.5 History of seismological monitoring in Nepal Himalaya
   - 1.6 Geological works of surface water, groundwater, glacier and wind
   - 1.7 Physiography and tectonic divisions of the Nepal Himalaya
   - 1.8 Evolution of the Himalaya
   - 1.9 Structures and stratigraphy of different tectonic zones of Nepal Himalaya

2. **Structural Geology**
   - 2.1 Definition and scope of structural geology
   - 2.2 Geological map and cross-section; orientation of a line (trend and plunge) and a plane (dip and strike); geological compass; stereographic projection; stress and strain, stress in two dimensions; Mohr circle and its use
   - 2.3 Primary structures and their importance in structural geological interpretation, unconformity
   - 2.4 Folds, classification of folds, criteria of recognition of folds in the field
   - 2.5 Faults, classification of faults, criteria of recognition of faults in the field
   - 2.6 Joints, classification of joints; study of joints in the field
   - 2.7 Foliation, lineation, cleavage, schistosity and their classifications; relationship of foliation and lineation with other structures in the field

3. **Sedimentary Petrology**
   - 3.1 Depositional environment: Fluvial, lacustrine and glacial environments
   - 3.2 Distribution of sedimentary rocks, formation of sediments
   - 3.3 Tectonic setting of sediment accumulations
   - 3.4 Geosynclines and plate tectonics
   - 3.5 Structure of sedimentary rocks: Erosional structures, depositional structures, synsedimentary deformational structures and their significance
   - 3.6 Sedimentary rocks - classification, definitions, texture and structures, and compositions of sandstones, conglormerates, mudrocks, limestones and dolomites; Introduction to other sedimentary rocks, evaporites, bedded cherts, and iron deposits; Diagenesis, compaction, cementation, dissolution, replacement, recrystallization, inversion and authigenesis, provenance

4. **Crystallography and Mineralogy**
   - 4.1 Introduction to crystallography, morphology of crystals: Point group; symmetry; geometrical operation symmetry notations
   - 4.2 Concept of point groups and 32 classes; definition of crystal face, edge, and solid angle; Forty-eight forms

4.3 Definition of mineral, rock and ore-forming minerals
4.4 Physical properties of minerals
4.5 Crystallinity and forms of minerals, habit of minerals, forms of crystalline and cryptocrystalline aggregates
4.6 Chemical properties of minerals: native elements, sulphides, halides, oxides, silicates, titanates, phosphates, arsenates and vanadates; nitrates, borates and uranates, sulphates and chromates, tungstates and molybdates, oxalates and hydrocarbons.
4.7 Optical mineralogy: Snell's law, total internal reflection, critical angle, isotropic and anisotropic minerals, polarization and interference of light, polarizing microscope, pleochroism and birefringence, uniaxial and biaxial crystals, optical properties of minerals- form, cleavage, fracture, and parting, refractive index and relief, Becke line and its use, twining, colour and pleochroism, properties under crossed polarisers – interference colour, twining and extinction angle

5. **Stratigraphy, Paleontology and Historical Geology**
5.1 Stratigraphy
5.1.1 Stratification and sedimentary cycles
5.1.2 Principles of stratigraphic classification and correlation
5.1.3 International stratigraphic codes
5.1.4 Unit and measurement of geological time and geochronology
5.1.5 Lithostratigraphy, biostratigraphy and chronostratigraphy
5.2 Paleontology
5.2.1 Fossils and their mode of preservation
5.2.2 Evolution of life, definition, concept and method of nomenclature
5.2.3 Classification, geographical distribution, morphology, evolution and geological history of different Phylums
5.2.4 Fossils found in Nepal
5.3 Historical geology
5.3.1 Evolution of the Earth
5.3.2 Theory of origin of life, index fossils
5.3.3 Geological history of Phanerozoic eon, organic life evolution through geological time scale

6. **Igneous and Metamorphic Petrology**
6.1 Igneous Petrology
6.1.1 General characteristics of igneous rocks.
6.1.2 Magma: definition, composition, physico-chemical constitution, primary magma
6.1.3 Evolution and differentiation of magmas: fractional crystallization, Magmatic mixing and assimilation
6.1.4 Forms and structures of igneous rocks, method of emplacement of intrusive rocks; Extrusive igneous rock: type, their structures and forms
6.1.5 The IUGS classification system, chemical classification, characteristics and description of common igneous rocks
6.1.6 Distribution of Igneous rocks in Nepal
6.2 Metamorphic Petrology
6.2.1 General characteristics: definition, types of metamorphism, distribution and nomenclature, structures and textures of metamorphic rocks

6.2.2 Shape of minerals, growth and mutual relation of minerals, pressure, temperature and composition in metamorphism
6.2.3 Slate, phyllite, schist, gneiss, amphibolite, marble, quartzite, hornfels, serpentinite, granulite and eclogite
6.2.4 Types of metamorphism, contact metamorphism, regional metamorphism and others; metamorphic differentiation, metamorphic reactions
6.2.5 Metamorphic zones, index minerals, isograds

7. **Economic and Exploration Geology**
   7.1 Economic Geology
      7.1.1 Morphology of ore bodies, classification of mineral deposits, physical characteristics, properties of ore minerals. Genesis of mineral deposits:
      7.1.2 Magmatic concentration, Contact metasomatism, Hydrothermal, Sublimation, Volcanic and submarine exhalative, Sedimentation, Sublimation, Bacteriogenic, Residual and mechanical concentration, Oxidation and supergene enrichment and Metamorphism
      7.1.3 Important mineral deposits of Nepal
   7.2 Exploration Geology
      7.2.1 Scope and principles of exploration geology, prospecting criteria: Structural-tectonic, Lithological, Stratigraphical, Magmatogenic, Geomorphologic, Geochemical
      7.2.2 Prospecting methods and techniques: Geological, Geophysical, Geochemical

8. **Engineering Geology**
   8.1 Role of engineering geology in engineering works
   8.2 Index properties of soil: unit weight, porosity, void ratio, degree of saturation, cohesive and non-cohesive soil, soil consistency, classification of engineering soil, unified soil classification
   8.3 Rock strength and deformation, discontinuities in rock masses, index tests, engineering classification of rocks
   8.4 Mass movements and landslides: causes and classification, control and mitigation measures, landslides of Nepal
   8.5 Slope stability analysis, construction material
   8.6 Concept of geohazard, risk and vulnerability
   8.7 Site investigation

9. **Hydrogeology**
   9.1 Principle of Groundwater Flow
      9.1.1 Groundwater and hydrological cycle, occurrence of groundwater, forms of sub-surface water, springs
      9.1.2 Hydro-geological properties of soil and rocks, porosity, permeability, void ratio
      9.1.3 Types of aquifers - confined, unconfined, perched and leaky aquifers
      9.1.4 Groundwater movement, laminar and turbulent flow, Darcy's Law, hydraulic conductivity, estimation of well yields, depth to water level, cone of depression
   9.2 Pumping Test and Water Pumps
      9.2.1 Objective and types of pumping tests
      9.2.2 Well interference and well efficiency

9.2.3 Water pumps and their selection

9.3 Tube Well Drilling

9.3.1 Basic principle of well drilling, dug well, driven wells, jet drilling, rotary drilling, reverse rotary drilling, cable-tool percussion method of drilling and their equipments, drilling bits, drilling fluid

9.3.2 Well development, installation and commissioning

9.4 Ground water exploration

9.4.1 Geological and hydro geological, exploratory drillings, piezometers, Monitoring of depth to water level,

9.4.2 Geophysical survey (electrical resistivity survey), geophysical well logging (self potential logging, resistivity logging, gamma-ray logging, etc.)

9.4.3 Ground water quality and its data presentation

9.4.4 Ground water resources of Nepal

10. **Relevant Laws**

10.1 खानी तथा खनिज पदार्थ ऐन, २०४२ र खानी तथा खनिज पदार्थ नियमावली, २०५६

10.2 जलस्रोत ऐन, २०४९ र जलस्रोत नियमावली, २०५०

10.3 जलस्रोत, वातावरण र प्राकृतिक स्रोत सम्बन्धी नेपालको संविधानमा भएका प्रावधानहरु

10.4 चालु आवधिक योजनामा खनिज तथा जलस्रोत सम्बन्धी व्यवस्था

प्रथम पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरू सोधिने छ ।

प्रथम पत्र (वस्तुगत)					
भाग	**खण्ड**	**विषयबस्तु**	**परीक्षा प्रणाली**	**अङ्कभार**	**प्रश्न संख्या × अङ्क**
I	**(A)**	सामान्य ज्ञान (General Awareness)	बहुवैकल्पिक प्रश्न (MCQs)	२०	१० प्रश्न × २ अङ्क = २०
	(B)	सार्वजनिक व्यवस्थापन (Public Management)		२०	१० प्रश्न × २ अङ्क = २०
II	-	सेवा सम्बन्धित कार्य-ज्ञान (Job Based -knowledge)		६०	३० प्रश्न × २ अङ्क = ६०

प्रथम पत्रको **<u>भाग (Part II)</u>** सेवा सम्बन्धित कार्य-ज्ञान (Job based -knowledge) को पाठ्यक्रमका इकाईबाट परीक्षामा यथासम्भव देहाय बमोजिम प्रश्नहरू सोधिने छ ।

इकाई	1	2	3	4	5	6	7	8	9	10
प्रश्न संख्या	3	3	3	3	3	3	3	3	3	3

द्वितीय पत्र (Paper II) :-

सेवा सम्बन्धित कार्य-ज्ञान (Job Based -Knowledge)

खण्ड (Section) (A) : - ५० अङ्क

1. **Physical Geology and Geology of Nepal Himalaya**
   - 1.1 The science of geology and its branches
   - 1.2 Geologic time scale; hydrologic cycle and rock cycle
   - 1.3 Internal structure of the earth, the crust, mantle and core, lithosphere and asthenosphere, pressure and temperature inside the earth
   - 1.4 Earthquakes and faults; mechanism of earthquake, seismic waves; seismograph, magnitude and intensity of earthquakes, liquefaction, forecast and prediction of earthquakes, earthquakes in Nepal
   - 1.5 History of seismological monitoring in Nepal Himalaya
   - 1.6 Geological works of surface water, groundwater, glacier and wind
   - 1.7 Physiography and tectonic divisions of the Nepal Himalaya
   - 1.8 Evolution of the Himalaya
   - 1.9 Structures and stratigraphy of different tectonic zones of Nepal Himalaya

2. **Structural Geology**
   - 2.1 Definition and scope of structural geology
   - 2.2 Geological map and cross-section; orientation of a line (trend and plunge) and a plane (dip and strike); geological compass; stereographic projection; stress and strain, stress in two dimensions; Mohr circle and its use
   - 2.3 Primary structures and their importance in structural geological interpretation, unconformity
   - 2.4 Folds, classification of folds, criteria of recognition of folds in the field
   - 2.5 Faults, classification of faults, criteria of recognition of faults in the field
   - 2.6 Joints, classification of joints; study of joints in the field
   - 2.7 Foliation, lineation, cleavage, schistosity and their classifications; relationship of foliation and lineation with other structures in the field

3. **Sedimentary Petrology**
   - 3.1 Depositional environment: Fluvial, lacustrine and glacial environments
   - 3.2 Distribution of sedimentary rocks, formation of sediments
   - 3.3 Tectonic setting of sediment accumulations
   - 3.4 Geosynclines and plate tectonics
   - 3.5 Structure of sedimentary rocks: Erosional structures, depositional structures, synsedimentary deformational structures and their significance
   - 3.6 Sedimentary rocks - classification, definitions, texture and structures, and compositions of sandstones, conglormerates, mudrocks, limestones and dolomites; Introduction to other sedimentary rocks, evaporites, bedded cherts, and iron deposits; Diagenesis, compaction, cementation, dissolution, replacement, recrystallization, inversion and authigenesis, provenance

4. **Crystallography and Mineralogy**
   - 4.1 Introduction to crystallography, morphology of crystals: Point group; symmetry; geometrical operation symmetry notations
   - 4.2 Concept of point groups and 32 classes; definition of crystal face, edge, and solid angle; Forty-eight forms
   - 4.3 Definition of mineral, rock and ore-forming minerals

4.4 Physical properties of minerals
4.5 Crystallinity and forms of minerals, habit of minerals, forms of crystalline and cryptocrystalline aggregates
4.6 Chemical properties of minerals: native elements, sulphides, halides, oxides, silicates, titanates, phosphates, arsenates and vanadates; nitrates, borates and uranates, sulphates and chromates, tungstates and molybdates, oxalates and hydrocarbons.
4.7 Optical mineralogy: Snell's law, total internal reflection, critical angle, isotropic and anisotropic minerals, polarization and interference of light, polarizing microscope, pleochroism and birefringence, uniaxial and biaxial crystals, optical properties of minerals- form, cleavage, fracture, and parting, refractive index and relief, Becke line and its use, twining, colour and pleochroism, properties under crossed polarisers – interference colour, twining and extinction angle

5. **Stratigraphy, Paleontology and Historical Geology**
5.1 Stratigraphy
5.1.1 Stratification and sedimentary cycles
5.1.2 Principles of stratigraphic classification and correlation
5.1.3 International stratigraphic codes
5.1.4 Unit and measurement of geological time and geochronology
5.1.5 Lithostratigraphy, biostratigraphy and chronostratigraphy
5.2 Paleontology
5.2.1 Fossils and their mode of preservation
5.2.2 Evolution of life, definition, concept and method of nomenclature
5.2.3 Classification, geographical distribution, morphology, evolution and geological history of different Phylums
5.2.4 Fossils found in Nepal
5.3 Historical geology
5.3.1 Evolution of the Earth
5.3.2 Theory of origin of life, index fossils
5.3.3 Geological history of Phanerozoic eon, organic life evolution through geological time scale

खण्ड (Section) (B) : - ५० अङ्क

6. **Igneous and Metamorphic Petrology**
6.1 Igneous Petrology
6.1.1 General characteristics of igneous rocks.
6.1.2 Magma: definition, composition, physico-chemical constitution, primary magma
6.1.3 Evolution and differentiation of magmas: fractional crystallization, Magmatic mixing and assimilation
6.1.4 Forms and structures of igneous rocks, method of emplacement of intrusive rocks; Extrusive igneous rock: type, their structures and forms
6.1.5 The IUGS classification system, chemical classification, characteristics and description of common igneous rocks
6.1.6 Distribution of Igneous rocks in Nepal
6.2 Metamorphic Petrology

6.2.1 General characteristics: definition, types of metamorphism, distribution and nomenclature, structures and textures of metamorphic rocks
6.2.2 Shape of minerals, growth and mutual relation of minerals, pressure, temperature and composition in metamorphism
6.2.3 Slate, phyllite, schist, gneiss, amphibolite, marble, quartzite, hornfels, serpentinite, granulite and eclogite
6.2.4 Types of metamorphism, contact metamorphism, regional metamorphism and others; metamorphic differentiation, metamorphic reactions
6.2.5 Metamorphic zones, index minerals, isograds

7. **Economic and Exploration Geology**
   7.1 Economic Geology
      7.1.1 Morphology of ore bodies, classification of mineral deposits, physical characteristics, properties of ore minerals. Genesis of mineral deposits:
      7.1.2 Magmatic concentration, Contact metasomatism, Hydrothermal, Sublimation, Volcanic and submarine exhalative, Sedimentation, Sublimation, Bacteriogenic, Residual and mechanical concentration, Oxidation and supergene enrichment and Metamorphism
      7.1.3 Important mineral deposits of Nepal
   7.2 Exploration Geology
      7.2.1 Scope and principles of exploration geology, prospecting criteria: Structural-tectonic, Lithological, Stratigraphical, Magmatogenic, Geomorphologic, Geochemical
      7.2.2 Prospecting methods and techniques: Geological, Geophysical, Geochemical

8. **Engineering Geology**
   8.1 Role of engineering geology in engineering works
   8.2 Index properties of soil: unit weight, porosity, void ratio, degree of saturation, cohesive and non-cohesive soil, soil consistency, classification of engineering soil, unified soil classification
   8.3 Rock strength and deformation, discontinuities in rock masses, index tests, engineering classification of rocks
   8.4 Mass movements and landslides: causes and classification, control and mitigation measures, landslides of Nepal
   8.5 Slope stability analysis, construction material
   8.6 Concept of geohazard, risk and vulnerability
   8.7 Site investigation

9. **Hydrogeology**
   9.1 Principle of Groundwater Flow
      9.1.1 Groundwater and hydrological cycle, occurrence of groundwater, forms of sub-surface water, springs
      9.1.2 Hydro-geological properties of soil and rocks, porosity, permeability, void ratio
      9.1.3 Types of aquifers - confined, unconfined, perched and leaky aquifers
      9.1.4 Groundwater movement, laminar and turbulent flow, Darcy's Law, hydraulic conductivity, estimation of well yields, depth to water level, cone of depression

9.2 Pumping Test and Water Pumps
- 9.2.1 Objective and types of pumping tests
- 9.2.2 Well interference and well efficiency
- 9.2.3 Water pumps and their selection

9.3 Tube Well Drilling
- 9.3.1 Basic principle of well drilling, dug well, driven wells, jet drilling, rotary drilling, reverse rotary drilling, cable-tool percussion method of drilling and their equipments, drilling bits, drilling fluid
- 9.3.2 Well development, installation and commissioning

9.4 Ground water exploration
- 9.4.1 Geological and hydro geological, exploratory drillings, piezometers, Monitoring of depth to water level,
- 9.4.2 Geophysical survey (electrical resistivity survey), geophysical well logging (self potential logging, resistivity logging, gamma-ray logging, etc.)
- 9.4.3 Ground water quality and its data presentation
- 9.4.4 Ground water resources of Nepal

10. **Relevant Laws**
- 10.1 खानी तथा खनिज पदार्थ ऐन, २०४२ र खानी तथा खनिज पदार्थ नियमावली, २०५६
- 10.2 जलस्रोत ऐन, २०४९ र जलस्रोत नियमावली, २०५०
- 10.3 जलस्रोत, वातावरण र प्राकृतिक स्रोत सम्बन्धी नेपालको संविधानमा भएका प्रावधानहरु
- 10.4 चालु आवधिक योजनामा खनिज तथा जलस्रोत सम्बन्धी व्यवस्था

द्वितीय पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरू सोधिनेछ ।

द्वितीय पत्र (विषयगत)					
पत्र	**विषय**	**खण्ड**	**अङ्कभार**	**छोटो उत्तर**	**लामो उत्तर**
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based-Knowledge)	**(A)**	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०
		(B)	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०