

BACHELOR OF SCIENCE EXAMINATION, 2019

(1st Year, 1st Semester)

GEOLOGICAL SCIENCES

Essentials of Geology

Paper : GE - 1

Time : Two hours

Full Marks : 50

Use a separate answer script for each group.

GROUP - A (25 marks)

1. Answer any *five* questions :
 - (a) What are the two principal types of planets in the solar system? Describe the characteristic differences in their planetary constitutions. 2+3
 - (b) With the help of a suitable sketch explain the fundamental constituents of the Earth system. What is the magnetosphere, and how does it influence the Earth system? 3+2
 - (c) What is an elastic wave? How does it differ from optical waves? Explain the fundamental difference between body waves and surface waves. 1+1+3

(Turn over)

(2)

- (d) Write the expression of a wave equation, and show how it can be used to determine the wave speed. Express the general form of diffusion equation. Does this equation satisfy the condition of heat flow by conduction in an unsteady state? Justify the answer. 2+3
- (e) Derive the wave equation for one-dimensional compressional waves, and show their speed as a function of Young's modulus (E) and material density (ρ). 5
- (f) Show that the speed of P-waves propagating in Earth's interior obeys the following equation

$$V_p = \sqrt{\frac{k + \frac{4}{3}\mu}{\rho}},$$

where K , μ and ρ are the bulk modulus, shear modulus and density of the earth, respectively. 5

- (g) Using radial depth profiles of primary and secondary waves describe the internal structure of the Earth. Explain your answer with a mathematical basis. 5
- (h) Describe the variation of silicate structures with increasing degree of polymerization of SiO_4 tetrahedra. Provide figures.

(3)

GROUP - B (25 marks)

2. Answer any *five* questions :
- (a) Why does the basalt of the sea floor exhibit "magnetic reversal"? Do you expect this in the continental flood basalt? 5
- (b) What are the shallow and deep focus earthquakes? Where do they occur and why? 5
- (c) What are the differences between constructive and destructive plate boundaries? 5
- (d) Write a short note on 'Rock Cycle'. 5
- (e) What are the major factors controlling the weathering of rocks? 5
- (f) How do we determine the absolute age of rocks in Earth? 5
- (g) What is seismic shadow zone? 5
- (h) The Oceanic crust are not more than 200 M. yrs. old. Explain. 5

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