

**GEOLOGY**  
**Paper – III**

Time Allowed : **Three Hours**

Maximum Marks : **200**

**Question Paper Specific Instructions**

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

*There are **ELEVEN** questions divided in **SIX** sections.*

*Candidate has to attempt **SIX** questions in all.*

*The **ONLY** question in Section **A** is **compulsory**.*

*Out of the remaining **TEN** questions, the candidate has to attempt **FIVE**, choosing **ONE** from each of the other Sections **B, C, D, E** and **F**.*

*The number of marks carried by a question / part is indicated against it.*

*Unless otherwise mentioned, symbols, abbreviations and notations have their usual standard meanings.*

*Neat sketches are to be drawn to illustrate answers, wherever required. They shall be drawn in the space provided for answering the question itself.*

*Wherever required, graphs/tables are to be drawn on the Question-cum-Answer (QCA) Booklet itself.*

*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 (QCA) Booklet must be clearly struck off.*

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

## SECTION A

### (Compulsory Section)

**Q1. Describe the following in brief with neat labelled diagrams, wherever necessary :**

- |     |   |   |
|-----|---|---|
| (a) | Cherty iron formations  | 5 |
| (b) | Supergene Ores  | 5 |
| (c) | Suitable geophysical methods for disseminated sulphide deposits   | 5 |
| (d) | Building stones associated with Peninsular India  | 5 |
| (e) | Two major mineral commodities related to the cement industry and their distribution in India  | 5 |
| (f) | Pathfinder elements associated with magmatic deposits of chromite and Cu-Ni sulphides formed through immiscible magmatic processes. | 5 |
| (g) | What is a trap rock in hydrocarbon exploration ? Briefly describe the Kerogen shale as a trap rock.                                 | 5 |
| (h) | Young's Modulus and Poisson's Ratio   | 5 |
| (i) | Beach budget  | 5 |
| (j) | Urban floods  | 5 |

## SECTION B

Attempt any **one** question.

- Q2.** (a) Discuss the different types of hydrothermal cavity filling deposits. Illustrate your answer with suitable labelled sketches. 15
- (b) Describe the characteristics, geological setting and process of formation of heavy mineral sand deposits on shorelines. 15
- Q3.** (a) Describe the geological setting of Kupferschiefer type deposits. 10
- (b) Discuss the role of stable isotopes of O and H in ore genetic studies. 10
- (c) Describe the mineralization that occurs in continental rifts. 10

## SECTION C

Attempt any **one** question.

**Q4.** (a) What are the different stages of mineral exploration ? Discuss these stages in terms of expenditure versus risk from planning to mining stages. 15

(b) Explain various types of errors which are induced during sampling in mineral exploration. How can these errors be minimized ? 15

**Q5.** (a) Describe reverse circulation drilling in detail with a schematic diagram. Compare reverse circulation drilling with diamond core drilling. With which of these two techniques is wireline drilling associated ? What are the advantages of wireline drilling ? 10

(b) In the following table, length of core samples, specific gravity and assay values for a zinc mineralized deposit are provided. Consider all the cores to be of same diameter.

Calculate average grade in volume and weight terms. Which of these is a more reliable estimate of average grade ? 10

| Length | Specific Gravity | Assay value (Zn%) |
|--------|------------------|-------------------|
| 1.0    | 3.01             | 5.51              |
| 1.5    | 2.89             | 5.01              |
| 1.2    | 3.15             | 5.89              |
| 2.0    | 3.26             | 6.02              |
| 1.5    | 2.97             | 5.40              |
| 1.3    | 3.04             | 5.55              |

(c) Name two major Al-minerals in major bauxite deposits of India. Briefly describe the distribution of major bauxite deposits along the East coast of India. 10

## SECTION D

Attempt any **one** question.

- Q6.** (a) Define and describe Continental Shelf, Continental Slope, Continental Rise and Continental Margin in relation to the Exclusive Economic Zone (EEZ). 15
- (b) How are strategic, critical and essential minerals classified ? Discuss at least three mineral resources of India which have critical applications during war. 15
- Q7.** (a) Discuss various modes of occurrence of phosphorite deposits. Describe these deposits from India along with their stratigraphic context. 10
- (b) What are refractory minerals ? Describe their classification along with the distribution of these deposits in India. 10
- (c) Describe the calculation of reserves of mineral deposits by Isochore plan, illustrating with neat sketches. 10

## SECTION E

*Attempt any one question.*

- Q8.** (a) What is a tunnel ? Enumerate the various engineering properties of rocks that are to be considered in tunnel excavation. How do you circumvent a plausible collapse of a tunnel ? 15
- (b) What is Rock Quality Designation ? Enumerate the various rock qualification techniques adopted in the field to evaluate the soundness of rock for its utility as construction material in civil engineering projects. 15
- Q9.** (a) What is proximate and ultimate analysis of coal ? How does this analysis help in the evaluation of coal ? 10
- (b) Briefly describe the salient features of lignite deposits of India. List the various constraints associated with these deposits. 10
- (c) Briefly describe and categorize the major petroliferous basins of India. 10

## SECTION F

*Attempt any **one** question.*

- Q10.** (a) What is desertification ? Describe its causes and mitigation strategies. 15
- (b) Discuss the environmental impact of hydropower projects. 15
- Q11.** (a) Discuss the sources of groundwater pollution and possible treatment methods. 10
- (b) Describe in brief the strategies being used for preventing landslides. 10
- (c) Describe the environmental impact of mining. 10

The first part of the report deals with the general situation in the country. It is found that the economy is in a state of depression, and that the government is unable to meet its obligations. The report also discusses the political situation, and the need for reform.

The second part of the report deals with the financial situation. It is found that the government is unable to meet its obligations, and that the country is in a state of financial crisis. The report also discusses the need for reform, and the possibility of borrowing from foreign countries.

The third part of the report deals with the social situation. It is found that the population is suffering from poverty and unemployment. The report also discusses the need for social reform, and the possibility of introducing a system of social insurance.

The fourth part of the report deals with the military situation. It is found that the army is in a state of disrepair, and that the country is unable to defend itself. The report also discusses the need for military reform, and the possibility of introducing a system of conscription.