VINOBA BHAVE UNIVERSITY, HAZARIBAG
UNIVERSITY DEPARTMENT OF GEOLOGY
SYLLABUS FOR Ph.D. ENTRANCE TEST FOR ADMISSION TO Ph.D. PROGRAMME

Full Marks: 100 Time: 3 Hours

Structural Geology and tectonics

Concepts of stress and strain, types of strain, strain parameters, two dimentional strain and stress analysis. Mechanism of deformation intercrystalline and intracrystalline slip classification, causes and mechanics of folding faulting. Minor structures (Planar and linear) their origin and significance. Plate tectonics. Types of plate boundaries, causes of plate motion, relation of plate tectonics with seismicity, volcanism, sea floor spreading and mountain building.

Geomorphology

Basic concepts of geomorphology. Landform in relation to lithology and structure. Concept of geomorphic cycle and its interpretation. Fluvial land forms, drainage pattern and its significance. Aeolian processes and land forms. Glacial processes and land forms.

Photogeology, Remote Sensing and GIS

Elementary idea of photogeology, aerial photography and photogrammetry. Geometric characteristics of aerial photographs. Principles of remote sensing, general idea of EM spectrum, spectral signature of common natural objects. Radiation laws. Interaction of EMR with the Earth's surface and with the atmosphere. Platform and sensors. Resolution of sensors. Application of remote sensing in geological mapping, mineral exploration and groundwater prospecting .Principles and applications of Geogrphic information system (GIS).

Crystallography and geochemistry

Concepts of crystallography. International system of crystallographic notation, Hermann Mauguin system of notation. Space lattice and point group. Twinning. Laws and types. X ray crystallography and Bragg's law. Origin and cosmic abundance of elements. Geochemical classification of elements. Principles of ionic substitution in minerals. Laws of thermodynamics.

Optical and systematic mineralogy

General principles of mineral optics. Isotropism and anisatropism. Important optical properties of minerals. R. I. and relief colour and pleochroism, interference colours. Birefringence, extinction, optic axial angle. Optic sign of uniaxial and biaxial minerals. Behavior of uniaxial and biaxial minerals under convergent polarzed light. Principles of crystal chemistry. Co- ordination number and bonding, isomorphism, polymorphism, pseudomorphism and solid solution. Structure and classification of silicates. Atomic structure, mineral chemistry. PIT stability, paragenesis and occurrence of pyroxene, amphibole and Feldspar groups.

Igneous Petrology.

Magma- their nature, compostion and genesis. Crystallization of congruent, incongruent and solid solution seris. Texuteres and structures of igneous rocks. Diversity in igneous rocks. – differentiation, assimilation and magmatic mixing. Modern classification of igneous rocks.

Sedimentology

Formation of dedimentary rocks. Lithification and diagenesis. Classification of sedimentary rocks. Classification of sadistones and limestone. Provenance – mineral stability and maturity of sediments. Light and heavy minerals and their significance. Texture-concipt of grain size and grade.

Metamorphic Petrology

Metamorphism – role of temperature, pressure and fluids in metamorphism. Types of metamorphism Metamorphic zones, grades and facies. Mineral assemblages and important reactions in different facies Metamorphic belts. ACF and AKF diagrams.

Hydrogeology

Groundwater – origin, types, importance , occurrence and movements. Aquifers and their types. Hydrologic cycle. Hydrologic properties of rocks- porosity, permeability, specific yield, specific retention, hydraulic conductivity, transmissivity and storage co efficient. Water table contour maps. Groundwater quality estimation and treatment fro various uses. Water contaminant and pollutant. Water table and its fluctuation. Artificial recharge to groundwater.

Ore & Economic Geology, Fuel Geology

Ore, proto ore, ore minerals and their classification. modern concept of ore genesis, spatial and temporal distribution of ore deposits. Fluid inclusions in ores. Occurrence genesis and distribution of iron ores, copper ores, alumunium ores, mica and asbestos deposits, Coal - its rank, grade and types. Coal petrography and its applications. Coal bed methane (CBM). Oil bearing basins and geology of productive oilfields of Inida.

Stratigraphy

Principla of stratigraphy. Code of stratigraphic nomenclature, startigrpahic unit, geological time scale. Methods of stratigraphic correlation, Precambrian stratigraphy of india with the emphasis on precambraina of singhbhum and Karnataka. Cuddaphah supergroup. Vindhayan supergroup. Gandwana supergroup. Important stratigraphic boundary problems in Indian stratigraphy.

Palaeontology

Methods and techniques in palaeontology. Fossil records and geological time scale. Morphology and geological records of Brachiopoda, Trilobita and Foraminifera. Uses of micropalaeontology in petroleum exploration.

Exploration and Mining Geology

General idea of geophysical exploration – gravity method, magnetic method and resistivity method. Geochemical exploration – geochemical anomaly, interpretation and application of geochemical data in mineral exploration. Important methods of mining – open cast and underground mining.

Engineering and Environmental Geology

Engineering properties of rocks, rock discontinuities (defects) and their hazardous effects. Concept of rock quality designation (RQD) and rock mass rating (RMR). Geological considerations for the selection of dam and tunnel sites. Landslides – causes and mitigation concept of environmental geology, processes of soil formation, types of soils, soil degradation due to use of fertilizers and parricides, Environmental degradation due to mining and industrialization.