

**GEOLOGY**  
**Paper – II**

Time Allowed : **Three Hours**

Maximum Marks : **200**

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**Question Paper Specific Instructions**

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

*There are **ELEVEN** questions divided under **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 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 Booklet must be clearly struck off.*

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

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**SECTION A**  
**(Compulsory Section)**

- Q1. Describe the following in brief with diagrams and suitable examples, wherever necessary : **5×10=50****
- (a) Difference between solid solution and exsolution in minerals 5
  - (b) Optic axial plane of biaxial minerals 5
  - (c) Dynamic melting in mantle 5
  - (d) Carbon-14 dating 5
  - (e) Spinifex texture 5
  - (f) Total alkali-silica diagram 5
  - (g) Ultrahigh Pressure Metamorphism 5
  - (h) Porphyroblasts 5
  - (i) Apparent Polar Wandering 5
  - (j) Geometric fit of continents 5

## SECTION B

*Attempt any one question.*

- Q2.** (a) Describe the symmetry elements and forms of Normal class of Tetragonal crystal system. 15
- (b) Illustrate with neat sketches the interference figures obtained at different orientation of uniaxial minerals. How is the optic sign of uniaxial minerals determined using interference figure? 15
- Q3.** (a) What are Miller Indices? Discuss crystal notation using these indices. Illustrate your answer with suitable sketches and examples. 10
- (b) What are the differences between pyroxene and amphibole group of minerals? 10
- (c) Describe the crystal structure, physical properties and chemical composition of mica group of minerals. 10

## SECTION C

Attempt any **one** question.

- Q4.** (a) Describe Goldschmidt's classification of elements. Give suitable examples for each group. 15
- (b) Describe the Rb-Sr method of dating of rocks giving special emphasis on the assumptions used, advantages, disadvantages and the utility of this dating technique. 15
- Q5.** (a) What are Rare Earth Elements (REE) ? How does concentration of REE change during magmatic fractionation ? Draw chondrite-normalized REE patterns of calcic-plagioclase and garnet. 10
- (b) Give a brief account of Fick's Law of Diffusion and Rayleigh Fractionation Law. 10
- (c) Discuss the mass fractionation of stable isotopes of oxygen and comment on their significance in geological studies. 10

## SECTION D

Attempt any **one** question.

- Q6.** (a) Draw a neat, labelled diagram of the Nepheline-Kalsilite-Silica system (1 atm; dry). Describe the course of crystallization within this system taking two initial melt compositions, one lying within the silica-oversaturated part and other within the silica-undersaturated part. Briefly state the petrogenetic significance of this system. 15
- (b) Give a concise account on the petrogenesis of different types of granites. 15
- Q7.** (a) What is perthite ? Give labelled sketches of different types of perthite. Explain genesis of perthite with the help of suitable phase diagram. 10
- (b) What is magmatic differentiation ? Explain briefly crystal settling and liquid immiscibility. Illustrate your answer with suitable sketches. 10
- (c) What is a Large Igneous Province (LIP) ? Write briefly on Large Igneous Provinces of India. 10

## SECTION E

*Attempt any **one** question.*

- Q8.** (a) Discuss the types of skarn and their mineral assemblage. Explain the reactions by which skarn minerals are formed. 15
- (b) Write a detailed note on different types of charnockites and their origin. Add a note on incipient charnockite. 15
- Q9.** (a) Write a note on the stability of aluminosilicate polymorphs and their occurrence in metamorphic rocks. 10
- (b) Describe the effect of progressive regional metamorphism on mafic rocks. 10
- (c) Write a short note on geothermobarometers applicable to metamorphic rocks with suitable examples. 10

## SECTION F

Attempt any **one** question.

- Q10.** (a) Explain the conservative plate margins. Discuss the characteristics of continental and oceanic transforms. Illustrate your answer with suitable sketches and examples. 15
- (b) What is a Supercontinent ? Explain Supercontinent cycle and its role in climate change and sea level changes. 15
- Q11.** (a) Give a brief account of different types of remanent magnetism in rocks. 10
- (b) Explain briefly the mechanism of continental rifting. 10
- (c) Write a short note on heat flow distribution in oceanic and continental crust. 10