

A-FDN/RB-N-HMC

**GEOLOGY****Paper—III****Time Allowed : Three Hours****Maximum Marks : 200****INSTRUCTIONS**

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

*There are SIX questions divided under TWO sections.*

*Candidate has to attempt ALL the SIX questions.*

*ALL the parts in the ONLY question in Section A are compulsory.*

*In Section B, THREE parts out of FOUR are to be attempted in each of the FIVE questions.*

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

*All parts and sub-parts of a question are to be attempted together in the answer book.*

*Attempts of questions shall be counted in chronological 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 answer book must be clearly struck off.*

*Answers must be written in ENGLISH only.*

*Neat sketches are to be drawn to illustrate answers, wherever required.*

**SECTION—A**

1. Write short answer for each of the following with sketches wherever necessary :  $5 \times 10 = 50$
- (a) Geobotanical Indicators in geochemical prospecting.
  - (b) Steel making minerals.
  - (c) Landslide hazard Zonation map.
  - (d) Maceration techniques and their application in coal seam correlation.
  - (e) Limiting conditions of gas hydrate formation in continental shelf.
  - (f) Characteristics of diamond bearing Kimberlite.
  - (g) Rampura-Agucha Zinc-lead deposit.
  - (h) Alkali-aggregate reaction in concrete.
  - (i) Utility of gamma-gamma logging in coal exploration.
  - (j) Magma-mixing model for origin of stratiform chromite deposits.

**SECTION—B**

2. Answer any **THREE** of the following :  $10 \times 3 = 30$
- (a) Compare the geological setting, age, ore mineralogy and genesis of manganese ore deposits associated with the Eastern Ghats and Sausar Group of rocks.

10

- (b) Discuss the salient aspects of India's current National Mineral Policy and explain how the policy aims at the development of strategic mineral resources. 10
- (c) Give one important example of each of the following types of mineral deposits in India along with their mineral assemblage and associated host rocks : 2×5=10
- (i) SEDEX barite
  - (ii) Muscovite pegmatite
  - (iii) Greisen tungsten
  - (iv) PGE associated with ultramafic/ultrabasic rocks
  - (v) Orogenic gold.
- (d) (i) Draw a schematic geological map of Singhbhum craton showing Singhbhum shear zone and associated mineral deposits. 5
- (ii) Describe the iron ore basins of Singhbhum craton and associated BIF-hosted iron ore deposits. 5

3. Answer any **THREE** of the following :

- (a) What are sub-marine hydrothermal sulphides ? Explain their genesis in relation to MOR settings. Discuss their types, mineralogy and economic importance. 10

- (b) (i) What are the properties of fluid inclusions in ore mineral assemblages ? 5
- (ii) Explain the methods of determining chemical composition of fluid inclusions. 5
- (c) (i) How are metals transported in hydrothermal ore forming processes ? 5
- (ii) What are the causes of ore deposition from hydrothermal solution ? 5
- (d) Describe the geological characteristics and genesis of skarn-hosted ore deposits. 10
4. Answer any **THREE** of the following : 10×3=30
- (a) (i) What are the field evidences useful in prospecting of mineral deposits ? 5
- (ii) Write a note on categorisation of ore reserve. 5
- (b) (i) Why core drilling is more useful in mineral exploration compared to non-core drilling ? 5
- (ii) How wire-line drilling is more useful in mineral exploration compared to conventional core drilling ? 5

- (c) A vertical and tabular copper ore body having an average thickness of 2.86 m is being mined by developing levels at 30 m interval. The adjacent levels are connected by raise/winze at an interval of 40 m. Considering specific gravity of ore to be 2.94, calculate tonnage of ore in a block bounded by two consecutive levels and raises/winzes. If the average ore grade is 3.22 wt.% Cu, calculate the metal content of the block. 5+5=10
- (d) (i) Explain different electrode configurations used in resistivity surveys. 5
- (ii) How apparent resistivity is derived from the data obtained during resistivity survey ? 5
5. Answer any **THREE** of the following : 10×3=30
- (a) (i) Write briefly about oxidation of coal and its effect. 5
- (ii) Discuss the causes and environmental impact of underground coal combustion. 5
- (b) (i) Draw a labelled section of anticlinal structural trap formed by folding of clastic rocks consisting of sandstone and shale. 5
- (ii) Mention five major causes for migration of petroleum. 5

- (c) (i) Explain the process of coalification. 5
- (ii) Distinguish between coking and non-coking varieties of coal with examples from India. 5
- (d) (i) Describe the geological setting of any three types of uranium deposits in India. 6
- (ii) Write a note on primary and secondary uranium minerals. 4
6. Answer any **THREE** of the following :  $10 \times 3 = 30$
- (a) What are the possible hazards associated with construction of large dams in the Himalayas ? 10
- (b) Give a neat sketch of the seismic zone map of India. Discuss the need for the revision of the existing seismic map in the light of the recent earthquakes in Peninsular India.  $5 + 5 = 10$
- (c) Write notes on :
- (i) Use of geotextiles in road construction. 5
- (ii) Deere and Miller classification of important rocks on the basis of their unconfined compressive strength. 5



- (d) (i) What is seismic microzoning ? Explain the application of seismic microzoning in hazard mitigation. 5
- (ii) Modified Mercalli Scale and its relationship with Richter Scale. 5

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