

SSR DEGREE COLLEGE (AUTONOMOUS)
SEMESTER-I
Unit Wise Important Questions
PHYSICS

Unit – I Vector Analysis

Short Questions (4Marks)

1. Explain the concept of scalar and vector fields
2. If $S = X^2Y - 2Y^2z^2 + XY^2z$ find ∇S at the point (1,-1,1)
3. Define and find the gradient of a scalar field
4. Define divergence and curl of a vector field with examples.
5. Show that $\nabla (\nabla \times A) = 0$
 $\nabla (\nabla \cdot A) = \nabla^2 A$
6. Find the divergence and curl of
 $A = (X^2 + Y^2) i + (Y^2 + Z^2) j + (Z^2 + X^2) k$

Long Questions (10Marks)

1. State and prove Gauss divergence theorem. The surface S is occupying a volume V . The force vector $F = 2Xi + 3Yj + 3Zk$. Prove that $\iiint_V F \cdot ds = 8V$
2. State and prove Stokes theorem. Evaluate $\oint_C Yz dx + Zxdy + xydz$ by Stokes' Theorem where C is the curve bound by $X^2 + Y^2 = 1$ and $Z = Y^2$
3. State and prove Green's Theorem in the plane

Unit II

Short Questions (4Marks)

1. Define gravitational field and gravitational potential
2. Derive the equation of motion of a particle which is moving under the influence of central force
3. Show that central force is conservative
4. What is Galilean transformation? Derive Galilean transformation equations
5. What is the meaning of mass – energy equivalence? Obtain Einstein's mass – energy relations
6. What is meant by time dilation? Obtain an expression for it.

Long Questions (10Marks)

1. Write the Lorentz equations in a four vector formalism
2. Derive Lorentz – inverse transformation equations

3. Describe the Michelson – morley experiment and explain the physical significance of the negative result
4. State and prove kepler's laws of planetary motion

Unit III

Short Questions (4Marks)

1. What are the physical characteristics of a simple harmonic motion?
2. Derive the equation for time period of a torsional penoulum
3. Derive the equation for damped harmonic oscillator
4. Derive the equation for time period of a compound pendulum

Long Questions (10Marks)

1. Derive the equation of motion for a simple hermoinc oscillator and obtain its solution.
2. What is damped harmonic oscillator obtain its differential equation and solution of equation of motion
3. Define torsional pendulum and derive an expression for its timeperiod and rigidity modulus

Unit IV

Short Questions (4Marks)

1. Find the velocity of transverse wave along the stretched string
2. Write a short note on energy transport
3. Give the general solution of longitudinal wave equation
4. Derive solution of transverse wave equation
5. What are the laws of transverse vibration of strings
6. Derive an expression for the velocity of longitudinal waves in bar.

Long Questions (10Marks)

1. Derive an expression for the velocity of a transverse wave along stretched string and discuss the solution of wave equation.
2. Derive the frequencies of longitudinal vibrations of a bar fixed at both ends
3. Derive the frequencies of longitudinal vibrations of bar free at both ends
4. Derive the frequencies of longitudinal vibrations of a bar fixed at one end and free at the other.