BACHELOR OF SCIENCE EXAMINATION, 2024

(1st Year, 1st Semester)

GEOLOGICAL SCIENCE

PAPER : MAJOR-TH-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 :

1. *(a)* There are four physical entities : A, B, C and D in a given space. State the principal requirement to form a system with them.

(b) Consider a balloon containing air under pressure. Describe this balloon in terms of a thermodynamic system.

(c) Would you consider the Earth as an isolated system? Explain the answer. 1+2+2=5

2. *(a)* Derive the equation for one-dimensional compressional wave speed in an elastic medium.

(b) With the help of illustrations show the difference between a Rayleigh wave and a Love wave.

(c) Find the difference in arrival times between *P* and *S* waves as a function of the elastic moduli. 2+1+2=5

3. *(a)* From a graphical plot explain the variation of shear-wave speed with depth inside the Earth.

(b) How is Earth's mantle divided into lower and upper mantle?

(c) Explain the origin of *P*-wave shadow zone. 2+1+2=5

4. *(a)* Using graphical plots show the variations of density and temperatures with depth in Earth's interior.

(b) State the fundamental difference in the chemical compositions between Earth's mantle and core.

(c) How would you distinguish lithosphere and asthenosphere? 2+1+2=5

5. *(a)* Oceanic crusts across mid-ocean ridges show a systematic variation in their paleomagnetic records in space and time. Explain this geological observations.

(b) Write a short note on continental drift theory. 3+2=5

6. *(a)* What is the main factor responsible for the accelerating expansion of the Universe?

(b) Show the nuclear chain reactions involved in formation of oxygen in the Universe.

(c) Explain the role of angular momentum conservation in the solar disk formation. 1+2+2=5

PART—II (20 Marks)

Answer ***any five*** of the following : 4×5=20

1. Define erosion. What are the major agents of erosion? What are the respective roles of degradation and aggradation during Peneplanation?

2. How did ozone layer form? How did oxygen-rich atmosphere developed in Earth?

3. Where does one put the major boundaries in the Geological time scale? Discuss their geological significance.

4. Draw Hjulström diagram. Why is there a marked difference in flow velocity requirement for deposition and subsequent erosion of mud?

5. What are the essential components of life? Disucss. How do you distinguish Prokaryotes from Eukaryotes?

6. *(a)* "All terigeneous rocks are clastic, but all clastic rocks are not terrigenous" – Explain.

(b) All sedimentary rocks are not weathering product of pre-existing rocks – Explain.

7. What is Mass wasting? What are the major triggerring mechanisms for sudden mass failure?

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