March-2017

B.Sc. semester-VI

Physics- Paper-602(code: 4614)

2:30 h (Magnetostatics, Maxwell's field equation and Laser)

Time : 3 Hours] [Total Marks : 70

---

* **Instruction:** (1) Symbols have their usual meaning.
(2) Figures on the right indicate total marks of the question.

1(a). Explain Biot-Savart Law and define magnetic induction ($\vec{B}$). [08]

(b). Define and derive equation of current density when current extended in space. [06]

OR

1(a). Define magnetic vector potential $\vec{A}$ and show that magnetic induction is given by a curl of magnetic vector potential. [08]

(b). Show that for a charged particle moving with velocity $\vec{v}$; is given by $\vec{A} = \frac{\vec{v}}{c^2} V$, where V is electrostatic potential and c is velocity of light. [06]

2(a). Write formula for magnetic vector potential and take divergence of it. Give the Lorentz condition for that. [08]

(b). Explain boundary condition for electric field $\vec{E}$. [06]

OR

2(a). Explain boundary condition for electric displacement vector $\vec{D}$. [07]

(b). Explain construction of Ruby Laser . [07]

3(a). Write Maxwell's equation for free space and show that the field vectors can be propagated as waves in free space and the velocity of propagation is equal to velocity of light. [07]

(b). Write Maxwell's equation in matter. Derive wave equation for electric and magnetic field vector. [07]

OR

3(a). Derive wave equation for propagation of plane EM waves in Ionised gas. [10]
Discuss about Conductivity of ionised gas region.

(b). Prove that; $\vec{\nabla}\left(1/r\right) = -\vec{r}/r^3$ [04]

4(a). Explain construction and working of He-Ne Laser . [10]

(b). Explain spontaneous emission for Laser. [04]

OR

4(a). Explain construction and working of Semiconductor Laser. [12]

(b). Define Homogeneous medium and Isotropic medium . [02]

5(a). Prove that the tangential component of magnetic field is continuous across the interface. [07]

(b).What is holography ? Explain the re-construction of the image. [07]

OR

5(a). Write characteristics of Stimulaed emission. [06]

(b). Show that the wave equation can be written in the form $(\nabla^2 + K^2)\vec{E} = 0$, [04]
Where K is wave vector.

(c). What is Laser ? Give uses of Laser. [04]