**Paper II**

**Total Marks: 100**

**Earth Resources:** Fossil fuels, Nuclear mineral resources, Renewable energy

resources, hydropower and geothermal energy, Water cycle, Surface water, Ground

water, construction materials including those for concrete and aggregate, sand gravels,

cement making and building stones; Fundamentals of Matellogeny and plate tectonics

with reference to Pakistan. Uranium and strategic metals.

**Engineering Geology:** Fundamentals of Engineering Geology. Soil and rock

properties. Landslides classification for slopes in rock and soil, Excavation principles in

rock and soil. Stability of slopes – analysis. Site investigation and instrumentation. Dam

sites of Pakistan (elementary analysis).

**Remote Sensing and GIS:** Introduction to the filed of remote sensing. Earth satellite

systems for remote sensing. Applications in geological mapping, mineral prospecting,

structural geology, geohydrology, engineering geology and geomorphology. Principles of

geographic information system (GIS) including an overview of data structure, data

types, methods of data analysis and cartographic modeling.

**Climate and Climate Change:** Scientific bases of the climate change phenomenon,

climates of the past and theories of climate change. Impacts of a changing climate in

different regions of the world, and mitigation strategies. Earth as a planet, its origin and

composition. Rock forming major minerals. Fundamental description and classification

of igneous, sedimentary and metamorphic rocks. Processes of Geomorphology both

internal and external. Peneplain concept. Valley formation and Drainage patterns.

Glacial landforms. Fossils, fossilization, modes of fossil preservation, geological

signification of fossils. Geological timescale. Principles of stratigraphy, stratigraphic

code and nomenclature, stratigraphy of Salt Range. Study of major structures i.e. Folds,

Faults, Joints, Cleavage and linear structure. Fundamental concepts of Engineering

Geology and Geohydrology Introduction to the concept of Environmental Geology and

Global Climate Change. Fossils Fuels, hydropower, Geothermal Energy, Nuclear

minerals, Renewable energy.

**RECOMMENDED BOOKS**

1. Albarade, F., (2003), Geochemistry: An Introduction, Cambridge Press.

2. Barnes, J.W. and Lisle, R.J. (2004), Basic Geological Mapping, John Wiley &

Sons.

3. Bell, F.G., (2004), Engineering Geology and Construction, Spon Press, N.Y.

4. Bender, F.K. and Raza H.A.(1995), Geology of Pakistan, Gebruder

Borntraeger.

5. Best, M.G. (2003) Igneous and metamorphic Petrology, Blackwell Science

6. Davis, G.H. and Reynolds, S.J. (1996), Structural Geology of Rocks and

Regions, John Wiley & Sons.

7. Demers, M.N. (2005) Fundamentals of Geographic Information System, John

Wiley & Sons.

8. Dobrin, M.B. and Savit, Ch.H. (1988), Introduction to Geophysical

Prospecting, McGraw Hill.

9. Emery , D. and Myers, K.J. (1996), Sequence Stratigraphy, Oxford, Blackwell.

10. Hudak, P.F. (2005), Principles of Hydrogeology, 3rd Ed. CRC Press

11. Kazmi, A.H. and Abbas, S.G. (2001), Metallogeny and Mineral Deposits of

Pakistan, Orient Petroleum Inc.

12. Kazmi, A.H. and Jan, M.Q. (1997) Geology and Tectonics of Pakistan,

Graphic Publishers.

13. Keary, P and Vine, F.J. (1996) Global Tectonics, Blackwell.

14. Montgomery, C.W., (2005) Environmental Geology, McGraw Hill.

15. North, F.K. (1985) Petroleum Geology, Allen & Unwin.

16. Plummer, (2005), Physical Geology, Mcgeay and Carlson.

17. Raup, D.M. and Stanley, S.M. (1985), Principles of Paleontology, W.H.

Freeman & Co.

18. Sam Boggs (1987), Sedimentology and Stratigraphy.

19. Shah. S.I. (1977) Stratigraphy of Pakistan, Geological Survey of Pakistan.

20. Solomon, S., Qin, D., Manning, M., (2007) Climate Change 2007: The

Physical Science Basics, Intergovernmental Panel on Climate change

(IPPCC).

21. Thomas M.L, and Ralph, W.K. (2003) Remote Sensing and Image

Interpretation, John Wiley & Sons.

22. Willam H.B. (1990) Principles of Mineralogy, Oxford University Press.

23. Yeung, Lo.C.P. and Lal, A.K. (2003) Concepts and Techniques of Geographic

Information System, Prentice Hall.