4. Deduce the equation of face velocity ‘c’ with wave length $\frac{2\pi}{\xi}$ for the Love surface wave. 10

5. Deduce the Rayleigh-Lamb frequency equations for (i) symmetric and (ii) antisymmetric mode of vibrations of an infinite isotropic elastic plate. 10

6. Show that for time harmonic plane longitudinal wave, the time average of total energy density is equally divided between time averages of kinetic and strain energy densities. 10

M. Sc. Mathematics Examination, 2023

(2nd Year, 1st Semester)

Mathematics

Paper – DSE 4-A27

[Solid Mechanics-II]

Time : Two hours Full Marks : 40

Answer ***any four*** questions.

All Symbols and notations have their usual meanings.

1. Deduce the displacement vector equation in elastic medium in the form :

$$\rho\frac{\partial^2\vec{u}}{\partial t^2}=(\lambda+\mu)\vec{\nabla}\left(\vec{\nabla}.\vec{u}\right)+\mu\nabla^2\vec{u}+\rho\vec{F},$$

where $\vec{F}$ is the body force vector and other symbols have their usual meanings. Also show that the disturbances in an elastic medium can be described with the aid of two types of waves : one of these travels with velocity $C_1=\sqrt{\frac{\lambda+2\mu}{\rho}}$ and other with velocity $C_2=\sqrt{\frac{\mu}{\rho}}$. 10

2. A uniform pressure varying harmonically with time is acting radially on the surface of a spherical cavity of radius ‘a’ in an infinite elastic medium. Determine the displacement at any point of the medium. 10

3. Deduce Pochhammer frequency equation for longitudinal vibration of an infinite circular cylindrical rod. 10