

CMDQ/M-24

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MATHEMATICAL ASPECTS OF SEISMOLOGY

Paper–MMATH 21–408

Time Allowed : 3 Hours]

[Maximum Marks : 80

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Answer the following questions : $8 \times 2 = 16$

- Define the Frequency of a Wave. What is the relation between n and ω ?
- Show by an example that variables are separable in case of stationary waves.
- Define the Wave front and explain Cylindrical waves.
- Why S waves are rotational waves?
- Explain the Beats.
- Explain the Energy flux.
- What is the difference between body waves and surface waves?

(h) Explain layers of the Earth below crust.

UNIT–I

- What are plane harmonic waves? Derive the Mathematical representation of these waves. 8
 - Define a Seismogram and explain that how are Earthquakes located with help of Seismograms. 8
- Write 3D wave equation in Cylindrical coordinates and then solve that equation. 16

UNIT–II

- Derive Sommerfield's integral. 16
- Obtain solution of Generalized equation of telegraphy. 8
 - Explain dispersion and Obtain the relationship between group velocity and phase velocity. 8

UNIT–III

- Is SV wave is an incident wave at the free surface of a Solid half-space, then find reflection coefficients. Discuss all special cases. 16
- Reduce the equation of Motion in an Elastic medium into two wave equations. Prove that P wave is dilatational and irrotational wave. 10
 - Explain Snell's law of reflection. 6

UNIT-IV

8. Solve Lamb's problem for a point source acting on the surface of a semi-infinite elastic solid. 16
9. What is the condition of existence of Rayleigh waves? Derive its period equation and show that particle motion in case of these waves is elliptical retrograde at the surface. 16