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PHYS132 Enrol. No. A2305224208
[ST]

END SEMESTER EXAMINATIONS JANUARY 2025

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. (a) Show that curl (grad ϕ) = 0. (3)

   (b) Determine the thickness of a quarter wave plate when the wavelength of light is equal to 5890 Å, $\mu_O = 1.55$, and $\mu_E = 1.54$, where the symbols have their usual meaning. (3)

2. Discuss the Davisson and Germer's experiment to demonstrate the wave nature of electrons.

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3. What is Heisenberg's uncertainty principle? Derive the Heisenberg's uncertainty principle in terms of position and momentun.

4. (a) Derive relativistic law of addition of velocities and prove that the velocity of light is the same in all inertial frame irrespective of their relative speed. (4)

(b) A rod has length 100 cm. When the rod is in a satellite moving with velocity 0.9 c relative to the laboratory, what is the length of the rod as measured by an observer in the laboratory. (2)

5. (a) Write the statement of Gauss's divergence theorem (3)

(b) At what speed does the kinetic energy of a particle equal to its rest energy? (3)

SECTION – B (20 Marks)

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

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

6. (a) Discuss the phenomenon of interference of light in a thin film in reflected light and find the condition for maxima and minima. (6)

(b) If $\vec{r}$ is the position vector of a point, show that

$\text{div}\,((\vec{r}/r^3) = 0.$ (4)

7. (a) State and prove Gauss's law in electrostatics. (6)

(b) Prove the relation $E^2 - p^2c^2 = m_0^2c^4$, where the parameters have their usual significances. (4)

8. (a) What do you mean by wave packet. Show that group velocity of wave packet is equal to the velocity of material particle in motion. (6)

(b) Explain what do you understand by population inversion and why it is essential for laser action to take place. (4)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Define plane transmission grating. Derive an expression for resolving power of a plane transmission grating. (6)

(b) Discuss the construction and working of Ruby laser. (6)

(c) Write down Maxwell's equation in integral form and give the physical significance of each equation. (4)