

7. Discuss reflection and refraction of P-waves at an interface between two solid mediums of different properties. 14

Unit IV

8. Derive the formal solution of Lamb's problem for a normal line source is acting on the surface of a semi-infinite elastic solid. 14
9. What are Surface Waves ? Obtain the frequency equation for Love waves in a layer of uniform thickness overlying a half-space. Derive the condition for existence of these waves. 14

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Roll No.

(07/21-II)

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M. Sc. (2 Year) EXAMINATION

(For Batch 2018 & Onwards)

(Fourth Semester)

MATHEMATICS

MTHCE-2404

Mathematical Aspect of Seismology

Time : Three Hours

Maximum Marks : 70

Note : Q. No. 1 is compulsory. Attempt Five questions in all, selecting one question from each Unit I-IV and the compulsory question. All questions carry equal marks.

(Compulsory Question)

1. (a) Define a Wave and Harmonic Wave.
(b) Find velocity of the system of plane waves :
 $\phi = a \sin(Ax + By + Cz - Dt).$

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- (c) Define Spherical Waves.
- (d) What do you mean by epicentre of an earthquake ?
- (e) State Snell's law of reflection.
- (f) Define P and S waves of seismology.
- (g) Define Stoneley Waves. 14

Unit I

2. (a) Obtain progressive type solution of wave equation :

$$C^2 \left(\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} \right) = \frac{\partial^2 \phi}{\partial t^2}.$$

- (b) Show that $\phi = f(x \cos \theta + y \sin \theta - Ct)$ represents a wave in two dimensions, the direction of propagation making an angle θ with the axis of x . 9+5
3. (a) Obtain stationary type solution of wave equation in cylindrical co-ordinates.

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- (b) Find a solution of $\frac{\partial^2 \phi}{\partial x^2} = \frac{1}{C^2} \frac{\partial^2 \phi}{\partial t^2}$ such that $\phi = 0$ when $x = +\infty$ or $t = +\infty$. 9+5

Unit II

4. (a) Write a short note on relation between phase velocity and group velocity.
- (b) Describe phenomenon of Dispersion. 14
5. Explain the following :
- (a) Causes of Earthquakes
 - (b) Energy released by earthquakes
 - (c) Seismic moment. 14

Unit III

6. What are SV-waves ? Discuss the reflection of SV-waves incident at the plane free boundary of a semi-infinite elastic solid medium. 14

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