GEOLOGY

Paper – II

*Time Allowed : **Three** Hours*

*Maximum Marks : **200***

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

*There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.*

*Questions no. **1** and **5** are **compulsory**. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections A and B.*

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly stuck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

*Answers must be written in **ENGLISH** only.*

Neat sketches may be drawn, wherever required.

SECTION A

Q1. (a) Draw a neat labelled sketch of a petrological microscope. Add a brief note on each part of the microscope. *8*

(b) Draw a labelled diagram of SiO_4 tetrahedra. Give the structural classification of silicate minerals. *8*

(c) What are the minimum symmetry requirements for the monoclinic system ? Draw stereographic projection corresponding to normal class of the system. Write names of two minerals that crystallize in this system. *8*

(d) Discuss briefly about indexing a crystal face. Calculate the Miller indices of a crystal face having Weiss Symbol of 1a, ∞b, ∞c. *8*

(e) How would you distinguish between the following pairs of rocks petrographically : *8*

(i) Diorites and Anorthosites

(ii) Carbonatites and Peridotites

Q2. (a) Give a brief account of primary sedimentary structures and discuss their significance. *15*

(b) What is Pleochroism ? Describe the method of determining pleochroism in hornblende. *10*

(c) Explain Bowen's reaction series. How do you explain corona structure with the help of this reaction series ? Explain what happens when a basaltic magma assimilates granitic country rock. *15*

Q3. (a) What is Diagenesis ? Describe different processes of diagenesis with suitable examples and sketches. *10*

(b) What are Alkaline rocks ? Discuss the petrogenesis of alkaline rocks. Give two Indian occurrences. *15*

(c) Define Prograde and Retrograde Metamorphism. Discuss various mineral assemblages formed due to these processes involving basic igneous rocks. *15*

Q4. (a) Define Contact Metamorphism. Explain the processes involved in the development of contact aureole. *10*

(b) Draw a neat labelled sketch of the Diopside-Anorthite system (1 atm, dry). Describe the crystallization behaviour of an initial melt having composition $Di_{80}An_{20}$. Give petrogenetic significance of this system. *15*

(c) Describe the crystal structure, types, mineralogy, composition, physical and optical properties of pyroxene group of minerals. *15*

SECTION B

Q5. (a) How are ore deposits classified ? Give the salient features of Lindgren's classification. *8*

(b) Explain the processes involved in the formation of skarn deposits. *8*

(c) "Beach placers are vital for India's nuclear energy sector." — Justify the statement. *8*

(d) What is Co-ordination Number ? Describe with neat sketches different types of co-ordination found in minerals. *8*

(e) Define Enthalpy, Entropy and Gibb's free energy. What is the relationship among these thermodynamic parameters ? *8*

Q6. (a) Discuss with neat sketches ore mineral textures formed by replacement and exsolution processes. *10*

(b) Give an account of the mineralogy, modes of occurrence and distribution of copper deposits of India. *15*

(c) Explain with neat sketches the causes of landslides. What are the preventative measures to mitigate landslides ? Add a short note on the landslide-prone areas of India. *15*

Q7. (a) What is Channel sampling ? Explain the steps involved in channel sampling. *15*

(b) What are Meteorites ? Give a detailed account of the classification of meteorites. *10*

(c) What are the widely used electrical methods of prospecting ? Explain self-potential method to decipher mineral bodies. *15*

Q8. (a) Describe the following underground mining methods with suitable diagrams : *15*

(i) Room and Pillar method

(ii) Cut and Fill stoping

(iii) Sub-level stoping

(b) Discuss the sources of groundwater pollution. Add a detailed note on the remedial measures to prevent it. *10*

(c) How are coals classified based on the fixed carbon content ? Add a detailed note on the distribution of coal deposits of India. *15*