Total number of printed pages: 01 **UG/1st Semester/UPH101**

2023

ENGINEERING PHYSICS

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) If 'V' and 'F' are respectively scalar and vector, then find the value of the following vector identities. 20

   (i) $\vec{\nabla}\times(\vec{\nabla}\vec{V})$

   (ii) $\vec{\nabla}.(\vec{\nabla}X\vec{F})$

2. a) Define gradient of a scalar field, divergence of a vector field and curl of a vector field 10

   b) Discuss the displacement current and the equation of continuity. 10

3. State Gauss's law in electrostatics. Apply Gauss's law to calculate the electric field intensity due to a uniformly charged cylinder at points 20

   (i) inside the cylinder
   (ii) at the surface of the cylinder
   (iii) outside the cylinder

4. Using the Schrodinger wave equation, prove that the energy of a particle travelling in one dimensional box is quantized. 14

   b) Calculate the de Broglie wavelength associated with a proton moving with a velocity equal to (1/20)th of the velocity of light. 6

5. a) Write down the Schrodinger time dependent and independent wave equations. 6

   b) Define acceleration, time period, frequency and phase of a simple harmonic motion. 6

   c) Define damped harmonic oscillation and find the under damped solution 8

6. a) State and explain 1st and 2nd law of thermodynamics. 6

   b) What is the basic difference between Fresnel and Fraunhofer diffraction? 4

   c) Derive an expression for diameter of dark and bright ring in reflected light of Newton's ring experiment. 10

7. a) Write down the basic characteristics of LASER radiations. 10

   b) Write and discuss the components of He-Ne LASER system 10

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