GOVERNMENT DEGREE COLLEGE - NANDIKOTKUR

DEPARTMENT OF PHYSICS

I Year B.Sc. (Hon.) II Semester-Minor Subject-Physics

Academic Year 2024-25

Course *I: Mechanics& Properties of Matter*

QUESTION BANK

UNIT I: Vector Analysis

Short Answer Questions:

1.Define Scalar and Vector Fields. Give three examples for each.

2.Explain gradient of scalar field.

3. Define line integral and surface Integral &Volume Integral

Long Answer Questions:

1.Explain gradient of scalar field and give its physical significance

2.Define Curl of Vector field and write its significance.

3.State and Prove Gauss Divergence theorem.

4.State and Prove Stokes Theorem.

UNIT II: Mechanics of Particles:

Short Answer Questions:

1.State Newton's laws of motion.

2.Distinguish between elastic and inelastic collisions.

3.Explain the law of conservation of momentum and energy.

4.Write a note on scattering cross section.

5.Define impact parameter and scattering cross-section.

Long Answer Questions:

1.Describe the equation of motion of a system of variable mass.

2.Describe the principle of motion of rocket as a system of variable mass.

3.Explain two-dimensional collision in detail

4.Explain three -dimensional elastic collision,

5. Obtain an expression for Rutherford scattering cross-section.

UNIT III: Mechanics of Rigid Bodies and Continuous Media

Short Answer Questions:

1.Define a rigid body. Distinguish between pure translational and pure rotational motion.

2.Obtain the equation of motion for a rotating body.

3.Define angular momentum. Derive the relationship between angular momentum and kinetic energy.

4.What is pure rotatory motion? Define angular velocity, angular momentum and angular acceleration.

5.Show that $\tau = I\alpha$ for a rigid body.

6. Define Youngs modulus, Bulk modulus, Modulus of rigidity and Poisson's ratio.

7.Discuss types of bending.

Long Answer Questions:

1.What is symmetric top and precessional motion? Explain the Precession of a top.

2.Describe a Gyroscope.

3.Explain the Precession of the equinoxes.

4.Write a detail note on the elastic constant of isotropic solids and obtain their relation.

5.Classify different types of beams

6.What are different types of loads?

7. Explain point load and distributed load.

UNIT IV: Central Forces

Short Answer Questions:

1.Define Central forces and give examples

2. Define central forces and write their characteristics.

3.Show that central force is conservative.

4.Write short note on Motion of satellites.

Long Answer Questions:

1.Prove that conservative force is equal to negative gradient of potential energy.

2.Obtain the equation of motion of a body under central forces

3.State and Prove Kepler's laws of Planetary Motion.

UNIT V: Special theory of Relativity

Short Answer Questions:

1.What is frame of reference? Distinguish between Inertial and Non-inertial frames

2.Write Galilean transformation equations.

3.Explain length contraction.

4.Explain Time dilation.

5. Explain the addition of velocities.

Long Answer Questions:

1.State the Postulates of special theory of relativity. Derive the Lorentz transformation equations.

2.Describe the working of Michelson-Morley experiment & Explain negative result.

3.Derive Einstein's mass-energy relation.

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