

GEOLOGY
Paper – I**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 struck off.

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

Neat sketches may be drawn, wherever required.

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

- Q1.** (a) Explain Orogeny and Epeirogeny. 8
- (b) Illustrate Plunging and Reclined folds. 8
- (c) Explain the Karst cycle. 8
- (d) An aerial mapping camera with a focal length of 120 mm is mounted on an aircraft flying at an altitude of 4800 meters above mean terrain level. The sensor of the camera has pixel size $12 \mu\text{m}$ and dimensions $36 \text{ mm} \times 24 \text{ mm}$. Calculate the ground resolution and ground coverage area at the nadir. 8
- (e) A rounded mineral grain of radius 4 cm got deformed. The lengthening of the grain perpendicular to stress became 10 cm. Find the extension and magnitude of change in length. 8
- Q2.** (a) Explain the remote sensing techniques which are useful in groundwater and mineral explorations. 15
- (b) Illustrate oceanic topographies with their characteristics. Add a critical note on which part of oceanic topography is most suitable for the development of coral reefs. 10
- (c) Describe fault structures with the help of stress ellipsoids. How can one recognize the fault in the field? 15
- Q3.** (a) What is the magnitude of an earthquake? What are the different magnitude scales used to measure earthquakes? How is the magnitude of the earthquake related to earthquake intensity? 15

- (b) What is Strain ? How does the shape and size of a mineral grain within a rock change during deformation ? 10
- (c) Describe the primary and secondary landforms and discuss their interrelationship. 15
- Q4.** (a) What are the different hypotheses of Isostasy ? Explain each hypothesis with the help of suitable diagrams. 15
- (b) What are joints in a rock ? With neat sketches, show how the joints are related to folds and faults within an outcrop ? 10
- (c) Describe the geomorphic set-up of the Indian peninsular plateau and add a brief note on the forces responsible for their formation. 15

SECTION B

- Q5.** (a) Define lithostratigraphic units and give suitable example from India. 8
- (b) How are biological species different from paleontological species? 8
- (c) Write the conditions suitable for the preservation of soft parts of fossils. 8
- (d) An unconfined aquifer has areal extent of 200 km² and specific yield of 20%. What is the average drawdown in the aquifer, if the pumped volume of water from the area through uniformly distributed wells is 30 billion litres? 8
- (e) What is porosity? Briefly describe the generic classification of porosity. Support your explanation with appropriate neat sketches. 8
- Q6.** (a) Describe lithostratigraphic classification and depositional environments of the Gondwana Supergroup. Comment on the economic importance of the Gondwana Supergroup. 15
- (b) Critically discuss the factors which influence groundwater chemistry. Explain the major chemical constituents of groundwater. 10
- (c) Describe the morphology of Ammonoidea with the help of neat and labelled diagrams. Comment on their geological history and stratigraphic importance. 15
- Q7.** (a) Discuss in brief the evolutionary trends in Proboscidea. 15
- (b) Briefly discuss the stratigraphic classification of the Bastar Craton and add a note on its economic importance. 10
- (c) What are the laboratory methods used for the determination of hydraulic conductivity? Explain each method in detail with the help of neat and well-labelled sketches. 15
- Q8.** (a) Discuss the importance of geological investigations in planning and construction of tunnels. Add a note on potential consequences if adequate geological assessment is not carried out. 15
- (b) Draw a neat and labelled diagram of dorsal view of trilobite and explain the morphology. 10
- (c) Discuss the origin of the Deccan Trap Volcanism and comment on its aftermath on climatic conditions and mass extinction. 15