

**CSM – 34 / 15****Geology****Paper – I***Time : 3 hours**Full Marks : 300**The figures in the right-hand margin indicate marks.*

*Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and **three** of the remaining questions, selecting at least **one** from each Section.*

**Section – A**

1. Answer any **three** of the following in about **200** words each : **20×3 = 60**
  - (a) Describe the Earth's internal structure based on chemical composition and mechanical (physical) properties and justify your answer with two different sketches.

- (b) List five ways in which the effects of weathering are expressed in natural outcrops of bedrock.
  - (c) Describe the data types and their sources used for GIS in India and explain data processing in GIS application with desired steps and suitable examples.
  - (d) Compare the kinds of deformation produced by extension and those produced by contraction and contrast brittle and ductile behaviour in rocks.
2. (a) Compare the relative earthquake hazard along a divergent, transform, and convergent plate boundary. How does the depth of earthquakes indicate (i) convergent plate margins and (ii) divergent plate margins ? Describe the difficulties that geologists have encountered in trying to predict earthquakes.
- $12+12+6 = 30$
- (b) Explain the structural features that are associated with the following tectonic settings :
- $10+10+10 = 30$
- (i) Compression

- (ii) Extension
- (iii) Strike-slip fault

3. (a) Describe and illustrate the three major subsystems of a river. Draw a diagram showing the general nature of transportation of (i) bed load, (ii) suspended load and (iii) dissolved load.  $15+15 = 30$
- (b) Describe the electromagnetic spectrum. Explain the electromagnetic process in integration with GIS. Explain the electromagnetic energy interactions with earth surface materials.  $10+0+10 = 30$
4. (a) Make a perspective sketch of an anticline and syncline pair, and label the given features : (i) hinge plane, (ii) hinge, (iii) angle of plunge and (iv) limbs. Define the given with neat sketches : (v) Reclined fold, (vi) Parasitic fold, (vii) overturned fold and (viii) Sheath fold. Compare between ductile deformation and brittle deformation (discuss processes and products of each).  $10+10+10 = 30$

- (b) Describe the three deformation mechanisms that operate in the plastic deformation of quartz. Using stress-strain diagrams, show the difference in deformation response between elastic and linear viscous materials. With drawings, differentiate between the stress ellipse and the strain ellipse. How are the two interrelated ?

10+10+10 = 30

### Section – B

5. Answer any **three** of the following each in about **200** words :  $20 \times 3 = 60$
- (a) Types of microfossils and stratigraphic significance.
  - (b) Any three physical criteria of stratigraphic correlation.
  - (c) Rain water harvesting.
  - (d) Application of microfossils for palaeoclimatic inferences
6. Discuss the details of the following :  $30 \times 2 = 60$
- (a) Evolution of man giving Indian examples of human fossil occurrences.

(b) Graptolites, their geologic distribution and environmental significance.

7. Describe the following in brief :  $30 \times 2 = 60$

(a) Stratigraphic succession, distribution and economic significance of Proterozoic rocks of Peninsular India.

(b) Tertiary stratigraphic successions of Extra-Peninsular India.

8. Write explanatory notes on the following :

$30 \times 2 = 60$

(a) Porosity, permeability and their relation with water bearing characteristics of rocks

(b) Causes and prevention of landslide problems

