[No. of Printed Pages – 4] **F452**

PHYS132 Enrol. No. .....

[ST]

END SEMESTER EXAMINATION : DECEMBER, 2023

ENGINEERING PHYSICS

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed. Use of scientific calculator is allowed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**

Each question carries **06** *marks.*

1. Discuss Fraunhofer diffraction produced by a narrow single slit of width 'a' and illuminated by the light of wavelength 'λ'. Also, deduce the position of maxima and minima and plot the intensity distribution curve.

2. State and prove Gauss's law in electrostatics. How it is related to Coulomb's law?

P.T.O.

3. A certain particle has a life time of 1×10^{-7}s when measured at rest. How far does it go before decaying if its speed is 0.99c when it is created?

4. Prove that $x^2+y^2+z^2 = c^2t^2$ remains invariant under Lorentz transformation.

5. Establish the one-dimensional time-dependent Schrodinger equation for a free particle.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**

Each question carries **10** *marks.*

6. (a) What is 'Wedge-Shaped thin film'? Discuss interference due to reflected light from a 'Wedge-Shaped film'. Obtain the conditions for maxima and minima and hence find out the 'fringe width'. (7)

(b) A glass wedge of angle 0.01 radian is illuminated by monochromatic light of wavelength 6000 Å falling normally on it. At what distance from the edge of the wedge will the 10^{th} fringe be observed by reflected light? (3)

7. If $\vec{r}$, the position vector is $\vec{r} = \hat{i}x+\hat{j}y+\hat{k}z$, find:

(i) grad r^n

(ii) div $r^n\vec{r}$, and

(iii) curl $r^n\vec{r}$.

8. (a) What is 'wave function'? When is a wave function said to be normalised. Discuss the physical significance of the wave function. (5)

(b) Discuss Davisson Germer's experiment and show the experimental evidence of matter waves. (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Describe the principle, construction and working of 'Helium-Neon Laser' with proper energy level diagram. (5)

(b) Explain Rayleigh's criterion of resolution with a proper diagram. Define the limit of resolution and resolving power. (5)

(c) If $V = 2x^2-3y^2+z^2$ represents the electrostatic potential at a point, find the electric field intensity at a point (3, 2, -3). (3)

(d) Find the expectation value $\langle x \rangle$ of the position of a particle trapped in a box L cm wide. (3)