

Syllabus for Ph.D. Entrance Test
Centre for Disaster Risk Reduction

Part-A

Research Methodology

Maximum Marks: 35

Unit-I

Research Fundamentals

(10 Marks)

Aims and Objectives of Research. Types of Research – Basic, Novel, and Applied Research. Tools for Searching a Research Topic – Books, Journals, Internet, E-Journal access, Google Scholar, SCOPUS, Wikipedia, Research Gate, etc. Research Hypothesis, Steps in Research Design. Literature Review, and Research Gap. Publication of Research, Plagiarism, Intellectual Property Rights. Papers Indexing, Impact Factor, Citation Index, H-index. Dissemination of Research Results through Conferences, Workshops, Report Writing, and Publication of Research Papers.

Unit-II

Research Methodology

(10 Marks)

Survey and Techniques Used in the Field and Laboratory for Geological Samples. Methods of Sampling, and Analytical Techniques. Collection of Primary Data from Field, Collection of Air, Water, Soil, and Rock Samples. Preparation of Samples for Geotechnical Investigation, Microscopic Examination, and Chemical Analysis. Analytical Techniques and Portable Analytical Techniques. Geospatial and Remote Sensing Techniques. Techniques of Pre- and Post-Disaster Needs Assessment (PDNA).

Unit-III

Data Analysis and Modelling

(08 Marks)

Concept of Data. Types of Data. Mean, Median, Mode, Standard Deviation, Standard Error and Variance of Data. Correlation Coefficient, Covariance, Multivariate, Regression and Factor Analysis. Knowledge about Statistical Tools and Software's. Data Models- Raster and Vector, Processing and Analysis, Data analysis and modelling in GIS – Types of GIS Modelling; Digital Elevation Model (DEM).

Unit-IV

Computer Fundamentals and Quantitative Aptitude

(07 Marks)

Basic Knowledge of Computer. General Awareness of Computer Hardware. CPU and other Peripheral Devices (Input/Output and Auxiliary Storage Devices). Primary and Secondary Memory. Basic Knowledge of Software and Programming Languages. Introduction to Artificial Intelligence, and Machine Learning.

Mathematical Reasoning and Aptitude, Analysis of quantitative and qualitative data, Data Interpretation, Logical Reasoning, Comprehension, Research Aptitude, Verbal and Non-Verbal Communication.

Books Recommended:

1. Wickham, H., & Wickham, H. (2016). Data analysis. Springer, pp.189-201.
2. Goel, A. (2010). Computer Fundamentals.
3. Sukamolson, S. (2007). Fundamentals of quantitative research. Language Institute Chulalongkorn University, 1(3), 1-20.
4. Singh, Y.K. (2006). Fundamental of research methodology & statistics. New Age International.
5. Andrew S. (2003). Environmental Modelling with GIS and Remote Sensing.

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Part-B

Subject Specific (Core Paper)

Maximum Marks: 35

Unit-I

Hazard, Vulnerability, and Risk Assessment

(10 Marks)

Hazard – Estimation and Effects. Vulnerability Assessment. Risk – Components and Fundamentals of Risk Analysis. Seismic Risk Evaluation. Direct and Indirect Disaster Damages. Assessment for Different Disasters. Disaster Mitigation – Hazard Monitoring, Forecasting, and Early Warning Systems (EWS). Natural Hazards, and Their Classification. Geological Hazards – Earthquakes, Tsunamis, Liquefaction, Volcanic Eruptions, Landslides, Ground Subsidence, and Desertification. Hydro-meteorological Hazards – Floods, Glacial Lake Outburst Floods (GLOFs), Droughts, Avalanches, Storms, Heat Waves, and Cold Waves. Geogenic Groundwater Contamination (Arsenic, Fluoride, etc.).

Governance in Disaster Risk Reduction (DRR); International Initiatives by United Nations – International Decade for DRR, Yokohama Strategy, Hyogo Framework for DRR (2005-2013), Sendai Framework (2013-2030); Sustainable Development Goals. Disaster Management Act of India. National Disaster Management Plan, 2016. Section-135 of Company Act, 2016. Corporate Social Responsibility, Scope, Utility, and Initiative taken for DRR. Disaster Economics. National, State, District, and Local Disaster Management Organizations. National and State Disaster Response Funds.

Unit-II

(10 Marks)

Remote Sensing & Geographic Information System (GIS)

Electromagnetic Spectrum and Spectral signatures. Spectral Reflectance of Vegetation, Soils, Minerals, and Rocks. Types of Sensors, Aerial Photographs, Satellite Images, and Radars. Resolution – Spatial, Spectral, Radiometric, and Temporal. Image Interpretation, and Correction. Image Classification – Supervised and Unsupervised. Application of Remote Sensing Techniques in Mapping. Global Positioning Systems (GPS) – Functions and Operation. Components of GIS, GIS Software Packages. Geospatial Analysis for Disaster Risk Assessment With Case Studies on landslides, and floods. GIS for Environmental Applications like Lake Management, Land Use Land Cover, etc.

Unit-III

Geomorphology

(10 Marks)

Nature and Scope of Geomorphology. Fundamental Concepts – Catastrophism, and Uniformitarianism. Cycle of Erosion – Concept of Davis and Penck Model. Constitution of Earth's Interior – Physical Properties, and Chemical Composition of Earth's Crust. Continental drift, and Plate Tectonics. Forces of Earth's Crust, and Earth's Movements. Folds, and Faults. Rocks – Formation and Types. Weathering – Types, and Agents. Topographic Features and Processes – Fluvial, Glacial, Aeolian, Karst, and Coastal. Mass Wasting – Definition, Types, and Factors affecting Mass Wasting viz., Lithology, Topography, Climate, Vegetation, etc. Epeirogenesis and Orogenesis. Soils – Formation, Profiles, and Types. Relevance of Geomorphological Studies in Disaster Studies. Cenozoic Climate Extremes.

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Unit-IV

Engineering & Environmental Geosciences

(5 Marks)

Engineering Properties of Rocks, and Soils. Soil Liquefaction and Creep. Stress Distribution in Soil, and Foundation Failure. Fundamental Concepts of Environmental Geosciences. General Relationship between Landscape, Climate, and Biomass. Earth Processes and Natural Hazards. Slope Processes, Landslides, and Subsidence. Water, Mineral, and Energy Resources. Soils and Environment, Global Climate Change. Geology, Society, and Future.

Books Recommended:

1. Keller, E.A. 2007. Introduction to environmental geology. Prentice-Hall, Inclusive.
2. Summerfield, M. A. (2014). Global geomorphology. Routledge.
3. Wisner, B., Gaillard, J. C., & Kelman, I. (2012). Handbook of hazards and disaster risk reduction. Routledge.
4. Bhatta, B. (2008). Remote sensing and GIS (Vol. 2). New Delhi: Oxford University Press.

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Mehdi Saher