Semester IV (250 marks)

Module 16

Environmental Issues in Geography

Full Marks 50

Unit III: Global Environmental Issues

3.1. Global Resources Crisis and Management.
3.4. Sustainable Development.

Unit IV: Environmental Issues in India

Unit I: Concept and Theories

1.1 Concept of Region (Hartshorne), its critics and further development; typology and delineation.
1.2 Critical appreciation of Losch and Christaller’s theory.
1.3 Economic Base theory, Regional development theories of Growth Centre and Growth Pole.
1.4 Theories of City Structure; Core- periphery relations.

Unit II: Regional Planning

2.1 Basic principles of Regional Planning – Types of planning.
2.2 Measurement of Regional Development; Economic Development.
2.3 Regional Disparity and Regional Diversity.
2.4 Economy of a region: Levels of development.

Unit III: Regional Identification

3.1 Process and measurement of Urbanisation; Urbanisation in the Third World.
3.2 Definition of Towns: physical, social, functional; Human ecology of cities.
3.3 Concept and approaches to rural Development, Rural Development Institution: Panchayeti Raj.
3.4 Problems of Rural Development.

Unit IV: Urban Structure

4.1 Internal Structure of Cities, Inner problems and Structural elements of CBD; Rural-Urban fringe, Suburbs, Rural- urban continuum.
4.2 State Control of Industry.
4.3 Residential Segregation; Factorial ecology; Neighbourhood concept.
4.4 Urban environment, urban landuse, Urban ecology and Urban management.
Unit I: Planning Region

1.1 Concept of Planning Region, economic planning.
1.2 Planning Regions of India; purpose and methods of delineation of Planning Region.
1.3 State as a Planning unit; Criteria for dividing a State into Economic Region; West Bengal as a case study.
1.4 Micro Level Planning at District Level: West Bengal and Tamil Nadu.

Unit II: Urban Development

2.1 Metropolitan concept, Metropolis, Metropolitan area, Metropolitan region, Mega city and Primary city, Need, Importance and Concept of Urban Planning.
2.2 Urban Planning in India: Kolkata, Mumbai and Delhi; City region: Problem of planning.
2.3 Planned Town: concept; New Towns of India.
2.4 National Policies on Urbanisation, Urban Renewal vs. Urban Redevelopment; 74th Constitutional Amendment.

Unit III: Rural Development

3.1 Tribal Area Development.
3.2 Rural Development Strategies, case studies from India.
3.3 Backward Region: Identification and Development.
3.4 Rural Development in India: Programmes and Policies.

Unit IV: Regional Development

4.1 Economic Base, Resource Potentials.
4.2 Role of Agricultural in Regional development.
4.3 Role of Industries in Regional development.
4.4 Transport, Trade and Commerce and Regional development.
Module 19
Regional Planning (Practical) (Full Marks 50)

Unit I: Regional Concentration and Disparities

1.1. Sphere of influence by Gravity Model.
1.2. Measurement of Inequality by Lorenz Curve.
1.3. Concentration by Location Quotient
1.4. Regional Disparity by Sopher’s Index

Unit II: Transport and Regional Development

2.1. Infrastructure and Regional development.
2.2. Accessibility by Detour Index.
2.3. Measurement of Transport Accessibility by Shortest Path Matrix.
2.4. Regional Growth by analysis of Time series data.

Unit III: Regional Growth

3.1. Rank-size distribution of population.
3.2. Rural-urban growth and differentials.
3.3. Correlation and Spatial correspondence.
3.4. Weighted Score and Combination analysis.

Unit IV: Laboratory Note Book and Viva-voce
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<td>Report and Seminar Presentation on specific problem by individual student based on special Paper</td>
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- Each report to be restricted within 30 (Thirty) pages in A4 size paper with 1.5 spacing inclusive of maps, diagrams and photographs.
Module 17  Advanced Geomorphology  (Full Marks 50)

Sem -4

Unit I: Perspectives in Geomorphology

1.1 Evolution of Geomorphological thoughts and ideas: A General Review.
1.2 Concepts of Spatial scale, Temporal scale, Equilibrium and Threshold.
1.3 Approaches to Geomorphology: Structural, Climatic, Applied and Systems approach.
1.4 Principles of Landform classification: Genetic and Hierarchical.

Unit II: Fluvial process and forms

2.1 Hydraulics and Hydrological properties of Channels: Regime, Velocity, Discharge and Energy; Factors controlling Entrainment, Transportation and Deposition by running water.
2.2 Morphological properties of Channels: profiles, platforms and patterns; Effect of floods in channel modification and characterization.
2.3 Formation, System of change and Classification of Fluvial Landforms with special reference to Badlands, Terraces, Alluvial Fans and Accretional Topography.
2.4 Slope Processes in Fluvial Landscapes: factors and processes of Bank Erosion and Valley Walls.

Unit III: Coastal processes and anthropogenic impact

3.1 Coastal Morphodynamics: Factors, characteristics and relative dominants of Wave, Tidal and Fluvial processes in Coasts.
3.2 Processes and effects of Bioturbation, Bio-tidal accretion, Coral formation and Strom surge/Tsunamis in coasts.
3.3 Formation, System of change and Classification of Coastal Landforms with special reference to Rhythmic Beach Topography, Coastal Dunes and deltas.
3.4 Humans as Geomorphic agents: Effects of River control, Coastal modification and Landuse change in Mountainous regions.

Unit IV: Tropical Geomorphology

4.1 Definition and boundary of Humid and Tropics; Climatic and Vegetation characteristics and their control on Tropical landforms.
4.2 Factors and Processes of Deep Weathering with special reference to formation of Tors, Domed Inselberges and Laterite Duricrusts.
4.3 Characteristics of Tropical Streams with special reference to of large rivers.
4.4 Urban Geomorphology of Humid Tropics: scope, content and significance in Town Planning.
Module 18

**Sem -4**

**Advanced Geomorphology**

(Full Marks 50)

**Unit I: Applied Geomorphology**

1.1 Methods and uses of Rainwater Harvesting and check dams.
1.2 Geomorphic consequences of Sea Level change in Coasts and Estuaries.
1.3 Application of Geomorphology in Terrain Evaluation, EIA and EMP.
1.4 Principles of Integrated Drainage Basin Management and Integrated Coast Zone Management with reference to Coastal Regulation Zones.

**Unit II: Case Studies of Landforms and Landuse**

2.1 Badlands on Laterite Duricrusts: Garhbeta and Santiniketan, West Bengal.
2.2 Tors and inselberge: Chhotanagpur plateau and surroundings, Jharkhand and West Bengal.
2.3 Alluvial fans: Sub – Himalayan West Bengal.
2.4 Deltas and estuaries: Lower Ganga delta, West Bengal.

**Unit III: Management of Geomorphic Problems**

3.1 Management of Mining Subsidence with special reference to Coal Belts of Raniganj and Darjiling hills.
3.2 Management of River Discharge and its effect with special reference to Damodar Valley Corporation and Farakka Barrage Project.
3.3 Management of Urban Water Supply and Disposal with special reference to Kolkata.
3.4 Management of Reclaimed Coastal areas with special reference to Indian Sundarban.

**Unit IV: Management of Geomorphic Hazards**

4.1 Management of Landslide with special reference to North West Bengal.
4.2 Management of Floods with special reference to Northern Piedmont areas and Padma – Bhagirathi interfluve of West Bengal.
4.3 Management of Riverbank Erosion with special reference to Ganga and Bhagirathi in West Bengal.
4.4 Management of Coastal Erosion with special reference to Digha township and Sagar island of West Bengal.
Module 19 Advanced Geomorphology (Practical) (Full Marks 50)

Unit I: Analysis of Channel Planforms and Sediments

1.1 Computation of Braiding index, Sinuosity Index, Meander wavelength and Radius of curvature.
1.2 Computation of River Profiles.
1.3 Collection and analysis of Coastal or Riverine Sediments using Ø-graded sieves and chemicals / electronic balance.
1.4 Analysis of Pebble – grade Fluvial and Coastal sediments for shape, size and materials.

Unit II: Geomorphic Mapping

2.1 Preparation of Geomorphic maps from field data using standard symbols and colours.
2.2 Preparation of overlays from Topographical maps showing Geomorphic features.
2.3 Extraction of Geomorphic features from Satellite FCCs in overlays.
2.4 Extraction of relative height of Geomorphic features from Aerial Photopairs using parallax bar.

Unit III: Hazard Mapping and Zonation

3.1 Landslide: sites and Vulnerability zones.
3.2 Floods: inundation and Risk zones.
3.3 Riverbank erosion: quantification of Eroded area and Vulnerability zonation.
3.4 Coastal erosion: quantification of Eroded area and Vulnerability zonation.

Unit IV: Laboratory Notebook and Viva-voce.
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Unit I: Emerging concepts in Cartography and understanding of Field Astronomy and Spherical Trigonometry

1.1 Basic concepts in Cartography.
1.2 History and development of cartography; Geomatics – Cartography relationship.
1.3 Field Astronomy- Spherical triangle, Napier’s rule, Spherical excess, Determination of distance, azimuth and area on the earth’s surface.
1.4 Spherical Trigonometry – Celestial sphere, co-ordinates of celestial bodies; Equation of time and its application; determination of latitude, longitude and azimuth of celestial bodies.

Unit II: Ground survey and Positioning

2.1 Traverse Survey by Theodolite.
2.2 Triangulation Survey.
2.3 Tacheometric Survey.
2.4 Reciprocal Levelling by Theodolite.

Unit III: Quantitative Analysis and Mapping

3.1 Bi and Tri – component data: Proportional and Ternary diagrams.
3.2 Transport data: Graph theoretic measure.
3.3 Population Data: Gravity model, Lorenz curve.
3.4 Agricultural data: Crop combination by Weaver’s method.

Unit IV: Remote Sensing and Aerial Photography as sources of Data Products

4.1 Principle of remote sensing, electromagnetic radiation, remote sensing platforms, sensors.
4.2 Orbiting satellites. Spectral, spatial, temporal and radiometric resolution; Satellite images.
4.3 Aerial photographs – vertical, oblique and trimetrogen; Spectral characteristics of aerial photography.
4.4 Photogrammetry – Scale, Relief displacement, Calculation of number of photographs for aerial coverage, Parallax and determination height of photo features.

**Sem 4**

**Module 18 Advanced Cartography (Full Marks 50)**

**Unit I: Mapping Elements and Geoinformatics**

1.1 Plane and spherical co-ordinates, UTM and UPS grid systems.
1.2 Cartographic Symbolization – Point, Line, Area, Volume symbols and generalization.
1.3 Choropleth and selection of class interval and accuracy assessment of choropleth.
1.4 Geoinformatics: Basic components of GIS, Types of data used in GIS – spstial and non-spatial, GIS and Remote Sensing applications.

**Unit II: Study of Selected Projections and their Specific Uses**

2.1 Polar Zenithal Gnomonic Projections for shortest routes.
2.2 Mercator Projection for Rhumb line.
2.3 International Projection for Million Sheets.
2.4 Interrupted Sinusoidal Projection for better representation of either Land or Ocean areas.

**Unit III: Determination of Distance, Azimuth and Scale Variations of Selected Projections**

3.1 Simple Conical Projection with two standard parallels.
3.2 Conical Equal Area Projection with two standard parallels.
3.3 Conical Orthomorphic Projection with two standard parallels.
3.4 Mollweide’s Projection.

**Unit IV: Determination of Distance, Azimuth, Scale Variations of the Selected Projections**

4.1 Equatorial Zenithal Gnomonic Projection.
Sem 4
Module 19 Advanced Cartography (Practical) (Full Marks 50)

Unit I: Location of Points and Determination of Area

1.1 Use of GPS for planimetric and altimetric location of points.
1.2 Theodolite Survey for vertical distance.
1.3 Tacheometric survey for determining difference in height.
1.4 Area by simple Planimeter/Digital Planimeter.

Unit II: Construction of the Graticules of Selected Projections

2.1 Polar Zenithal Gnomonic and Mercator Projections; Modified International and Interrupted Sinusoidal Projections.
2.2 Simple Conical Projection with two standard parallels, Conical Equal Area and Conical Orthomorphic Projections on two standard parallels.
2.3 Equatorial Zenithal Gnomonic and Stereographic Projections.
2.4 Mollweide, Homolosine and Transverse Mercator Projections.

Unit III: Choropleth, GIS and Digital Mapping

3.1 Capturing data, Scanning, GPS.
3.2 Image processing: Visual and Digital.
3.3 Creation of maps by GIS.
3.4 Choropleth mapping.

Unit IV: Laboratory Note Book and Viva - voce
CONTENT

Unit I: Regional Concentration and Disparities

1.5. Sphere of influence by Gravity Model.
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