लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, जियोलोजी समूह, जनरल जियोलोजी उपसमूह, राजपत्र अनंकित प्रथम श्रेणीका पदहरुको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रुपरेखा :– यस पाठ्यक्रमको आधारमा निम्नानुसार चरणमा परीक्षा लिइने छ :

प्रथम चरण	लिखित परीक्षा	पूर्णाङ्क :– १००
द्वितीय चरण	अन्तर्वार्ता	पूर्णाङ्क :– २०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या Xअङ्कभार	समय
सेवा सम्बन्धी	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	५० X २ = १००	४५ मिनेट

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	२०	मौखिक

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।

२. पाठ्यक्रमकका निम्न एकाईहरुबाट निम्नानुसार प्रश्नसंख्या सोधिनेछन् :

एकाइ	१	२	३	४	५	६	७	८	९	१०
प्रश्न संख्या	५	५	५	५	५	५	५	५	५	५

३. वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरुको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत २ (दुई) अङ्क प्रदान गरिनेछ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अर्थात् ०.४ अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

४. यस पाठयक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरु परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्दछ ।

५. लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र अन्तर्वार्तामा सम्मिलित गराइनेछ ।

६. पाठ्यक्रम लागू मितिः- २०६६/६ /१

लोक सेवा आयोग
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विषयः- सेवा सम्बन्धी

1. Physical Geology **10**

The science of geology, its branches, geologic time scale, hydrologic cycle and rock cycle. volcanoes, volcanic products, types of volcanoes, lava- its types and properties, types of volcanic eruptions, volcanic landforms. Internal structure of the earth, the crust, mantle and core, lithosphere and asthenosphere, pressure and temperature inside the earth. Earthquakes and faults; mechanism of earthquake, seismic waves; seismograph, magnitude and intensity of earthquakes, liquefaction, forecast and prediction of earthquakes, earthquakes in Nepal. Plate tectonics. Isostasy.

Weathering and soil, Geological works of running water, groundwater, glacier, sea and ocean, and wind.

2. Structural Geology **10**

Definition and scope of structural geology, geological map and cross-section, orientation of a line (trend and plunge) and a plane (dip and strike). Use of a geological compass. Stereographic projection. Stress and strain, stress in two dimensions, Mohr circle and its use. Primary structures, types of primary sedimentary and igneous structures and their application in structural geology; cross-cutting relationships and younging directions. Unconformity. Folds, classification of folds, criteria of recognition of folds in the field. Faults, classification of faults, criteria of recognition of faults in the field. Joints, classification of joints; study of joints in the field. Foliation, lineation, cleavage, schistosity and their classifications; relationship of foliation and lineation with other structures in the field.

3. Crystallography and Mineralogy **10**

Introduction to crystallography, morphology of crystals: Point group; symmetry; geometrical operation (rotation, reflection, inversion, and inversion and rotation); symmetry notations; concept of point groups and 32 classes; definition of a crystal face, edge, and solid angle; law of constancy of interfacial angles; axial ratios; parameter system of Weiss; Miller indices; law of rationality of indices; forty-eight forms; typical crystals showing a combination of forms. Crystal growth and twining; twining in crystals.

Definition of mineral, examples of rock-forming (silicate) minerals and ore-forming (non-silicate) minerals. Physical properties of minerals. Ferromagnetic, paramagnetic, and diamagnetic minerals. crystallinity and forms of minerals, habit of minerals, forms of crystalline and cryptocrystalline aggregates – type examples and use in identification. Chemical properties of minerals: classification of minerals; examples of native elements, sulphides, halides, oxides, silicates, titanates, phosphates, arsenates and vanadates; nitrates, borates and uranates, sulphates and chromates, tungstates and molybdates, oxalates and hydrocarbons.

Crystal chemistry of minerals: Concept of crystal structure of minerals; dimorphism, polymorphism, and pseudomorphism; isomorphism and solid solutions.

Elements of optics, optics of isotropic medium – refractive medium; Snell’s law; critical angle; anisotropic media; polarisation and interference of light; polaroid; polarising microscope – construction and use; magnification and resolving power; construction and use of quarter and full wave plates and quartz wedge; pleochroism

and birefringence; optical indicatrix – uniaxial and biaxial indicatrices; behaviour of light in uniaxial and biaxial crystals; optic sign; optical properties of minerals – form, cleavage, fracture, and parting; refractive index and relief; Bécké line and its use; twining, colour, and pleochroism; pleochroic forms of common minerals; properties under crossed polarisers – interference colour, twining, and extinction angle; anomalous interference colours; Michael Lévi chart and its use in determining thickness, path difference, birefringence, and order of interference colour; optic sign of anisotropic medium; interference figures; dispersion of optic axes in biaxial crystals.

Mineral genesis and mineral classification: formation of minerals in different endogenous and exogenous processes; physical and optical character, mode of occurrence and important uses of the following minerals – quartz, feldspar, feldspathoids, mica, amphibole, pyroxene, olivine, garnet, chlorite, epidote, scapolite, andalusite, sillimanite, kyanite, zeolites, zircon, talc, clay minerals, calcite, apatite, rutile, spinel, pyrite, and cordierite.

4. Stratigraphy and Historical Geology 10

4.1 Stratigraphy

Stratification, sedimentary cycles and sedimentary forces, principles of stratigraphic classification and correlation, international codes and contentions for stratigraphic classification and nomenclature. Unit and measurement of geological time and geochronology. Principles of lithostratigraphy, lithostratigraphic units, methodology in establishing lithostratigraphic units, basic principles of biostratigraphic units, establishment of biostratigraphy and index fossils of different systems, time stratigraphic units, chronological boundaries, magnetostratigraphy and chronostratigraphy type locality, subdivision and fossil content of standard stratigraphic units, introduction to sequence stratigraphy.

4.2 Historical geology

Origin of solar system, evolution of the Earth, development of the atmosphere, hydrosphere and biosphere, theory of origin of life, index fossils. Principal tectonic units of the present continents, tectonic evolution of the earth's crust. The earliest (Precambrian) history of the earth's crust: the Precambrian shield rocks and paleogeography, Precambrian glaciations. Geological history of Phanerozoic eon, organic evolution, paleogeography, life and the crustal movements during the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous, Palaeogene and Neogene.

5. Igneous and Metamorphic Petrology 10

General characteristics of igneous, sedimentary and metamorphic rocks. Magma, definition, composition, physico-chemical constitution, primary magma, magmatism in different tectonic environments. Evolution of magmas, differentiation: fractional crystallization, other differentiation mechanisms, Magmatic mixing and assimilation. Forms and structures of igneous rocks, method of emplacement of intrusive rocks. Extrusive igneous rock: their structures and forms. Textures and microstructures of igneous rocks. Crystallization of silicate melts: Unary and binary systems. Phase relations and textures, Ternary systems: Simple and complex, the effects of pressure on melting and crystallization of magma. The IUGS classification system, chemical

classification, characteristics and description of common igneous rocks.

Definition, types of metamorphism, distribution and nomenclature, structures and textures of metamorphic rocks. Shape of minerals, growth and mutual relation of minerals, pressure, temperature and composition in metamorphism, petrographic descriptions of slate, phyllite, schist, gneiss, amphibolite, marble, quartzite, hornfels, serpentinite, granulite and eclogite. Initiation of metamorphism, contact metamorphism, metamorphism of igneous rocks, submarine metamorphism, porphyroblasts, preferred orientation, metamorphic differentiation, compositional gradient, temperature gradient, metamorphic reactions. Metamorphic zones, index minerals, isograds. Facies of metamorphism. phase rule, relationship of zones, grades and facies, graphic representation of ACF, AKF and AFM diagrams. Determination of pressure and temperature using total assemblage and changes in mineral composition, pressure (P)-temperature (T)-time (t) path and its interpretation in metamorphism. Metamorphic rocks and global tectonics: Metamorphism at transform faults, divergent and convergent plate junctions.

6. Sedimentology and sedimentary petrology 10

6.1 Sedimentalology

Introduction: Sedimentology and global sediment discharge, fluid flow, Reynolds Number, Froude Number, bed-forms, stream power and water depth. Depositional environment**:** Concept of depositional environment, basic tools of environment analysis, classification of depositional environments. Fluvial Systems**:** Alluvial fans: Depositional setting, sedimentary processes, deposits and their characteristics. Braided-River Systems: Depositional setting and depositional processes, bedforms, structures and vertical succession, Meandering-River Systems: Depositional setting and depositional processes, deposits and vertical succession..Eolian Desert Systems: Introduction, depositional processes and deposits. Lacustrine Systems: Sedimentation processes in lakes and characteristics of lacustrine deposits. Glacial Systems: Environmental setting, transport and deposition in glacial environments, characteristics of glacial and interglacial deposits. Deltaic Systems: Sedimentation processes and sediment characteristics of deltaic systems. Beach and Barrier-Island Systems: Depositional setting, depositional processes on beaches, characteristics of Beach and Barrier-Island deposits. Estuarine and Lagoonal systems: Physiography, hydrologic and sediment characteristics of estuaries and lagoons. Tidal-Flat Systems: Depositional setting, sedimentation processes, characteristics of tidal-flat sediments. Marine Environments: Shallow Marine Environment: physiography and depositional setting, depositional processes, self sediments and characteristics. Deep Marine Environment: Depositional setting, transport and depositional processes, principal kinds of modern deep-sea sediments.

Distribution of sedimentary rocks, formation of sediments. sediments and climate, tectonic setting of sediment accumulations. Geosynclines and plate tectonics. Texture of sedimentary rocks: size of sedimentary particles, grain size distribution, shape of sedimentary particles (sphericity and roundness), factors controlling particle morphology; surface texture of sedimentary particles, concept of textural maturity. Structure of sedimentary rocks:

Erosional structures, depositional structures, synsedimentary deformational structures and their significance. Classifications of 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.

7. Geology of Nepal Himalaya and adjoining regions 10

Introduction to the physiography and tectonic divisions of the Himalaya, evolution of the Himalaya, structures and stratigraphy of different tectonic zones of Nepal Himalaya (Siwaliks, Lesser Himalaya, Higher Himalaya and Tethys Himalaya). Paleozoic and Miocene granites of Nepal Himalaya, inverse metamorphism of the Himalaya.

8. Paleontology 10

Fossils and their mode of preservation, evolution of life, species: definition, concept and method of nomenclature. Classification, geographical distribution, morphology, evolution and geological history of Phylum Brachiopod, Mollusca (Bivalve, Gastropod, Cephalopoda), Arthopoda (Trilobite) Coelenterate (Anthozoa), Protozoa (Foraminfera), Echinodermata (Echinoidea), Hemichordata (Graptoloidea), Brayozoa, introduction of microfossil, introduction of trace fossils. Geological history through time of the following vertebrate groups: Fishes, Amphibians, Reptiles, Aves and Mammals, Equidae, Proboscides and Hominidae, Plant fossils: Plant life through time.

9. Economic and Exploration Geology 10

9.1 Economic Geology

Morphology of ore bodies, classification of mineral deposits, physical characteristics, optical properties and textures of ore minerals. Genesis of mineral deposits:

9.1.1 Magmatic concentration
9.1.2 Contact metasomatism
9.1.3 Hydrothermal
9.1.4 Sublimation
9.1.5 Volcanic and submarine exhalative
9.1.6 Sedimentation
9.1.7 Sublimation
9.1.8 Bacteriogenic
9.1.9 Residual and mechanical concentration
9.1.10 Oxidation and supergene enrichment and
9.1.11 Metamorphism.Chemical composition, important physical properties, mode of occurrence, utilization of the ores of lead, zinc, copper, aluminium, iron and gold, magnesite, limestone, coal, petroleum and some selected gem stones (quartz, ruby, tourmaline, beryl).

9.2 Important mineral deposits of Nepal.

9.3 Mines and Mineral Act and regulations of Nepal.

9.4 Exploration Geology

Scope and principles of exploration geology, prospecting criteria:

9.4.1 Structural-tectonic,

9.4.2 Lithological,

9.4.3 Stratigraphical,

9.4.4 Magmatogenic,

9.4.5 Geomorphologic,

9.4.6 Geochemical,

9.4.7 Geophysical: Prospecting guides (indication):

9.4.7.1 Outcrops of valuable mineral or productive rocks

9.4.7.2 Dispersion haloes (aureols)

9.4.7.3 Ore boulders or floats

9.4.7.4 Rock zone alterations

9.4.7.5 Geophysical anomalies

9.4.7.6 Botanical

9.4.7.6 Paragenetic

9.4.7 Prospecting methods and techniques:

9.4.8.1 Geological

9.4.8.2 Geophysical

9.4.8.3 Geochemical

Explosives and blasting. Mine working, open cast and under ground mining, mine ventilation, lighting and support. Hand drilling, percussion drilling, rotary drilling. Types of sampling, sampling spacing in mine opening, sampling of exploratory borholes. Estimation of reserves, classification.

10. Engineering Geology. 10

10.1 Fundamentals of engineering geological investigation:
10.1.1 Formulation of investigation
10.1.2 Data collection
10.1.3 Data analysis
10.1.4 Evaluation for decision making. Instruments used in engineering geological investigations. Soil mechanics, engineering properties of soils, classification of soils. Rock strength and deformation, discontinuities in rock masses, index tests, rock mass evaluation and classification of rocks. Infiltration and permeability and their influence in construction, control of subsurface water. Landslides, causes and classification, control measures, slope stability analysis. Construction materials. Concept of hazard, risk and vulnerability.

------The End------