

(4)

2. Answer *any two* questions :

5×2=10

CO-4 :

- (a) What are bedforms? Give a few examples of bedforms. How are wave ripple and current ripple distinguished? How do they originate?
- (b) How rocks can be classified based on their genesis? Demonstrate the rock cycle with a suitable sketch.
- (c) What is decompression melting? At which type of plate tectonic boundary does it take place? Discuss the principle of magmatism at this site.
- (d) Define mineral with examples. Name three light-coloured minerals and three dark-coloured minerals with their general formula. Name a cation that may be occupied in the tetrahedral site as well as in the octahedral site.

CO-5 :

3. How many Eons are there in the geologic history? Describe the major geologic events that mark each eon. 5

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Ex/SC/GEOL/UG/MAJOR/TH/11/101/2025

B.Sc. GEOLOGICAL SCIENCE EXAMINATION, 2025

(1st Year, 1st Semester)

GEOLOGICAL SCIENCE

PAPER : MAJOR/TH/11/101

(EARTH SYSTEM SCIENCE)

Time : Two Hours

Full Marks : 40

(Use separate Answer-Script for each part)

PART—I

(20 Marks)

Answer *any four* questions :

5×4=20

CO-1 :

1. (a) Is the spatial gradient of temperature a scalar quantity? Explain the answer.
- (b) What is the time scale of electron transfer between atoms?
- (c) Express the size of a proton in femtometer. 3+1+1=5

CO-2 :

2. (a) What are the principal entities required to define a thermodynamic system?

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[Turn Over]

(2)

- (b) Does the entropy of a non-equilibrium isolated system remain constant with time? Explain the answer.
- (c) Would you consider the magnetosphere as a component of the Earth system? Justify your answer. 1+2+2=5

CO-3 :

3. (a) Consider a one-dimensional wave moving in space and time. Show that the wave displacement (u) must satisfy the following second-order differential equation :

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}, \text{ where } c \text{ denotes the phase speed of the wave.}$$

- (b) Derive an equation to determine the speed of a shear wave.
- (c) State the reason for calling shear waves as secondary waves in seismology. 2+2+1=5

CO-3 :

4. (a) Elastic waves show a remarkable increase in their speed at a depth of about 35 km in Earth's continents. Give a geological reason in support of this observation.
- (b) How would you prove that the Earth's outer core is in a liquid state?
- (c) With the help of a P-wave velocity versus depth curve reconstruct the layered structure of oceanic crust. 2+1+2=5

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(3)

CO-5 :

5. (a) What are the principal ways by which rocks can acquire natural remanent magnetism?
- (b) From magnetostratigraphic records show the time scales of Earth's magnetic polar reversibility in the last 5 million years history. 3+2=5

CO-6 :

6. (a) Write brief notes on the main hypotheses for the origin of life, and mass extinction in Earth's biological evolution.
- (b) Explain the role of angular momentum conservation in the solar disk formation. 3+2=5

PART—II

(20 Marks)

1. Answer *any one* question : 5×1=5

CO-3 :

- (a) How does continental crust differ from oceanic crust? Why are older rocks always found in continental lithosphere, not in the oceanic lithosphere?
- (b) Discuss the Earth's layered structure with a suitable sketch.

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[Turn Over]