f) What were the major constituents of Archaean atmosphere? How did oxygen-rich atmosphere develope in earth?

g) i) What is exogenous cycle?

ii) Define diagenesis. Characterize different stages of diagenesis.

h) What are the major boundaries present in the geological time-scale? Is Law of Superposition valid always?

B. Sc. Geological Sciences Examination, 2023

(1st Year, 1st Semester)

Earth System Science

Paper – CORE/TH/01

Time : Two hours Full Marks : 40

(Use a separate Answer script for each Part)

PART – I (20 Marks)

Answer ***any four*** questions.

1. a) Show that the gradient of a scalar in space is a vector.

b) Calculate the time in picosecond for light to travel 0.30 mm.

c) How would you define natural science? 2+2+1=5

2. a) Show that magnetosphere is a critical component of the Earth system.

b) With an example define an adiabatic wall of a system.

c) Does the entropy of a non-equilibrium isolated system remain constant with time? Explain the answer. 2+1+2=5

3. a) With the help of a graphical plot show the density variation across the core-mantle boundary.

b) Explain the drop of compressional wave velocity at this boundary.

c) Show the temperature variation with depth inside the Earth and explain the liquid state of the outer core. 1+2+2=5

4. a) Derive the equation to determine the shear wave speed in an elastic medium.

b) Using a P-wave velocity structure recognize the main layers of oceanic crust, and locate the Mohorovicic discontinuity. 3+2=5

5. a) What are the principal ways 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

6. a) With the help of a space-time plot show the major events in the history of the Universe.

b) Explain the role of angular momentum conservation in the solar disk formation. 3+2=5

PART – II (20 Marks)

Answer ***all*** the questions.

1. Answer any **5 (five)** of the following: 1×5=5

a) Do paleo-flow directions always show paleo-slope directions?

b) What are Photoauthotrophs?

c) Which climate is favoured for Lateritic soil formation?

d) What is unroofing?

e) How do you define trace fossil?

f) Why is microbiota restricted to extreme conditions after Precambrian-Cambrian boundary?

g) How did the ozone layer form on earth?

2. Answer any **5 (five)** of the following: 3×5=15

a) How do you define allochemical sediment? What are their differences with terrigenous sediments?

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

ii) Why is a marked difference in flow velocity required to deposit and erode mud?

c) What are the major factors controlling rates of weathering? What is the role of carbonic acids in chemical weathering?

d) Define erosion. What are the major agents of erosion? What is the respective role of degradation and aggradation during Peneplanation?

e) What are the major sedimentological attributes of a glacial deposit? Why is attrition process favoured in aeolian environment?