

(b) Solve the following numerical.

- (i) A seismic wave crosses from a rock with a velocity of 2 km/sec to another rock with 4 km/sec, such that it runs along (parallel to) the interface after refraction. At what angle did it approach the interface?
- (ii) A seismic reflection survey is carried out over a 2500 m thick horizontal layer with a P-wave velocity of 2000 m/s. Calculate the travel time of a reflected wave at a detector placed 1000 m from a source.

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1212

I

Unique Paper Code : 2193010006

Name of the Paper : Introduction to Geophysics

Name of the Course : B.Sc. Geology (Theory Examination) 2024-2025

Semester : V, NEP

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any five questions.
3. Question No. 1 is compulsory.
4. All questions carry equal marks.

1. Answer the following :

- (a) The strength of the total magnetic field at the pole is _____ of the strength of the total magnetic field at the equator.
- (b) A surface on which the potential is constant is called _____.
- (c) What is the name of the phenomenon in which Earth's magnetic field periodically reverses its direction?
- (d) What would be a VES curve over a three-layer sequence comprising: moist soil (top), freshwater saturated coarse sand (middle), and Clay (bottom)?
- (e) The resistivity of the orebody is _____ than the resistivity of the host rock.
- (f) When the movement of the particles is parallel to the direction of wave propagation, the wave is called _____.

Age (Ma)	Declination (degrees)	Inclination (degrees)	Age (Ma)	Declination (degrees)	Inclination (degrees)
Present	0	+36	100	10	-38
25	6	+26	140	190	+61
40	10	+19	160	10	-69
65	10	-6			

7. (a) How does the anomaly arise in the resistivity survey? With illustrations, briefly describe the Wenner and Schlumberger configurations.
- (b) A Schlumberger array with a current electrode separation of 80 m and potential electrode separation of 10 m is placed over an inhomogeneous medium. If the measured potential difference is 40 mV and the computed apparent resistivity is 120 Ωm . Calculate the magnitude of current passing through the subsurface. (Use $\pi = 3.14$)
8. (a) Write a short note on the seismic refraction survey.

(b) Write short notes on :

(i) Geographic poles

(ii) Magnetic poles

(iii) Geomagnetic poles

6. (a) Describe the role of paleomagnetic study in establishing the seafloor spreading theory.

(b) A small area of a continent has rocks of a range of ages. Their palaeomagnetic directions were measured, giving the data below (dates are accurate to about ± 4 Ma, palaeomagnetic directions to $\pm 2^\circ$). Plot the palaeolatitudes against time. What can you deduce about the movement of the continent?

(g) P-waves always travel _____ than shear waves in the same medium.

(h) Which type of rocks are commonly used in paleomagnetic studies due to their ability to preserve remanence magnetism?

(i) Sedimentary rocks

(ii) Igneous rocks

(iii) Metamorphic rocks

(iv) Organic origin rocks

(i) During the reflection survey when each reflection point on the reflector is sampled more than once, the method is called _____.

2. Briefly explain the following :

(i) Free-air correction

(ii) Apparent polar wander path

(iii) Konigsberger ratio (Q_n)

(iv) Crossover distance (x_{cr})

3. (a) Briefly describe the following :

(i) True gravity and absolute gravity.

(ii) Define gravity reduction.

(iii) International Reference Ellipsoid

(b) A galena ore body of spherical geometry is found using a gravity survey. The radius of the ore body is 6 m and its centre of radius is 10 m below the surface. The density of galena is 7.5 g/cm^3 and the density of the surrounding rock is 1.5 g/cm^3 . Calculate the maximum magnitude of the anomaly in mGal.

4. (a) Give reasons :

(i) The Bouguer anomaly is positive over the ocean.

(ii) The gravity anomaly is more pronounced for the ore body buried at a shallower level compared to a deeper level.

(b) An extensive dolerite sill was intruded at the interface of horizontal sandstones. Sketch the gravity profiles expected if the sill and beds have been displaced by : (a) A steeply dipping normal fault, (b) A shallow thrust fault.

5. (a) Give the classification of the minerals based on their magnetic susceptibility. What is the significance of curie temperature in acquiring magnetization in the minerals?