

**HIMACHAL PRADESH  
PUBLIC SERVICE COMMISSION**

**“PRESS NOTE”**

No. 3-04/2021-PSC (R-II)

Dated: 22<sup>nd</sup> April ,2024

**Syllabus for Objective Type Screening Test (MCQ) for the posts of  
Emergency Operation Centre Incharge-Cum-Documentation  
Coordinators, (Class-II) and Training Capacity Building  
Coordinator, Class-II in the Department of Revenue (Disaster  
Management Cell, H.P.**

Himachal Pradesh Public Service Commission advertised **12** posts of **Emergency Operation Centre Incharge-Cum-Documentation Coordinators, (Class-II) and 12 Posts of Training Capacity Building Coordinator, Class-II** in the department of Revenue, Disaster Management Cell, H.P. vide advertisement No. 34-05/2022 & 30-05/2022 dated 06-05-2022 The syllabus for the above mentioned posts is as under:-

**Syllabus**

The Screening Test shall be of 02 hours duration of maximum 100 marks i.e. 70 questions from the subject specific syllabus mentioned below, 20 questions of General Knowledge of Himachal Pradesh and 10 questions consisting of National and International affairs. The candidates will opt for subject specific syllabus of one of the discipline given below as per annexure “A”.

In case of any enquiry, the candidates can contact Commission’s office on any working day from 10:00 A.M. to 5:00 P.M. on telephone No. 0177-2624313/ 2629739 and Toll Free No. 1800-180-8004.

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(Sushma Watts), HAS  
Additional Secretary,  
H.P. Public Service Commission  
Telephone No. 0177-2624313

OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS SYLLABUS FOR RECRUITMENT TO POST OF EMERGENCY OPERATION CENTRE INCHARGE-CUM-DOCUMENTATION COORDINATOR, (CLASS-II) AND TRAINING CAPACITY BUILDING COORDINATOR, (CLASS-II) IN THE DEPARTMENT OF REVENUE (DISASTER MANAGEMENT CELL), HIMACHAL PRADESH, SHALL BE OF 02 HOURS DURATION. THE OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS SHALL COVER THE FOLLOWING TOPICS OF MASTER DEGREE IN DISASTER MANAGEMENT LEVEL.

### 1. FOUNDATION OF DISASTER MANAGEMENT:-

**Basic concept of Disaster Management:** Hazard and Disaster: Definition; Classification; Levels; Models (PAR and Access), Risk: Definition; Factors of disaster risk; Disaster Risk analysis, Vulnerability: Definition; Types (physical vulnerability, socioeconomic vulnerability, vulnerability related to gender and age, rural & urban vulnerability); Vulnerability analysis. Inter-relationship between Hazard, Vulnerability and Risk, Capacity: Coping capacity; Capacity assessment and Capacity development, Disaster Management: Definition; Elements; Scope, Significance; DM Cycle, **Disaster Risk Management:** Minimizing Disaster Risk: Preparedness, Mitigation and Prevention – definition, specific interventions (required for each); procedure and role of various stakeholders, Preparedness: Awareness generation; Information management; Early warning dissemination system; Community participation – Task force formation; Training and Capacity building; Preparedness plan preparation, Mitigation: Knowledge of disaster specific risk; Analyzing disaster damages and possible interventions for minimizing the impact of disaster; Preparation of Mitigation plan, Prevention: Analyzing the nature of a hazard and ways of minimizing its intensity; Preparation of disaster prevention plan, Disaster Risk Management (DRM) Plan: Preparing Hazard-Vulnerability profile; Stakeholder analysis; Disaster risk assessment; Incorporation of Preparedness, Mitigation and Prevention plans. Implementation of DRM plan, **Emergency Response and Crisis Management:** crisis Management: Rescue, relief, rehabilitation & reconstruction; Crisis Management plan, Emergency Response: Standard Operation Procedure (SOP) for disaster response; Information Management System; Warning Dissemination; Evacuation; Search and Rescue operations; Relief operations; Emergency Operation Center (EOC); Resource Management & Networking: Role of Disaster Response Forces and Community Based Organizations (CBO) in emergency response mechanism, Relief Operations: Arranging for Shelter, Food, Safe drinking water, Sanitation and Medical aids; Role of NGOs and Health workers in relief operations; Maintaining law and order, **Recovery, Rehabilitation and Reconstruction:** Recovery: Decisions and actions related to rehabilitation and reconstruction taken after a disaster with a view to restoring or improving the pre- disaster living conditions of the affected community; Encouraging and facilitating necessary adjustments to reduce disaster risk, Rehabilitation: Damage Assessment; Need

analysis of disaster affected people; Resource mobilization for rehabilitation; Restoration of basic amenities—housing drinking water, sanitation, medical facilities, power supply etc.; Creating Livelihood options, Reconstruction: Repair and reconstruction of roads, bridges, crossways, buildings, structures and establishments damaged in the disaster; Restoration of operations of the service sector, Documenting disaster; Lessons learnt; Updating DRM Plan for risk mitigation.

## **2. NATURAL HAZARDS AND DISASTERS:-**

Concept of Natural Hazards and Disasters, Catastrophes in Nature: Types of Natural Hazards and Disasters, Predicting Catastrophe and Interconnections Among Natural Hazards, Earthquake and Tsunami, Landslide and Avalanche, Volcanic Eruption, Floods and Cloudburst, Cyclone and Associated Hazards, Drought and Desertification, Regional Dimensions of Hazards/Disasters in India, Geo-tectonic Hazards in India: Earthquakes and Landslides, Hydro-meteorological Hazards in India: Floods and Drought, Concept of Natural Hazards and Disasters, Catastrophes in Nature: Types of Natural Hazards and Disasters, Predicting Catastrophe and Interconnections Among Natural Hazards, Earthquake and Tsunami, Landslide and Avalanche, Volcanic Eruption, Floods and Cloudburst, Cyclone and Associated Hazards, Drought and Desertification, Regional Dimensions of Hazards/Disasters in India, Geo-tectonic Hazards in India: Earthquakes and Landslides, Hydro-meteorological Hazards in India: Floods and Drought.

## **3. HUMAN MADE HAZARDS AND DISASTERS:-**

Understanding Human-made Hazards and Disasters, Linking Development, Environment and Disasters, Disasters and Impact on the Environment, Public Health Emergency and Disaster Management, Biological Disasters, Epidemics and Health Hazards, Linking Development and Extremism; Terrorism and Security Issues, Industrial & Technological Disasters, Chemical, Biological Hazards Disasters and Management, Nuclear and Radiological Emergencies, Air, Water and Soil Pollution, Fire; Coal Fire, Forest Fire, Oil Fire, Local Disasters (Road, Rail, Air and Sea Accidents).

## **4. FUNDAMENTALS OF GEOINFORMATICS:-**

**Fundamental concepts of Remote Sensing:** Remote Sensing: Concept, Types and Applications, Remote Sensing Platforms, Sensors and Scanning Systems, Major Satellite Systems and their Sensors, **EMR Principles and Interaction Mechanisms:** Electromagnetic Spectrum; Energy-Atmosphere Interaction, Energy-Earth Interaction; Spectral Signatures of Surface Features, Image: Meaning and Types and Characteristics, **Fundamentals of Geographic Information Systems:** Definition, Concept, Significance, Component and Applications of GIS, Spatial data base: Types and Representations, GIS Analysis: Buffer, Overlay and Query, **Fundamentals of Global Navigational Satellite**

**System:** Global Navigational Satellite System and its Application, GPS Concept and Principles of Operation, GPS Segment, GPS Positioning, GPS Accuracy and Errors, Major GPS Systems.

## **5. GLOBAL INITIATIVES FOR DISASTER MANAGEMENT:-**

**Global Disaster Scenario:** Emergence and evolution of disaster research and management, Global Disasters: Continental disaster profiling, Country-wise disaster profiling with special focus on Asian countries, **Global Initiatives for Disaster Management:** IDNDR: Formulation, Priorities and Outcomes, ISDR: Formulation, Priorities and Outcomes, Hyogo Framework (HFA): Framework, Priorities for Action and outcomes, **Contemporary Disaster Management Framework and Future Agenda:** Sendai Framework: Goals, objectives and Guiding Principles, Priorities for Action in Sendai Framework, Sendai Framework: Role of Stakeholders; International Cooperation and Partnership, **International Agencies for Disaster Management:** United Nations: UNDRR (UNISDR), FAO, IOM, UNDP, OHCHR, UNHCR, UNICEF, WFP, WHO, IFRC and ICRC, International Non-governmental agencies.

## **6. DISASTER MANAGEMENT MECHANISMS IN INDIA:-**

Disaster-scope of India, Role of Planning Commission in Disaster Management, disaster Management Act - 2005, DM Rules -2009, AMCDRR-2016 (PM-10 point agenda), Disaster Management Plan and Policy, Institutional Framework for Disaster Management, Financial Framework for Disaster Management, Legal Framework for Disaster Management, Role and Responsibilities of NDMA, SDMA, DDMA, Role of NIDM, SIDM, NDRF, SDRF, Role of Municipalities and Panchayati Raj Institutions in Disaster Management, Community Participation in Disaster Management and Risk Reduction.

## **7. INCIDENT RESPONSE SYSTEM AND EMERGENCY MANAGEMENT:-**

**Incident Response System:** Concept, Context and Relevance of IRS, IRS Organization and Features of IRS, incident Response Teams (IRTs) at State and District Level, **Disaster Response Management:** Response and Coordinating Arrangements at National, State and District Level, Incident Response System Facilities, Community Participation in Disaster Response, **Organization of Incident Response System:** Incident Commander (IC) and Command Staff, Role and Responsibilities of IC, IMO, LO and SO, General Staff, **Functions of Incident Response System:** Operation Section: Role, duties and responsibilities, Planning Section: Role, duties and responsibilities, Logistics Section: Role, duties and responsibilities.

## **8. DISASTER RISK REDUCTION AND MANAGEMENT PLANNING:-**

**Disaster Risk Reduction:** Disaster Risk: Concept and Components, Disaster Risk Reduction (DRR) Concept and Relevance, DRR Activities and Initiatives; Disaster Risk Management (DRM), **Community Based Disaster Risk Management (CBDRM):** Resilience, Community, Characteristics Disaster Resilient Communities, Concept, Need, Relevance and Approaches of CBDRM, Integrating Disaster Risk Reduction with Rural Development, **Public Preparedness and Management for Risk Reduction:** Public Awareness and Preparedness for Risk Reduction, Mock Drills, School and Hospital Safety, Crowd Management, **Developing Disaster Risk Resilience for Urban Cities:** Media in Public Preparedness, Awareness and Risk Reduction, Role of NGOs and Corporate Sector in Disaster Risk Management, Gender-Sensitive Disaster Risk Reduction.

## **9. RESEARCH METHODOLOGY:-**

Scientific Investigation: Definition, scope and objective, types, approaches and significance, The research process: the broad problem area; preliminary data collection; problem selection and definition; theoretical framework; hypothesis development and research design, Experimental Design: laboratory experiment; variables; validity; experimental designs, Data collection: measurement, processing and analysis; measurement in research, operational definition, measurement scales, scaling; scaling techniques, reliability and validity; sources of data; data collection methods: interviewing, questionnaires, other methods of data collection; review of statistical data analysis, Sampling: Need and purpose of sampling, population and sample, population frame, sampling with and without replacement, population parameters, Sampling theory–sampling distributions, parameter estimation, hypothesis testing. Sampling designs – probability and non-probability sampling, Report writing: the research proposal, the report, integral parts of the report, steps involved in report writing, types of reports, oral presentation, conclusions.

## **10. INDUSTRIAL SAFETY AND RISK MANAGEMENT:-**

**Introduction to Industrial Safety:** History and Development of Safety Standards and Codes; Safety Organisations, Accident and their Causes; Accident Prevention and Control Techniques, Work Place Hazards: Identification of Hazards- Physical,

Chemical, Electrical and Fire, Industrial Safety Legislations, **Industrial Safety Management:** Concept and Definition, Management Principles, Safety Management Principles and Practices, **Safety Awareness and Training:** In-Plant Training Programmes; Out of Plant Training Programme, Role of Trade Unions in Industrial Safety; Safety Promotion and Publicity, Human Behaviour and Safety.

## **11. URBAN DISASTERS AND RISK MANAGEMENT:-**

Basic Concepts: Urban Hazards and Disasters: Nature and Classification, Urban Hazard and Disasters: Global trends, Urban Hazard and Disasters: Vulnerable Spaces and Sections, Hazard Risk & Vulnerability in Urban Areas: Understanding Hazard Risk and Vulnerability Analysis (HRVA), Preparing Database for HRVA, Conducting /Preparing Hazard Risk Vulnerability Analysis, Disaster Risk Reduction: Risk Sensitive Urban Planning, Resilient Cities and Hazard Proofing of Built Spaces, Implementing Disaster Risk Reduction, Urban Disaster Management: Institutional Arrangements for Disaster Management, Community Based Urban Disaster Management, City Disaster Management Plan.

## **12. GEOINFORMATICS FOR DISASTER MANAGEMENT:-**

**Geoinformatics Perspective for Disaster Management:** Significance of Geoinformatics in Disaster Management, Contribution of Geoinformatics to Disaster Management, Satellite Sensors and Data for Disaster Management, **Geoinformatics for Disaster Mitigation and Preparedness:** Hazard Evaluation: Analysis, Zonation and Modelling, Risk and Vulnerability Assessment, Monitoring and Forecasting; Warning and Evacuation, **Geoinformatics for Geotectonic Hazards and Disasters:** Landslide Hazard Assessment and Monitoring, Seismic Hazard Assessment and Monitoring, Volcanic Hazard Assessment and Monitoring, **Geoinformatics for Hydro-meteorological Hazards and Disasters:** Flood Hazard Assessment and Monitoring, Cyclone Hazard Assessment and Monitoring, Drought Hazard Assessment and Monitoring.

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## 1. GEOMORPHOLOGY:-

Geomorphology: Meaning, nature and scopes, approaches of geo morphological analysis, Fundamental concepts in geo morphology: geological structure and landforms, uniformitarianism, characteristic assemblages of landforms, sequential changes in landforms, Structural geomorphology: Physical conditions of earth interior, characteristics and topographic expression of fault and fold structures, Mountain and mountain building theories by Kober and Holmes, Forces of crustal instability: Continental drift and Plate Tectonics, Isostasy, Vulcanicity, Weathering and mass wasting: meaning, significance, controlling factors and classification. Concept of Hill- slope development, Slope decline theory by Davis, Slope replacement by Penck and parallel retreat by King, Drainage system and pattern, concept of river capture, man and river processes, Surface processes and landforms: Fluvial geomorphic system and its evolution, Aeolian processes and landforms, glacial processes and landforms, Karst process and landforms, work of ocean and coastal landforms, Concept of Applied Geomorphology: Geomorphology and Hazard management, Geomorphology and Urbanization, Geomorphology and Hydrology.

## 2. HUMAN GEOGRAPHY:-

**Human Geography: Changing Scales of Experience:** Meaning of Human Geography, Subject Matter of Human Geography, Human Geography through the corridors of time, Classification of Human Societies, Man- Environmental Relationship and Environmental Crisis, **Urbanism, Globalization and Changing Culture:** Defining Urban area: Town and City, Origin and Growth of Urbanization in India. Concept of Globalization, Cultural globalization, Impact of globalization on Indian culture, **Population and Food Supply and Ageing:** Population Growth and Food Supply, Demographic transition model and Emergence of second demographic transition, Population Ageing and development, **Geopolitical Traditions, Development and Sustainability:** Organic Theory of State, German Geopolitics, Heartland and Rim land Theories, Concept of State, Nation and Nation-States, Concept of Boundaries, their classification and Frontiers, Sustainable Development and environmental sustainability with reference to India.

### 3. CLIMATOLOGY:-

Compositional and thermal structure of the atmosphere, Insolation: Solar source, heat balance of the earth, greenhouse effect and global warming, vertical and horizontal distribution of temperature, Atmospheric motion: Forces controlling motion of air, vertical motion and vorticity, local winds, jet stream, general circulation in the atmosphere; Atmospheric moisture: humidity, evaporation, condensation, precipitation: formation, types, acid rain, world pattern of precipitation, Tropical, temperate and high latitude weather systems- concept of air masses and atmospheric disturbances, ocean atmospheric interaction- El Nino, southern oscillation (ENSO) and La Nina, monsoon winds, northwesterly and cyclones, Tropical and Temperate phenomena, climate of India and its controls: Eastern disturbances, Climatic classification of Koppen, and Thornthwaite, Major climates of the world- tropical, temperate, desert and mountain climate. Climatic Changes: Ozone Depletion; Global Warming: Strengthening of Greenhouse effect.

### 4. ECONOMIC GEOGRAPHY:-

**Nature of Economic Activity:** Definition, nature, and scope of economic geography Types of Economic Activity, Geographical Configuration of World trade (WTO, NAFTA, SAPTA, EU) Open World Trading System (FTA): Merits & Demerits, International Trade and Foreign Direct Investment (FDI), **Location and Land Use:** Central Place Theory: Christaller's Model Agricultural Land Use: Von Thunen's Model Industrial location: Weber's Model, Urban Land Use: Monocentric city and Polycentric city, **Resource Economics:** Resource: Concept and Types, Natural Resources and Development: An Overview of Land, water and Minerals World Production and Distribution of Coal, Petroleum and Iron Ore, **Economic Growth:** Concept of Economic Growth and Development Rostow's Stage Model, Polarized Development: Models of Myrdal, Hirschman and Friedman Growth Pole Theory of Perroux.

### 5. GEOGRAPHICAL THOUGHT:-

The field of geography and characteristics of geographical work, Classification of knowledge, place of geography among sciences, Nature of geographic knowledge during ancient (Greek, Roman and Indian) and Medieval(Arab) periods, Foundations of modern geography-contributions of Varenus, Kant, Humboldt and Ritter, Emergence of geography as a study of (i) physical features (ii) chorology (iii) landscapes. Concepts in geography: environmental determinism and possibilism, a real differentiation and spatial organization Dichotomy and dualism in Geography: Physical versus Human Geography and Systematic versus Regional Geography, Quantitative revolution-emergence of geography as spatial science Positivist explanations in geography-laws, theories, models Inductive and deductive logic in geographic explanations, Behavioural and humanistic perspectives in geography Social relevance in geography – Welfare, Radical and Feminist Perspectives Postmodernism and Geography.



## **6. GEOGRAPHY OF SOCIAL WELL-BEING:-**

**Social Well Being, Human Development and Quality of Life:** Meanings of development, Concept of social well-being, measuring development as human development: The Human Development Index- Concept and measurement, Quality of Life: Concept and measurement, the origins and nature of the sustainable development goals (SDGs) and social well being, **Education and Health Factors in Social Well Being:** Indicators of educational development in India and their data sources, Historical development of education in India, National Education Policy-2020 and its likely impacts on social well- being, Indicators of health development in India and their data sources, current scenario of undernourished children and ageing population in India, **Poverty as Expression of Poor State of Social Well Being Poverty:** Concept and measurement (UNDP and Indian Perspectives), Current State wise pattern of poverty in India, Causes of poverty in India, **Food Security and Public Distribution System:** Concept of food security, Indicators of food security, Public distribution system as a tool to ensure food security in India, Major challenges of food security in India.

**OR**

## **URBAN GEOGRAPHY:-**

Nature and scope of Urban geography, approaches to urban studies, Origin and evolution of cities: Characteristics of cities in different historical periods: Pre-industrial, industrial and Post-industrial, Functional classification of cities: Qualitative and Quantitative methods, Theories of urban structure: Burgess, Hoyt, Harris and Ullman, Mann, Pattern of urbanizations in developed and developing world, Urban Sprawl and Urban agglomeration, Urban Environmental Problems and their Management: Air, water, Transport and solid waste with special reference to India, Urban Governance: Role of state and other agencies in urban planning and development, Urban policies and development: Smart and Sustainable Cities.

**OR**

## POPULATION AND SETTLEMENT GEOGRAPHY

Historical Development of Population Geography as a discipline; Nature and Scope of population geography, Sources of population data; their quality and reliability, Major theories of population: Malthusian perspective and Marxist perspective, Demographic transition theory, Concept, determinants & pattern of the following attributes of population in India and World: Density and distribution, Growth, Urbanization and Literacy, Settlement Geography: Nature and Scope of Settlement Geography; Theories of evolution of settlements, Internal and External physical structure of settlement, Rural and Urban, Settlement Hierarchy: Concept of Hierarchy, central place theory, hierarchical structure of settlements in India. Issues and Policies on population and Human Settlements.

### 7. REGIONAL PLANNING:-

**Basic Concepts and Historical Development:** Regional Planning: Concept, Nature and scope, Aims and objectives Rationale of Regional Planning, Principles of Regional Planning Historical Development: Regional Planning in the Developed World Regional Planning in Less Developed World, **Geography and Regional Planning:** Background and Philosophical Base. Role of Geography in Regional Planning. Methodology: Design Method, Regional Method .Techniques of Regional Planning: Analytical technique, Procedural techniques, **Regions for Planning:** Concept of Regions: Delineation and variables. Types of Regions, Planning Region: Concept and Characteristics Need and Importance of Planning Region. Principle, Criterion and Method for Planning Region. Planning Regions of India: Detailed Study of Planning Regions given by C.S. Chandrasekhara. Problems and Prospects of Regional Planning in India, **Surveys and Methods for Planning:** Concept and Functions of Surveys. Types of surveys: Regional and Diagnostic survey. Role of Geospatial Technology in planning Environment Impact Assessment.

### 8. QUANTITATIVE TECHNIQUES:-

Measures of Central tendency: Mean, median and mode. Measures of Central locations in spatial situation: types of spatial data and scales of measurement, concept of Mean centre, weighted mean centre and median point, Measures of dispersion: Mean deviation, standard deviation, coefficient of variation, measures of spatial dispersion along point, line and area distributions, Probability: Classical and relative frequency approaches to probability, calculation of probability: Law of addition, law of multiplication. Probability distributions: normal and binomial. Sampling: Basic concept, sampling frame, different sampling designs, Measuring the strength of relationship: Scatter diagram, Spearman's rank correlation, Karl Pearson's product moment correlation coefficient, Regression analysis: Fitting a regression line by semi-averages and least square methods.

## **9. CULTURAL GEOGRAPHY:-**

Cultural Geography: meaning, nature, Components of culture, cultural traits, significance and framework of cultural geography. Major themes of cultural geography, The evolutionary approach in cultural geography. The evolution of cultural Geography- The contribution of Otto Schluter and Carl Sauer, Linguistic cultural regions, linguistic diffusion, linguistic ecology, linguistic cultural integration, and linguistic landscapes, Religious cultural regions, major religions of the world, religious diffusion, religious ecology, cultural integration in religion, religious landscapes, Concept of folk Geography, folk culture region, folk culture diffusion, folk architecture in the cultural landscape, house types, Concept of Popular cultural Regions, Popular cultural diffusion, popular cultural ecology, Landscapes in popular culture, Cultural Realms and Ecology; Concept of Cultural Hearths; Major Cultural Realms and Regions of the World, Behavioral geography as a sub-field of cultural geography. A general account of cultural geography of the Himalayas. Humankind as a geomorphic and biotic agent.

**OR**

## **AGRICULTURAL GEOGRAPHY:-**

Definition, Nature, subject matter and Significance of Agricultural Geography Approaches: (i) commodity, (ii) systematic, (iii) regional, Determinants: (i) physical, (ii) economic, (iii) socio-cultural, Agricultural Types: Agricultural types and their world distribution, Subsistence Agriculture, Commercial farming, Plantation agriculture, mixed agriculture, State, Collective and Cooperative farming, Spatial patterns of major commodities in each type, Selected agricultural concepts and their measurement, Intensity of cropping, Degree of commercialization, Diversification and specialization, Efficiency and productivity. Land-use survey and classification, A critical evaluation of the classification of world agriculture with reference to Whittlesey, New perspectives in Agriculture: Contract Farming, Agri-business and Food Security.

**OR**

## **POLITICAL GEOGRAPHY:-**

Nature, scope and dimensions of Political Geography; Approaches to the Study of Political Geography, Perspectives: Political-Economy, Power and Politics in World Economy, World Systems, Place, and Globalization, Power-Political Heritage: Mackinder's heartland theory, German geopolitics 1924-1941, Containment and deterrence: the US world model Geopolitical World-Orders: Cycles of international politics, the cold war as a geopolitical world order, Forms of Governance: Unitary and Federal, Geography of Imperialism: The rise and fall of the classical theory, A world- systems interpretation of imperialism, Formal Imperialism: The creation of empires, Informal Imperialism: Dominance without empire, Geography and electoral studies: Geography of voting; Geographical

influences on voting; geographical influences on representation; Electoral Abuses: Malapportionment, Boundary Discrimination, Gerrymandering. Electoral Reforms: The Problem of Alternative Geographic; the problems of Alternative Electoral Systems.

## **10. GEOGRAPHY OF INDIA:-**

**Physical Geography:** Introduction: Physiographic Regions; Drainage Systems; Indian Monsoon; Natural Vegetation and Soil, **Demography:** Population Growth and Distribution; Sex-Ratio and Literacy Rate; Urbanization, Regional Geography; Regional schemes of LD Stamp, O.H. K. Spate, R.L. Singh; Himachal Region, **Economic Geography of India:** Agriculture: Salient Features, Problems and Solutions of Indian Agriculture; Green Revolution; Industries: New Industrial Policy and Industrial Regions, Development and Patterns of Transport Networks: Railways, Roadways and Waterways; Indian Foreign Trade.

## **11. BIOGEOGRAPHY:-**

Biogeography: Concept, field and significance and approaches to biogeographical studies Ecosystem: Concept, properties, components, types and functioning, Mountain Ecosystems: Mountain ecology, risks and vulnerabilities, Soil system: Definition, function, components and characteristics; Soil Profiles. Biomes: Meaning and major forest biomes of the world, Biodiversity: Meaning, types and importance of biodiversity, Extinctions of species and their global concern, Biodiversity and conservation, Biodiversity hot spots, The characteristics and evolution of living things: Lamarck and Darwin views of evolution, Factors affecting distribution of organisms, General characteristics of plants and animals. Plant association and succession, Taxonomic, Climatic, and Raunkiaer's classification of plants, Environmental Management: meaning, importance, Environmental governance and Management; Environmental policies and legislations: Conservation Act of 1972, Environmental Protection Act, 1986, Biological Diversity Act, 2002. Global Environmental problems and Sustainable Development.

## **12. RESEARCH METHODOLOGY IN GEOGRAPHY:-**

Nature of Geography, Perspectives in Geographic Research, Geographic questions in research, Meaning and Types of Research, Plagiarism and Ethical Issues in Research, Selection of the broad area of research, Identification and formulation of Research Problem, Writing of the research proposal, Literature search and Review, and research hypothesis, Sources and methods of primary Data Collection- Field work, observation Method, the Questionnaire, Sampling- Sampling design, sampling frame, sampling methods and types, Secondary Data: Census, National Sample Survey Organization, Central Statistical Organization, National Family Health Survey, Data Analysis- Qualitative Methods- Phenomenology, ethnography, Grounded Theory, Content analysis, Discourse analysis and historiography, Quantitative Research design, Comparison between

quantitative and qualitative research, Data interpretation and report writing in Geography.

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## 1. ENVIRONMENTAL GEOLOGY AND ATMOSPHERIC SCIENCE:-

Definition, evolution, characteristics principles and history of Environment and environmental Sciences. Fundamental concepts, Primary differentiation and formation of core, mantle, crust, magma generation, dynamics of earth, Plate tectonics – sea floor spreading, mountain formation, Continental drift theory, Earth's Magnetic field, types of seismic waves and their role in the study of earth's interior, **GEOMORPHOLOGICAL PROCESSES:** Formations and classification of rocks rock cycle, Fold, and Fault, Major types of fold and faults, Weathering and their types, Mass wasting and its types Volcanism , types, volcanic materials , process and effects of volcanism, Soil profile, soil classification, soils of India, **ENVIRONMENTAL GEOCHEMISTRY:** Concept of major, minor and trace elements. Mobility of elements, geochemical cycles, Geo- indicators. Resources and reserves, Mineral resources and reserves, Oceans as new areas for exploration of mineral resources. Mineral resources of Himachal Pradesh, **ATMOSPHERE:** Different layers and their characteristics; Atmospheric composition, meteorological aspects- inversions, mixing height, wind-rose, electromagnetic radiations, solar radiation and terrestrial radiation, Heat budget, Temperature measurements and controls, Environmental lapse rate, humidity, mixing ratio, dry and wet adiabatic lapse rate, clouds-types and their characteristics and atmospheric stability, Atmospheric transport, diffusion and dispersion, **WEATHER AND CLIMATE:** Elements of Weather and Climate, classification, energy balance in atmosphere, greenhouse effect, Atmospheric general circulation, Precipitation and types of storms, Indian monsoon, El Nino , La Nina effect, and western disturbances, Geostrophic wind and gradient wind, cyclones, Atmospheric moisture: Forms of cloud condensation; Precipitation, Thunderstorms, floods and droughts, Global Climate variability and climate change. Introduction to Weather forecasting models.

## 2. ENVIRONMENTAL BIOLOGY:-

**CONCEPT AND SCOPE OF ECOLOGY:** Definition and scope of ecology, branches of ecology, Human ecology and human settlement, Historical background of ecology, relevance of ecology to humankind, level of organization in ecology, Relationship of ecology with other branches of science,

**ORIGIN AND EVOLUTION OF BIOLOGICAL DIVERSITY:** General classification of biological diversity (plants and animals), Growth and morphogenesis in plants and animals, Basics of photosynthesis, transpiration, biological nitrogen fixation, Physiological, biochemical and genetic mechanisms associated with adaptations of plants and animals, **ECOSYSTEM CONCEPTS AND DYNAMICS:** Principle and concept of ecosystem, types of ecosystems, Biotic and abiotic components of ecosystem, biomes, ecotones and edge effect, ecological niche and equivalents, ecotype, ecophene and ecological indicator, Biogeochemical cycling Carbon, Nitrogen, Phosphorus and Sulphur and Hydrological cycles and microbial ecology, C3 and C4 pathways and their significance, Ecological pyramids of number, biomass and energy, food chain, food web and trophic levels, ecological amplitude and ecological niches, ecological energetics, Decomposition, Ecosystem stability, Ecological Succession, Primary and secondary productivity of different ecosystems in the world methods of measurements of productivity and the factors affecting productivity, **POPULATION AND COMMUNITY DYNAMICS:** Characteristics of Population, concept of carrying capacity, Population growth and regulation, Population fluctuation, dispersion and meta- population. Concept of r and k species, key stone species, Definition of community, its characteristics, diversity, dominance, structure, stratification, periodicity, fluctuation within community, Interdependence within community, **STUDY OF DIFFERENT ECOSYSTEMS:** Forest ecosystem- Forest as an ecosystem, distribution of forests, types of forests, economics and ecology of forest, role of forests in protection of species regulation of climate and production of various produce, Grassland ecosystem - Distribution and types of grasslands, rangelands and biodiversity in grassland, and productivity in grasslands, Desert Ecosystem and Wastelands-Desert as ecosystems, hot and cold deserts, productivity, characteristics and global distribution of deserts; Desertification process; Types and distribution of wastelands in India, Aquatic Ecosystem: Lentic and lotic ecosystem, structure, energy flow and productivity in estuaries, marine ecosystem, structure biodiversity and productivity in, marine ecosystem, Wetland Ecosystem: Distribution, energetics and productivity in wetlands. Biodiversity and economic importance of wetlands.

### **3. ENVIRONMENTAL DISASTERS: MITIGATION AND MANAGEMENT:-**

**INTRODUCTION TO DISASTERS:** Disasters: Meaning and definitions, difference between disaster and hazard, causal factors, development leading to disaster, characteristics of disasters, forecasting and warning of disasters, elements of early warning systems, Classification of Disasters: Natural and man-made hazards, hazard zonation and risk assessment, mitigation strategies, Man- Made Disasters: Types and nature of man-made disasters, general effects and mitigation strategies for manmade disasters, Biological Disasters: Meaning, types, vulnerability, effects, preparedness and mitigation of Biological disasters, Chemical and Radiological Disasters: Causes, impacts and management of chemical and radiological disasters, **NATURAL DISASTERS- I:** Natural

Disasters: Introduction, meaning, nature and types of natural disasters, general effects of natural disasters, Earthquake and Seismic Hazards: Origin and severity of earthquakes, effects of earthquakes, risk evaluation, seismic zonation of India with special reference to Himalayan Region, earthquake mitigation measures, Volcanic Eruptions: Nature, causes, monitoring and mitigation of volcanoes, Landslides: General characteristics, causes, vulnerability, effects, prediction and warning and risk reduction mitigation measures, Snow Avalanches: Formation of avalanches, classification, mitigation and management of avalanches, **NATURAL DISASTERS- II:** Floods: Causes of flood, flood and draught, erosion and sedimentation, flood prone areas of India and associated hazards, assessment and management of flood, Cyclones: Nature and genesis, anticyclones, weather associated with cyclones, Geological changes and other effects, Tsunami: Origin and nature, causes of tsunamis, wave propagation, impact on coastal areas, warning and prevention, tsunami mitigation measures, Drought: Meaning, types, general characteristics, causes and impacts, prediction and warning and mitigation measures, Heat and Cold Waves: Causes and impacts, prevention, preparedness and response, **DISASTER MANAGEMENT:** Disaster Management: Definition, objectives and scope of disaster management, elements of disaster management, role of professionals in the management of disasters, disaster management cycle, Disaster Response: Response plans, search, rescue and evacuation, community health and casualty management, **DISASTER MITIGATION AND PREPAREDNESS:** Disaster Preparedness: Disaster preparedness plans, prerequisites of preparedness planning, role of Information Technology, education, communication, and awareness in preparedness, Rehabilitation and Reconstruction (R and R): Social and economic aspects of R and R, Housing, relocation, retrofitting, repairing and strengthening of houses, reinstating livelihoods, national policy on disaster management.

#### **4. CURRENT ENVIRONMENTAL ISSUES AND THEIR MANAGEMENT:- GLOBAL WARMING, GREENHOUSE EFFECT AND OZONE PROBLEMS:**

Global Warming Potential, Possible Impact of Global Warming, Greenhouse Effect – Policy Response, Kyoto Protocol, El-NINO- Climate Cycle, Ozone in the Atmosphere, Ozone Depletion Process, Ozone Hole, Worldwide, Ozone Trends, the Montreal Protocol, Consequence of Ozone Depletion, **ACID RAIN, ATMOSPHERE TURBIDITY AND NUCLEAR:** Introduction, Nature and Development of Acid Rain, Acid Rain and Geology, Acid Rain and Aquatic Environment, Acid Rain and Terrestrial Environment, Acid Rain and Built Environment, Acid Rain and Human Health, Mitigation of Acid Rain Problems, Aerosol types, Production and Distribution, **OTHER ENVIRONMENTAL ISSUES:** Introduction, Consequences of global CO<sub>2</sub> changes; Strategies for Conservation of Environmental Changes Induced by CO<sub>2</sub> Rise, Problems of slums in urban cities, Cancer and AIDS, Descriptive and analytical markers and indicators of pollutants in the body; Water-borne, air borne, vector borne, genetic, contagious and non-contagious diseases and their management, Sanitation



measures to control infectious diseases, Environmental problems in India (Narmada Dam, Tehri Dam, Almetti Dam, Soil erosion, Formation and reclamation of user land, alkaline and saline soil; Unsustainable Agricultural Practices and Land Use Planning); recent problems like Delhi smog, crop burning,

**ENVIRONMENTAL POLICES AND REGULATIONS:** Fundamental principles of environmental protection, Constitutional perspective: Fundamental right to wholesome environment, directive principles of state policy, National Environmental Policy, Environmental regulatory framework in India, Role of international Environmental Agencies-UNEP, GEF, UNFCCC and IPCC,

**ENVIRONMENTAL TREATIES AND CONVENTIONS:** Stockholm Convention (1972), Basel Convention (1989, 1992) Earth Summit at Johannesburg (2002) Earth Summit Rio De Janeiro (1992, 2012), Kyoto Protocol, 1997; Montreal Protocol, 1987; Ramsar Convention on Wetland, 1971, Paris Agreement (2015), Rotterdam Convention on Prior informed consent procedure for certain hazardous chemicals and pesticides in International schedule, Agenda 21, sustainable development goals, India's role in various conventions and contributions.

## **5. ENVIRONMENTAL POLLUTION:-**

**INTRODUCTION:** Definition and sources of pollution, Different types of pollution, Global and regional scenario of pollution, **AIR POLLUTION:** Types and sources of air pollutants, Reaction of pollutants in atmosphere; atmospheric diffusion and stack performance, air quality standards, Introduction of basic instruments for sampling and analysis of air pollutants, Effects of air pollutants on flora and fauna, Biological indicators of air pollution, Bio-monitoring of air pollutions, **WATER POLLUTION:** Sources and kinds of water pollution, water quality standards, Effects of water pollutants on plants (phytoplankton and macrophytes); Effects of water pollutants animals (zooplankton, macro-benthic invertebrates and fish), Eutrophication and its impacts on organisms and communities, Impact of heavy metals, halogens, radio-nuclides on aquatic flora and fauna, **NOISE AND LAND POLLUTION:** Physiological, social and psychological effects of noise, Methods of noise abatement; shock waves and SST; Noise control in vehicles, Industrial noise control and effects, National and International standards, Soil pollution, Sources and management of municipal solid waste, Biomedical waste, Hazardous waste and Industrial waste, **THERMAL AND RADIATION POLLUTION:** Thermal pollution: Concept of thermal pollution, sources of thermal pollution, thermal power plant pollution, thermal effects on aquatic life, impacts on water quality, prevention of thermal pollution, Radiation pollution: Causes, effects (health hazards) and control measure of radiation pollution, Applications of ionizing isotopes in waste water and air pollution analysis and treatment.

## **6. NATURAL RESOURCES: CONSERVATION AND MANAGEMENT:-**

**NATURAL RESOURCES – FLORA:** Natural resources: introduction, characteristics and classification, Concept of endemic, extinct and threatened species (endangered, rare, vulnerable and indeterminate species), Plants as a

natural resource: a general account with reference to timber, food and medicines, Degradation of plant resources: Causes and Consequences, **NATURAL RESOURCES - WATER AND ANIMALS:** Wild life as natural resources: A general account with special reference to game wildlife and food, wildlife of India, Depletion of wildlife: causes and consequences, Fisheries: Status and conservation with special reference to India and Himachal Pradesh, **NATURAL RESOURCES - SOIL AND MINERALS:** Soil as a natural resource, a general account with reference to nutrients and soilbiota, Role of agricultural practices, wind and water erosion in soil degradation, Origin, distribution and uses of economically important minerals; exploitation of mineral resources from oceans with special reference to India, Impact of exploitation of minerals on environment, methods of conserving the mineral resources, **NATURAL RESOURCES – ENERGY:** Energy, demand and supply scenario in India, energy conservation measures, Coal, oil and natural gas (physico-chemical characteristics and energy content of coal, petroleum and natural gas), Principles of generation of Hydro energy, wind energy, tidal energy, solar energy, nuclear energy, Biogas, firewood, petero-plants, dendro-thermal energy and their application; impacts of large scale exploitation of different forms of energy, **NATURAL RESOURCES- CONSERVATION STRATEGIES and MANAGEMENT:** In-situ conservation of plants and animal species: Natural Parks, Biosphere reserves and sanctuaries, Ex-situ conservation: Botanical gardens, Zoological parks, tissue culture techniques, cryo- preservation of pollen, seeds and sperms, Conservation of forests, social forestry and agro-forestry, carbon sequestration, Conservation of soil and management of grasslands and wetlands.

## **7. ECOTOXICOLOGY AND RADIATION IMPACTS:-**

**CONCEPT and HISTORICAL BACKGROUND:** Origin and scope of toxicology, relationship with other sciences, Development of environmental toxicology (Historical and evolutionary Perspective), Classification of toxicants, natural and synthetic toxins, sources of toxicants, Basic concepts of toxicology, types of toxicity, acute and chronic toxicity, Toxicants and toxicity, factors affecting toxicity, types of toxins and basic mechanism of action, **MODE OF ACTION AND EFFECTS OF TOXICANTS:** Environmental Toxicants: Mode of action of toxicants, factors affecting the metabolism of xenobiotics; transport process mechanism of toxicants, mode of action and impacts of Arsenic, Cadmium, Lead, Mercury, Carbon-Monoxide, Nitrous Oxide, Sulphur Dioxide, Ozone, Cyanide, mode of action of pesticides, Toxicity impacts: Health impacts of toxicants on human and aquatic life, long-term effects- chronic, carcinogenic, mutagenic and teratogenic effects, **OCCUPATIONAL HEALTH:** Health problems related to occupation (due to dust, heat, stresses, chemicals, toxic gases, insecticides and pesticides, metals and biological agents) Risk Assessment and Management in the Workplace (Workplace Exposure Assessment, Risk Management in the Workplace), Dose response relationship, LD 50, LC 50, toxicity testing, acute toxicity tests, Sub-acute and chronic toxicity tests, heavy metal toxicity tests, **RADIATION IMPACTS:** Natural and man-made radiation, application of radiations, sources of ionizing radiation, types of ionizing radiation, radiation dose and units, direct and indirect effects, Dose limits, radiation hazard,

Personal protection and house-keeping and safety rules, **EFFECTS OF RADIATIONS:** Molecular and cellular radiobiology: Biological effects of radiation, Radiation lesions in DNA, Major types of DNA repair, DNA damage and repair, chromosomal aberrations and gene mutations, cell death, cell survival curve, consequences of unrepaired DNA damage, radiobiological definition of cell death, cell cycle effects, Impact of radiations on biological molecules (proteins, nucleic acids, lipid and carbohydrates), Radio-protectors and Industrial safety requirements, industrial radio-protector.

## **8. ENVIRONMENT IMPACT ASSESSMENT:-**

**OVERVIEW OF EIA,** Objectives and developmental Concept, origin of EIA, Benefits of EIA, Indian directions guidelines (GOI different notification of EIA). Rapid and comprehensive EIA perspectives, Sources and collection of data for EIA. Measurement of Impact (Physical, social, economic, natural), **EIA Methodology:** Outline of EIA process, Screening, Scoping, Purpose of scoping, impact implications, Baseline studies and superimposition of projected plant emission impacts; reliability of database; intrinsic and external database supports and interpretation; checklist, matrices, Overlays and Geographical Information System, Impact analysis and Predictions, Environmental Impact Statement [EIS]; Public hearing as part of EIA; EIA report, **PREDICTION and ASSESSMENT OF IMPACTS:** Prediction and Assessment of Impacts on Water Environment, Air Environment, Noise Environment, Biological Environment, Cultural and Socio-cultural Environment, EIA of River valley project, Hydro power project, Cement plants and Mining, Prediction and assessment of: Impact of tourism on environment, impact on flora and fauna in Himalayan region, **PUBLIC PARTICIPATION:** Social impact assessment (SIA), Strategic Environmental Assessment (SEA), types of impacts, Public involvement, Public Hearing compulsion, restoration and rehabilitation methodologies, Mitigation criteria, Project modification, Post project analysis, **ENVIRONMENTAL MANAGEMENT AND ISO CERTIFICATION:** Environmental Management Systems (EMS), ISO 14000 (EMS). Components of Environmental Management System-Objectives, Policies, Implementation and Review, Life Cycle Analysis – LCA. Waste minimization and product augmentation.

## **9. REMOTE SENSING AND GIS:-**

**INTRODUCTION TO REMOTE SENSING:** Definition of remote sensing; introduction to concepts and systems, Scope of remote sensing, Electromagnetic Spectrum; Radiation principles; image characteristics, Remote sensing systems; remote sensing platform, Sources of remote sensing information; advantages of remote sensing, **MICROWAVE SENSING:** Types of microwave systems, advantages, band designation, range resolution, azimuth resolution, real and synthetic aperture systems, Radar equation, radar return and image, Signatures, dielectric properties and interaction with vegetation Surveying, Leveling, Triangulation, Geo-datic survey, **AERIAL PHOTOGRAPHS AND SATELLITE IMAGERIES:** Interaction between light and matter,

Characteristics of aerial photographs, Visual interpretation of aerial photographs and satellite imageries, Instruments used in interpretation, Path and Row Index Maps; selecting and ordering images, **DIGITAL IMAGE PROCESSING:** Introduction to digital image processing, basic concept and principle, image rectification and restoration, Image enhancement; manipulation; image classification; the output stage; data merging; conclusion, **APPLICATION OF REMOTE SENSING IN ENVIRONMENTAL MANAGEMENT:** Remote sensing in natural resource management - forest resources, water resources, land resources and mineral resources, Hazard and disaster mapping and management, Introduction to GIS; principle of GIS; terminology used in GIS; space and time in GIS, Maps and its characteristics, map scale, map symbology; spatial relationship; data structure and spatial analysis in GIS; GIS data; software used in GIS.

## **10. ENVIRONMENTAL CHEMISTRY AND GREEN TECHNOLOGY:-**

**CONCEPT AND SCOPE OF ENVIRONMENTAL CHEMISTRY:** Nomenclature, segments of environment, Concept and scope of Environmental Chemistry, Chemistry of biologically important molecules, chemistry of water, hydrogen bonding in biological systems, Chemistry of various organic and inorganic compounds, Chemistry of hydrocarbon decay, environmental effects, effects on macro and microorganisms, **FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY:** Stoichiometry, Gibb's energy, chemical potential, Chemical equilibrium, Acid-base reaction, solubility product, solubility of gases in water, Solubility product, solubility of gases in water the carbonate system unsaturated and saturated hydrocarbons, Surfactants: Cationic, anionic and nonionic detergents, modified detergents, Pesticides: Classification, degradation, analysis, pollution due to pesticides and DDT problems, organ chlorides, organophosphates, organo-carbamates, herbicides, Synthetic Polymers: Microbial decomposition, polymer decay, ecological and consideration, Photosensitize additives., **ENVIRONMENT AND GLOBAL WARMING:** Chemical composition of Air: Classification of Elements, Chemical speciation, Chemical process for formation of inorganic and organic particulate matter, Thermo-chemical and Photochemical reaction in the atmosphere, Oxygen and Ozone chemistry, Chemistry of Air pollutants; photochemical smog. O<sub>3</sub>, N<sub>0</sub>x, HC CFCS and PAN, Chemistry of greenhouse gases, emission of CO<sub>2</sub>, Consequences of greenhouse gases, their control and remedial measures, threats of Global warming, **PRINCIPLES OF GREEN TECHNOLOGY:** Overview of green chemistry, principles of sustainable and green chemistry, Waste minimization and climate change, Introduction to nano-materials and green nanotechnology, Nano-medical application of green nanotechnologies, **APPLICATION OF GREEN TECHNOLOGY:** Green technology in industries, fuel cell and electric vehicles, solar energy and hydrogen production, energy from alternate sources, solar photovoltaic technology, Bio fuel production (bio-ethanol and biodiesel), Biomass, prevention/ minimization of hazardous/ toxic products, production of biodegradable materials, concept of green building.

## **11. RESEARCH METHODOLOGY, STATISTICS AND COMPUTER APPLICATIONS:-**

### **INTRODUCTION TO RESEARCH AND SCIENTIFIC WRITING:**

Characteristics and types of Scientific Research, Organizing Scientific Research: Experimental Design, Research Methodology, Sampling designs, Writing research proposals, research paper, reviews, thesis, conference reports, book reviews, project reports, reference writing and scientific abbreviations, Preparation and delivery of scientific presentations, **BASIC CONCEPTS OF STATISTICS:**

Importance and scope of Statistics, Primary and secondary data - collection of data, Sampling of data - random and non-random sampling, Diagrammatic (Line, bar, pie diagram) and Graphic (Histogram, frequency polygon, frequency curve, cumulative frequency curve) representation of data, Measures of central tendency – Mean (AM, GM and HM), Mode and Median, Measures of dispersion, skewness and kurtosis, **PROBABILITY DISTRIBUTION:** Probability distribution - Binomial distribution, Poisson distribution, Normal distribution, Test of hypothesis, two types of errors, T-Test for assumed population mean and comparison of two samples, **STATISTICAL TESTS:** Chi square tests and its application, Co-

relation and regression, Principles of design of experiments. Examples of CRD and RBD, Analysis of variance (one way and two way analysis of variance),

### **COMPUTER APPLICATION AND ENVIRONMENT SYSTEM ANALYSIS:**

Basics of Computer: meaning, definition, types and main parts, structure of Central Processing Unit (CPU); Software: Meaning and types, Application of Software, System and customized software, software piracy; Booting: meaning and types, Operating System and Memory: meaning and types of operating systems, i.e. UNIX, LINUX, MS-DOS, Microsoft Windows; Memory: meaning and types, Storage capacity and Storage media, Computer Networking and Cybercrime: meaning, types of network, data security, password, firewall, encryption, backups, wireless networking; Internet: Benefits of internet, web browsing, Digital/Cybercrime, Application of computers in Environmental Sciences, Environment System, Analysis, Meteorology and Climatology, Surface and Groundwater Hydrology, Environmental Management and Decision Analysis, Databases, Satellite Data, Image Processing and Remote Sensing; Software Models...AI-ML. Chat GPT. Open-AI, Block Chain, IoT .

## **12. TECHNIQUES IN ENVIRONMENTAL MONITORING AND ANALYSIS:-**

**SAMPLING METHODS:** Sampling methodologies for Air, Water, Soil, Noise and Radioactivity in environmental matrices. Sampling protocols- Selection of sites, Time and frequency for sampling, Preservation, Storage and Handling of samples. Good Laboratory Practices, **ANALYTICAL INSTRUMENTS:** Principles, working and applications of High volume sampler, Respirable Sampler, Impactors, Cyclones, Particle Size Analyser, Gas Analysers, Spectrophotometer (UV-Visible), Flame Photometer, Atomic Absorption spectrophotometer (AAS). Head space analysis, leaching tests, and immunoassay, **ADVANCED MICROSCOPY AND CHROMATOGRAPHS:** Principles,

working and applications of Phase contrast, fluorescent, polarization Microscopes, SEM. Gas Chromatograph (GC), GC-MS, HPLC, Ion chromatograph, X- ray diffraction, ED-XRF, WD-XRF, ICP-MS, ICP-AES, **RADIATION DETECTORS AND MONITORS:** Principles and working of radiation detectors- gas filled, scintillation (inorganic and organic) and semiconductor. Principles and working of Alpha Counter, Beta Counter, Gamma-ray Spectrometer, Liquid scintillation Counter, Beta- Gamma survey meters, Alpha, Beta and Gamma contamination Monitors.

### **13.ENVIRONMENTAL LAW, GOVERNANCE, ETHICS AND POLICY:-**

**INTRODUCTION TO ENVIRONMENTAL LAWS:** Historical background of Environmental Law and Policy in India, Constitutional mandate for environmental protection, Environmental Protection: Issues and Problems, Key International Efforts for Environmental protection, Sustainable Development: Essential features and Legal Implications, UN Framework Conventions on Climate Change, 1992, Kyoto Protocol, 1997, **ENVIRONMENTAL PROTECTION AND LAW:** Environmental laws, environmental Policy in India, Indian Constitution and Environmental Protection Environment (Protection) Act, 1986: Salient Features, Powers of Central Government under EPA, Prevention, Control and abatement of environmental pollution under EPA, Hazardous wastes (Management, Handling and Transportation) Rules, 2008, Public Liability Insurance Act, 1991, **POLLUTION ABATEMENT AND THE LAW:** Water (Prevention and Control of Pollution) Act, 1974: Salient Features, Powers and Functions of CPCB and SPCB under Water Act, Air (Prevention and Control of Pollution) Act, 1981, Powers and Functions of CPCB and SPCB under Air Act, Noise pollution (Regulation and Control) Rules, 2000 (Note: Only relevant provisions of the above Acts), **NATURAL RESOURCE CONSERVATION AND THE LAW:** Wildlife (Protection) Act, 1972: Salient Features, Protected Areas and Trade and Commerce under WPA, National Forest Policy, Forest Conservation Act, 1986, Biological Diversity Act, 2002, **JUDICIAL ACTIVISM AND ENVIRONMENTAL PROTECTION:** Judicial Response towards Environmental Protection, Public Nuisance under IPC (Sections 268,277,278,284, 290,291), Sections 133-143 of Criminal Procedure Code, 1973, Role of UN authorities in protection of Global Environment, Evolution of International Environmental Law, International Environmental Law and the Challenge of Globalization, Recent Trends in International Law, National Green Tribunal (NGT).

### **14. BIODIVERSITY AND WILDLIFE ECOLOGY:-**

**INTRODUCTION:** Biodiversity: Basic concepts, importance and conservational needs, Factors for decline of biological diversity, Approaches for conservation of biological diversity, Protection of wild flora, fauna and natural habitats, concept of threatened species, threatened and endangered animals of India, **CONCEPT OF BIODIVERSITY:** Biodiversity Convention, international and national efforts to conserve biodiversity, Concept of genetic diversity, gene and germplasm banks,

Socio-cultural aspects of biodiversity, traditional knowledge and biodiversity conservation, **WILDLIFE AND WILDLIFE HABITAT:** Wildlife: definition, concept and importance of wildlife in biological studies, Methods of studying wildlife (birds and mammals) in their natural habitat, Wildlife habitat: Forest, desert and Grassland with their characteristics, **ENVIRONMENTAL DEGRADATION AND WILDLIFE:** Wildlife damages: Assessment and impact of environmental pollutants on wildlife, Changed land use pattern and its effects on wildlife, Man-wildlife conflict, Wildlife management principles, **STATUS and DISTRIBUTION OF WILDLIFE IN INDIA:** Zoo-geographic subdivisions of India based on important mammalian fauna, Endangered Wildlife species (Birds and Mammals) of India, Important Wildlife species of HP State, Conservation sites of HP with characteristic Wildlife, Important National Parks, Wildlife Sanctuaries and Biosphere Reserves in India with characteristic Wildlife.

**OR**

**ENVIRONMENT ECONOMICS:-**

**ECONOMY AND THE ENVIRONMENT:** World environmental history and economic development, valuation of natural resources, Inter-linkages between the economy and the environment, Economics of Natural Resource Exploitation – Renewable and Non-Renewable Resources – Methods of valuation of Environmental Costs and Benefits. Entropy- Principle and law of entropy. Material flow in economy, **ENVIRONMENTAL POLICY:** Design of Environmental Policy. Economic Instruments for Environmental Protection: Command and Control versus Incentives and Subsidies. Effectiveness of these instruments. Indian scenario and comparisons with developed countries, **SUSTAINABLE DEVELOPMENT:** Concept and objectives. Strategic Planning for Sustainable Development, Natural resource based economic and social development, Climate Change and India: Vulnerability of regions and populations - Adaptation options, **GREEN ECONOMY:** New model for development, Green economy and green economy initiatives, Role of UNEP. Brundt land Commission. Ecological economics Economic Growth and the Environment: Environmental Kuznets' curve, Foreign Direct Investment and the Environmental quality.

**OR**

**ENVIRONMENTAL HEALTH:-**

**ENVIRONMENTAL HEALTH: INTRODUCTION:** Health and Environment (Historical perspective, basic requirement of healthy environment, environmental quality, human exposure to noxious substances in environment, Environmental factors affecting health, environmental health problems and its causes, Nature of Environmental Health Hazards (Biological, chemical, physical, mechanical and psychological hazards), Psychology and work environment; emerging issues; place attachment, pro- environmental behavior, ecological consumerism, **ENVIRONMENTAL HEALTH PROBLEMS-I:** Health problems linked with

unsafe water (Toxic pollutants their impacts on health), Water-borne diseases (National scenario of water-borne diseases in India), Social and quality dimensions of water and sanitation, sanitation and health related challenges, Vector-borne diseases: Malaria, Kala azar, Japanese Encephalitis, Dengue, Plague, (causal agents, manifestation of disease, prophylactic measures); Airborne diseases: Chickenpox, Influenza, Measles, Smallpox, and Tuberculosis (causal agents, manifestation of disease, prophylactic measures), **OCCUPATIONAL HEALTH PROBLEMS-II:** Diseases caused by chemical agents (beryllium, phosphorus, cadmium, selenium, phosgene, ammonia), Diseases caused by physical agents: Hearing impairment caused by noise, Diseases caused by vibration (disorders of muscles, tendons, bones, joints, peripheral blood vessels or peripheral nerves); diseases caused by compressed or decompressed air; diseases caused by optical (ultraviolet, visible light, infrared) radiations including laser; diseases caused by exposure to extreme temperatures, Occupational cancer: cancers caused due to Asbestos, Benzidine, Chromium, Nickel compounds, Arsenic, Cadmium, **OCCUPATIONAL SAFETY AND HEALTH:** Occupational safety and health policy: General framework, employers' responsibilities, workers' duties and rights, safety and health committees, Management of occupational safety and health: Management commitment and resources, workers' participation, training, organizational aspects, Health promotion, education and training: Promotion of occupational safety and health; training and information at the national level; Training and information at the enterprise level; Training methods and materials, **ENVIRONMENTAL HEALTH MANAGEMENT:** Priority areas for intervention (safe water supply, food safety, basic sanitation, solid waste management, vector control, public information and media), obstacles and opportunities for management of environmental health problems, Role of environment health professionals, environment and value education, biodiversity conservation and health education, health education for self- confidence and positive attitude.

**OR**

## **ENVIRONMENTAL BIOLOGY:-**

**BIOSPHERE AND ITS EVOLUTION:** Evolution of earth's atmosphere, evolution of secondary atmosphere (biochemical pathways and evolution of atmosphere), carbonate precipitation, photosynthesis and cellular respiration and carbon sequestration, Origin of living matter, composition of biosphere, survival strategies and conservation, toxic chemicals and biosphere catastrophes, biosphere systems, Evolutionary relationship between organisms, evolution of earth's biosphere, energy flow in the biosphere, hydrosphere and water cycle, earth's oceans, oceans as global temperature regulators, **GLOBAL CLIMATE PATTERNS:** Latitudinal variation in sunlight intensity, Global air circulation and precipitation patterns, Regional and local effects on climate, microclimate, global climate change, **STRUCTURE AND DISTRIBUTION OF BIOMASS:** General features of terrestrial biomes, Disturbance in terrestrial biomes, climate change and terrestrial biomes, Aquatic biomes, zonation in aquatic biomes,



**BIOGEOGRAPHY:** Scope and development, biogeography and ecosystem, plant dispersal and floristic region, Patterns of distribution, community and ecosystems, conservation biogeography, Atmospheric factors influencing the biota, edaphic factors influencing the biota, anthropogenic effects on the biota, zoogeographical regions of the old world, **ADVANCES IN ENVIRONMENTAL BIOLOGY:** Biodegradable and eco- friendly products, biodegradable plastics, bio-surfactants, trickling filters, bio-scrubbers and bio-beds, Bio energy, biomass production and its utilization, waste material for energy, Biotechnology in sewage treatment and environment monitoring, Bio techniques for air pollution abatement and order control (bio-scrubbers, bio- beds, bio-trickling filters), waste water treatment using aquatic plants.

**OR**

### **CLIMATE CHANGE AND CLEAN TECHNOLOGY:-**

**SCIENCE OF CLIMATE CHANGE:** Drivers of climate change- greenhouse gases, aerosols – reflective and black carbon, land use changes. Energy balance, feed-back processes in climate system, concepts of global warming potential (GWP), radioactive forcing, **GREEN HOUSE GASES:** Trends of Emission of Carbon dioxide, Nitrous Oxide, methane, CFCs, Sulphur hexafluoride. GHG inventories. Sectoral emissions. Time series plots of GHGs and temperature, **CLIMATE CHANGE IMPACTS:** Impact of Climate Change on weather and climatic patterns, ice caps, glaciers, agriculture, vegetation, biodiversity, sea level, tourism and their implications, **CLEAN TECHNOLOGY:** Imperatives of clean technology in the context of mitigation and adaptation measures. CDM concept, CDM scenario in India, CDM projects sector-wise, National Action Plan on Climate Change, sustainable habitat, concept of Green architecture. Carbon trading; carbon credits; Carbon sequestration; Carbon Footprint. Issues of Energy security, Food Security and Social security.

**OR**

### **ENVIRONMENTAL CLEARANCE AND ENVIRONMENTAL AUDIT:-**

**EIA NOTIFICATION:** EIA in Indian context, EIA Notification 2006, Prior environmental clearance requirements, EIA authority - State and Central government, Committees for Environmental Clearance, Application for EC, Form 1- contents. Categorization of projects, list of projects, activity, financial overlays, conditions and specifications, **PROJECT TYPES:** General idea, categorization criteria important considerations/features developmental projects - mining, cement industry, group housing, Township development, commercial malls, Star hotels, educational institutions, thermal power, textile, pulp and paper industry, biomass energy, fertilizer industry, Road / highway construction, Bridge construction, Railway lines, Airports and SEZ, **REPORTS FOR ENVIRONMENTAL CLEARANCE:** Generic structure of environmental impact assessment document – Executive summary of Project, Introduction, Project description, Project benefits, Policy legal and administrative framework, EIA methodology,

Description of Environment, prediction of environmental impacts, evaluation of impacts, Environmental impact statement (EIS), Impact evaluation, Environmental Management Plan (EMP), Disclosure of Consultants engaged, **ENVIRONMENTAL AUDIT:** Objectives, frequency and criteria audit team, Environmental appraisal, accounting and environmental audit. Environmental guidelines for setting of industry, Green Balance Sheet (GBS), Status of compliance of mandatory and voluntary requirements for industries -mineral, cement, pesticide and textile.

**OR**

### **PRINCIPLES OF CLIMATOLOGY:-**

**INTRODUCTION:** Definition, sub-divisions and scope of climatology, Composition and structure of the atmosphere, Insolation; Factors governing insolation; Heat budget of the Earth; Factors determining horizontal distribution of temperature, **PRESSURE AND WIND:** Factors controlling pressure, horizontal distribution of pressure; Factors controlling wind, Wind system; Types of planetary winds; Local winds and types; Measurement of wind, air temperature and insolation, **AIR:** Air masses, air fronts and their types; Climatic classification- Basis of classification; Koeppen's classification; Thornthwait's classification- 1931 scheme, 1948 scheme, concept of El-Nino, Southern oscillation (ENSO) and La- Nina, Weather Forecasting - Tools in weather forecasting; Weather Forecasting in India, **CLIMATE OF THE WORLD:** Describing the climatic features and native vegetation of the following: Equatorial, Savanna, Hot Desert, Mediterranean, Steppe, **CLIMATE CHANGE:** Hazards - Fog and thunderstorm; Effect of climate on vegetation; Bioclimatology -Climate and Human Health, Climate and House types; Climatic change-Indicators of past climate, Carbon dioxide theory, Volcanic dust theory.

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OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS SYLLABUS FOR RECRUITMENT TO POST OF EMERGENCY OPERATION CENTRE INCHARGE-CUM-DOCUMENTATION COORDINATOR, (CLASS-II) AND TRAINING CAPACITY BUILDING COORDINATOR, (CLASS-II) IN THE DEPARTMENT OF REVENUE (DISASTER MANAGEMENT CELL), HIMACHAL PRADESH, SHALL BE OF 02 HOURS DURATION. THE OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS SHALL COVER THE FOLLOWING TOPICS OF MASTER DEGREE IN (GEOLOGY) LEVEL.

## 1. MICROPALAEONTOLOGY:-

**Amoeboid Protists and Calcareous Nannofossils:** Foraminifera: Detailed morphology, classification of foraminifera including planktic and benthic Foraminifera. Benthic foraminifera as indicators of environmental change. Geological applications of foraminifera, ecology and geological history, Calcareous nannofossils: Outline of morphology. Application in biostratigraphy; Calcareous nannofossils and paleoclimate, Crustaceans, Pelagic Sea Snails and Algae: Ostracoda: Outline of morphology and classification, Ecology and environmental applications of Ostracoda including ancient and modern continental environments, Pteropods and Calcareous Algae: Brief Introduction of each group and their applications, Siliceous Microfossils Radiolaria: Outline of morphology, Classification and its applications, Diatoms and silico flagellates: Ecology, lifecycle, classification, applications and geological distribution of diatoms. Silico flagellate skeleton, classification, geological history and its applications, Palynology: Outline of morphology and classification of pollens and spores and charophyta, Environmental application of pollen and spores, Phosphatic and Organic Walled Microfossils, Brief Study of the phosphatic microfossils like Conodonts: Outline of morphology, classification, ecology, geological history, distribution and its applications, Study of organic walled microfossils Dianoflagellates like morphology, ecology and classification. Techniques in micropaleontology, principles and applications of SEM, EDX, and Cathodo luminescence.

## 2. NEOTECTONICS AND EARTHQUAKES:-

**Plate Tectonics:** Plate Tectonics: accreting plate boundary, subduction, transform faults, thrust and fold hotspots and mantle plumes; palaeo magnetism and motion of plates, driving mechanism, geodynamics and heat transfer. Dynamic evolution of continental and oceanic crust, **Orogenic Belts:** Tectonics of Precambrian orogenic belts of India. Formation of mountain roots, Anatomy of orogenic belts. Introduction to the Himalayan tectonics; longitudinal, transverse and out of sequence faults; Rate of deformation in the Himalaya – Quaternary, Holocene and GPS based rates; Tectonic deformation and seismicity in the Himalaya, Indo-Gangetic Plains & Peninsular India. Tectonic geomorphology of mountains (landscape response to isostatic and tectonic uplift, terraces, mountain front: escarpments, fault segmentation, mountain front sinuosity, scarp morphological changes with time), **Neotectonics:** Introduction to neotectonics and active

tectonics; Mountain building process; Thrust and fold belts; Active faults: concepts, methods and case studies; Geomorphic markers of tectonic deformation; Active tectonics and alluvial rivers; Tectonics and erosion; Tectonic-climate interaction; Landscape response to active tectonics; GPS geodesy and its applications to lithospheric deformation, Rate of deformation and seismicity; Introduction to paleoseismology; Seismic hazard zonation at regional and local scale, **Faults and Earthquakes:** Anderson's theory of faulting. Mechanical paradox of over thrusts and Hubbert-Rubey theory. Fault formation and development: Fault/shear zone rocks and their deformation mechanism. Strength and rheology of faults: the strong vs. weak fault debate; geology of earthquake source regions. Simple earthquake ruptures, earthquake scaling relations. Mechanics of complex and compound earthquakes: earthquake recurrence. Qualitative seismotectonic analysis. Seismo tectonics of trans current faults, subduction zones; intraplate seismicity. A seismic vis-à-vis seismic faulting. Induced seismicity: reservoir and mining-induced, with suitable examples. Earthquake prediction: problems and strategies, Case studies.

### 3. ISOTOPE GEOCHEMISTRY:-

**Nuclear Systematic:** Introduction, nuclear stability, atomic mass and binding energy; radioactive decay mechanisms; the law of radioactive decay; review of mineral structure; principles of mass spectrometry; Rb-Sr method: principles, isotopic evolution of Sr, Rb- Sr isochron and limitations, **Radiogenic Isotope Geochronometers-I:** K-Ar method: principles, methods and applications; Concept of closure temperatures and cooling ages; Ar-Ar method: principles, method and advantages; Sm-Nd Method: decay scheme, evolution of Nd with time, Nd model ages and application of Nd to petrogenesis; **Radiogenic Isotope Geochronometers-II:**U-Th-Pb Method: decay schemes, isochron; U-Pb zircon dating, methodology and application; Lu-Hf method: decay scheme, isochron and application; Zircon as evolutionary tracer, **Radiogenic, Cosmogenic and Stable Isotopes:** Common Pb-Pb method and its applications; Principles and application of Re- Os, K-Ca, Fission Track and Radiocarbon methods of dating; stable isotopes and their fractionation; ratio Mass Spectrometry; principles of oxygen, carbon and sulphur isotope geochemistry.

### 4. VERTEBRATE DIVERSITY AND EVOLUTION:-

**Early vertebrates: Fish and Early Tetrapods:** Vertebrate body plan; ancestry of vertebrates, early body plans with external armor; major steps in vertebrate evolution, Devonian diversity of fishes; evolution of jaws, teeth, internal skeleton, evolution of limbs and lungs and invasion of land. Palaeozoic fish revolution, **Reptiles, Birds, Dinosaurs and Early Mammals:** Development of amniote egg and dominance of land by reptiles; late Palaeozoic environments; vertebrate response to Permo-Triassic mass extinction; rise and fall of mammal-like reptiles; emergence of dinosaurs, conquering of land, air and sea by reptiles; origin of mammals and diversification of monotremes, marsupials and placentals; ancestry of birds nested in feathered dinosaurs; Cretaceous-Palaeogene boundary mass

extinction, **The Rise of Mammals:** Palaeogene hyper thermal events and emergence of modern mammalian orders; expansion of grasslands and co-evolution of grazing mammals, evolution of horses and proboscideans; back to water - whale evolution representing transition from terrestrial to aquatic life; Early Palaeogene vertebrate fauna of India. Shrinking forests and expanding grasslands; Siwalik Fauna; emergence of hominids; Pleistocene megafaunal extinctions, **Vertebrate Palaeobiogeography and Phylogenetics:** Evolution of vertebrates during India's journey from Gondwana land to Asia -Gondwana vertebrates; Vertebrate fauna of Deccan Volcanic Province and other Cretaceous formations. Vicariance, dispersals and geodispersals; Role of plate tectonics in disjunct distribution of mammals; molecular versus morphology based phylogenies for mammalian origin and dispersals.

## 5. SEDIMENTOLOGY:-

**Sediments and Sedimentary Rocks:** Sediments ranging from detrital to chemical including volcaniclastic and extraterrestrial sediments; Sediment generating surface processes and products, processes of sediment transport, syn- and post-depositional sedimentary processes; Maturity and stability of sediments; Genesis and composition of clastic and non-clastic sedimentary rocks, **Sedimentary tools, techniques and methodology:** Bed forms and Sedimentary structures; Grain size analysis; Palaeocurrent analysis; Heavy mineral studies; REE and trace element studies; Staining methods; Insoluble residue studies; Sedimentary logs; Clay mineralogy studies; Cathodo luminescence; XRD and SEM studies, **Sedimentary Environments and Tectonics:** Sedimentary Environments: classification including continental, marine and transitional environments; Sedimentary Facies; Sedimentary Basins: basic concepts and terminology; Plate tectonics and Sedimentation: sedimentation in divergent margins, convergent margins, transform tectonic regimes, **Significance for Science and Society:** Hydrocarbon energy industry: coal, oil shale and petroleum; Building and Heritage stone; Minerals, Mining and Ore industry; Provenance, Climate and Environment proxy tool.

## 6. CHEMICAL PETROLOGY AND CRUSTAL EVOLUTION:-

**Igneous Processes:** Magma series; Minor elements in magmatic crystallisation; Distribution coefficients; Models for solid-melt processes; Geochemical criteria for discriminating between tectonic environments; Application of trace elements in igneous rocks, Mantle Dynamics, Petrology of the mantle; Basalt generation from mantle; primary magmas; Heterogeneous mantle; Crust-mantle evolution: Secular changes in the crust and mantle; evolution of the lithosphere, **Continental Crust:** Continental crust: shields and platforms, orogens; heat flow in the continents; exhumation and cratonisation; rheology, origin and composition of crust; Isotopic record of juvenile crust; continental growth, **Early Earth and Supercontinents:** Archaean crust: greenstone belts and granite-gneiss terrains; Earth's oldest rocks; TTGs: petrography, classification, geochemistry and petrogenesis; Global changes at the end of the Archean; supercontinents and

supercontinent cycle: assembly and dispersal of Keno land, Columbia, Rodinia, Gondwana and Pangea.

## **7. MINERAL RESOURCES AND MINERAL ECONOMICS:-**

**Mineral Deposits in a Broader Geological Framework:** Relationship between plate tectonics and metallogeny; Mineral deposits associated with convergent and divergent plate boundaries; Distribution of mineral deposits in space and time, **Ortho magmatic and Magmatic/Metamorphic-Hydrothermal Ore Deposits:** General characteristics and distribution of magmatic ore deposits: chromite deposits, Ti-V magnetite deposits, PGE sulfide deposits, Ni-Cu sulphide deposits, diamond deposits associated with kimberlites and lamproites; Classification of hydrothermal deposits; General characteristics and distribution of: porphyry Cu-Mo-Au deposits, Sn greisens, base metal skarn and carbonate-replacement deposits, volcanic-hosted massive sulfide deposits (VHMS/VAMS/VMS) and black smokers, Sedimentary-Hydrothermal and Sedimentary Ore Deposits: General characteristics and distribution of Mississippi Valley-type (MVT) Pb-Zn deposits, SEDEX Pb-Zn-Ag deposits, and Kupferschiefer or red-bed copper deposits. Ore deposits formed by chemical precipitation from surface waters and clastic sedimentation - Iron and manganese deposits and placer and paleoplacer deposits (Witwatersrand deposit). Ore deposits formed by supergene processes - supergene/secondary deposits, residual deposits-bauxite (Central Indian bauxite deposits), limonite and Ni laterites (New Caledonia), Mineral Economics: Classification of ore minerals, industrial minerals and building stones; Resources and reserves, concepts of strategic, critical and essential minerals; Concept of heritage stones and their relevance; Importance of minerals in national economy; National Mineral Policy; United Nations framework classification, law of the sea, and marine mineral resources.

## **8. PETROLEUM GEOLOGY:-**

Composition, Origin and Accumulation of Hydrocarbon: Composition of hydrocarbon (petroleum and gas), kerogen and its type and geochemical signature; Mechanism of hydrocarbon generation; Migration, types and geological conditions; Migration pathway; Accumulation of hydrocarbons and types of traps (structural, stratigraphic and combination) and trapping mechanism; Isopach maps of traps, UNIT 2: Petroleum System and Reservoir: Petroleum system and hydrocarbon play concept, source rocks and geochemical techniques of its evaluation; pyrolysis: techniques, hydrogen and oxygen indices; production indices, vitrinite reflectance, thermal alteration and conodont alteration index and respective interpretations (maturation of hydrocarbons); Carrier beds and petrophysical properties of source rock, carrier beds, trap, and cap rocks; Reservoir morphology and characteristics of sandstones and carbonate reservoirs, reservoir management, petroleum system of Indian petroliferous basins, Sequence-Seismic Stratigraphy and Hydrocarbon Plays: Concepts of sequence stratigraphy, sequence, para sequences, bed, system tracts, sequence boundaries, flooding surfaces, condensed sections, applications of sequence stratigraphy in hydrocarbon

exploration; Facies maps; Sea level curves and role in hydrocarbon exploration; Basin analysis; Concept, terminology and applications of seismic stratigraphy in hydrocarbon exploration, **Exploration, Production and Environmental Impact:** Outline of production techniques in the petroleum industry; Principles related to evaluating potential reservoirs and the environmental and economical impact of the utilisation of the hydrocarbons.

## **9. EXPLORATION GEOLOGY:-**

**Earth's Gravity, Magnetic and Heat Flow:** Concept of scale and unit in Geophysics; Signal and noise; Data acquisition and reduction; Concept of geophysical modelling; normal and reverse. Importance of geophysics in Industrial application; Gravity fields of the Earth: gravity potential, normal-gravity field; Shape of the Earth; Large scale gravity and isostasy; Isostatic rebound, Bouguer and isostatic anomalies, isostatic models for local and regional compensation, gravimeters: stable and unstable (Lacoste' and Ramberg gravimeter, Worden gravimeter), data acquisition and corrections; Regional and residual separation; Interpretation of anomalies for simple geometric bodies, e.g. single pole, horizontal cylinder, sheet, dyke and fault; Magnetism of the Earth; Geomagnetic field, inclination and declination; Latitudinal variation; Secular and transient variations in magnetism; Magnetic induction and residual magnetism; Magnetic potential and Poisson's equation, magnetometers; Rock/mineral magnetism (DRM, TRM), palaeomagnetism, reconstruction of paleopole position; Apparent Polar wandering curves and continental drift; Heat flow, error function and its application, **Seismic and Electromagnetic techniques:** Seismic wave and its propagation; Seismic impedance, seismic refraction (2 layer, 3 layer), seismic reflection, NMO, stacking; Seismology: elements of earthquake seismology; Focal mechanism and fault plane solutions; Plate boundaries and seismicity. Seismic gaps; Seismotectonics and structure of the Earth; Himalayan and stable continental region earthquakes, reservoir induced seismicity; Seismic hazards; Basic electrical quantities; Electromagnetic field techniques and interpretation; GPR utility mapping and applications, **Subsurface Geophysics-Well logging:** Basic formation evaluation concepts, borehole environment, principles of resistivity, radiation, thermal and elastic wave measurements and measuring tools; Lithology plots; Saturation, irreducible saturation and porosity studies from well logs; Shale sand analysis; Integration of core, log, well test and seismic data evaluation; Well logging and borehole geophysics in mineral exploration and groundwater exploration, **Drilling Techniques, Mineral Exploration and Reserves Estimation:** Drilling techniques; Geological aspects of site selection for drilling operations; Planning of drilling operations; Borehole surveys; Correction of deviated boreholes and directional drilling, core-sampling; Definition and terminology of mining geology; Classification of mining methods: open cast mining (quarrying), underground mining; Coal mining method: board-and-pillar, longwall and room-and-pillar methods; An introduction to prospecting and exploration of mineral deposits.

## **10. ENVIRONMENTAL GEOLOGY:-**

**Earth and Environment: Fundamentals;** Earth in space and time; population growth and environment; natural hazards-causes and effects; risk assessment, **Hazardous Earth Processes:** Earthquakes- earthquake origin and distribution, hazards, predictions, control; Volcanoes- magma and plate tectonics, environmental hazards, forecasting and risk assessment; Tsunami- causes, effect, risk and forecasting; Rivers and flooding- stream discharge, erosion and deposition, flood plains, flooding causes, effects and reducing flood hazards; Coastal environment- coastlines and sea level, major processes, hazards and mitigation; Landslides and mass movement- slope stability and types of mass wasting, consequences and preventive majors; Glacial and arid environment-types and movement of glaciers, ice ages, wind erosion, dunes and loess, desertification, **Earth Resources and Environment:** Water resources- hydrologic cycle, traditional freshwater sources and alternatives, groundwater withdrawal; Energy resources- petroleum, coal and natural gas, nonconventional and renewable energy resources; Mineral and rock resources- geology of mineral resources, mining and processing of minerals, environmental impacts and mitigation; Soil resources- formation, property and classification of soil, human activities and soil, **Environmental Management:** Waste management- municipality, toxic and radioactive wastes disposal, sewage treatment; Water pollution- point and non-point sources, industrial and agricultural wastes, pollution control-surface/groundwater; Air pollution and control; Environmental law and policy-resources law- water, minerals, fuels and geologic hazards, international resource disputes, pollutions and its control.



## 11. ADVANCED GROUNDWATER HYDROLOGY:-

**Groundwater Exploration and Water Well Construction:** Geologic and hydro geologic methods of exploration; Role of remote sensing in groundwater exploration; Surface geophysical methods — seismic, gravity, geo-electrical and magnetic methods; Types of water wells and methods of construction; Design, development, and maintenance of wells; Sub-surface geophysical methods; Yield characteristics of wells; Pumping tests- methods, data analysis and interpretation, **Groundwater Quality:** Physical and chemical properties of water; Quality criteria for different uses; Graphical presentation of groundwater quality data; Groundwater quality in different provinces in India; Groundwater contamination; natural (Geogenic) and anthropogenic contaminants; Saline water intrusion; Radio-isotopes in hydro geological studies, Organic and inorganic pollutants in water Isotope Applications in Groundwater Hydrology: Water balance: groundwater inflow and outflow estimates; Dating of groundwater; Percolation tank hydrology; Determination of groundwater velocity in saturated zone; Identification of recharge/discharge processes; Pollution migration studies; Isotope techniques for water resource management, Groundwater Development and Management: Assessment of Groundwater resources- dynamic and static resources; Concept of sustainable development of groundwater resources; Groundwater management —supply side and demand side management; Artificial recharge of groundwater- Concept of artificial recharge – recharge methods, relative merits, applications of remote sensing in artificial recharge of groundwater; Conjunctive use of surface and groundwater; Groundwater legislation.

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**OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS OF 70 MARKS FOR THE RECRUITMENT TO POST OF EMERGENCY OPERATION CENTRE INCHARGE- CUM-DOCUMENTATION COORDINATOR (CLASS-II) AND TRAINING CAPACITY BUILDING COORDINATOR (CLASS-II) SHALL BE OF 02 HOURS DURATION. THE OBJECTIVE TYPE MULTIPLE CHOICE QUESTIONS SHALL COVER THE FOLLOWING TOPICS OF POST GRADUATE DIPLOMA IN (DISASTER MANAGEMENT) LEVEL.**

**1. INTRODUCTION TO NATURAL AND MAN MADE DISASTERS:-**

**Understanding Disasters:** Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster: A Global View, Disaster Profile of India, The Disaster Management cycle, **Geological and Mountain Area Disasters:** Earthquakes, Volcanic Eruption, Landslides, Snow Avalanches, **Wind and Water Related Natural Disaster:** Floods and Flash Floods, Droughts, Cyclones, Tsunamis, **Man Made Disasters:** Understanding Man-Made Disasters, Fires and Forest Fires, Nuclear, Biological and Chemical disaster, Road Accidents.

**2. DISASTER PREPAREDNESS:-**

**Introduction to disaster Preparedness:** Disaster Management: Prevention, Preparedness and Mitigation, Disaster Preparedness: Concept & Nature, Disaster Preparedness Plan, Disaster Preparedness for People and Infrastructure, Community based Disaster Preparedness Plan, **Roles & Responsibilities of Different Agencies and Govt.:** Roll of Information, Education, Communication & Training, Role and Responsibilities of Central, State, District and local administration, Role and Responsibilities of Armed Forces, Police, Para Military Forces, Role and Responsibilities of International Agencies, NGO's, Community Based Org. (CBO's), **Technologies for Disaster Management:** Role of IT in Disaster Preparedness, Remote Sensing, GIS and GPS, Use and Application of Emerging Technologies, Application of Modern Technologies for the Emergency communication, Application and use of ICST for different disasters, **Disaster Mitigation:** Disaster Mitigation: meaning and concept, Disaster Mitigation Strategies, Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination.

**3. REHABILITATION, RECONSTRUCTION AND RECOVERY:-**

Reconstruction and Rehabilitation as Means of Development, Damage Assessment, Role of various Agencies in Disaster Management and Development, Information Management Structure, Development of Physical and Economic Infrastructure, Creation of Long-term Job Opportunities and Livelihood Options, Funding Arrangements for Reconstruction, Nature of Damage to Houses and Infrastructure due to Disasters, Disaster Resistant House Construction, Role of Housing/ Building Authorities, Education and Awareness, The Philosophy of Coping with Disasters, Dealing with Victims' Psychology, Role of Information

Dissemination, Participative Rehabilitation Process: Some Case Studies, Role of Various Agencies in Recovery Measures, Monitoring and Evaluation of Rehabilitation Work, Constraints in Monitoring and Evaluation, Long-term Recovery, Long-term Counter Disaster Planning.

#### **4. DISASTER RESPONSE AND MANAGEMENT:-**

**Response Essential Components:** Disaster Response Plan, Communication, Participation and Activation of Emergency Preparedness Plans, Search, Rescue, Evacuation and other logistic management, Needs and Damage Assessment; Types and Technique, **Stakeholders Co-ordination in Disaster Response:** Disaster Response: Central, State, District and Local Administration, Armed Forces in Disaster Response: Role and Responsibility, Disaster Response: Police and Other organizations, Role of Multiple stakeholders in Disaster Response, **Human Behaviour and Response Management:** Psychological Response and Psychological Rehabilitation, Trauma and stress Management, Rumour and Panic Management, Medical and Health Response to Different Disasters, Role of Information and Communication Technology in Response Management, **Relief Measures:** Minimum Standard of Relief, Relief Management- essential components, Funding Relief- short term and long term, Disaster Site Management, Recovery.

#### **5. RISK ASSESSMENT AND VULNERABILITY ANALYSIS:-**

Hazard, Risk and Vulnerability: Concept and Relationship, Understanding Risk: Concepts and Elements, Disaster Risk Reduction, Risk Analysis Techniques, People Participation in Risk Assessment, Vulnerability: Concept and Parameters, Vulnerability Analysis, Observation and Perception of Vulnerability, Vulnerability Identification, Socio-Economic Factors of Vulnerability, Vulnerability of Shanty Town, Experience of Vulnerability in India, Strategies for Survival, Role of Developmental Planning for disaster Management, Resource Analyses and Mobilisation, Population Growth, Infrastructure and Vulnerability Reduction, Social Infrastructure For Vulnerability Reduction.

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