M. Sc. Mathematics Examination, 2024

(2nd Year, 1st Semester, Supplementary)

Mathematics

Paper – DSE-04 A-27

[Solid Mechanics-II]

Time : Two hours | Full Marks : 40

Answer ***any four*** questions.

(Symbols have their usual meaning.)

1. Show that the plane wave solution of the form :

$$\vec{U} = \vec{d}F\left(\vec{r}.\vec{N} - ct\right)$$

to the equation of motion

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

is possible if

(i) either $\vec{d} = \pm\vec{N}$ or $\vec{d}\cdot\vec{N} = 0$ and $\mu = \rho c^2$. 10

2. 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 and other symbols have their usual meanings. 10

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3. Deduce the equation of flexural vibration of a thin rod, when the rotatory inertia effect is taken into account. 10

4. Show that the Loves and dispersive waves and deduce the face velocity equation. 10

5. 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

6. Deduce the Pochhansmer frequency equation for the longitudinal vibration of an infinite circular cylinder. 10