

Seat No. \_\_\_\_\_

SEM-VI B. Sc. Examination  
Physics- Paper No.-602 (Sub. Code: 4614)  
(Magnetostatic, Maxwell's Equation and Laser)

April 2016

Time: 02:30 Hours

Total Marks: 70

Instructions: (1) Symbols have their usual meaning.

(2) Figures on right hand side show marks of that question.

Que.1 (A) Explain Biot-Savart Law and define magnetic induction ( $\vec{B}$ ). [10]

(B) Show that for a charged particle moving with velocity  $\vec{v}$ ; is given [04]

by  $\vec{A} = \frac{\vec{v}}{c^2} \cdot V$ , where V is electrostatic potential and c is velocity of light.

OR

Que.1 (A) Derive Ampere's force law for current element. [07]

(B) For magnetic induction  $\vec{B}$ , prove that  $\vec{\nabla} \cdot \vec{B} = 0$  and give its physical significance. [07]

Que.2 (A) Show that electromagnetic waves travel in free space with the velocity of light. [09]

(B) Define and derive equation of current density when current extended in space. [05]

OR

Que.2 (A) Define magnetic vector potential  $\vec{A}$  and show that magnetic induction is given by a curl of magnetic vector potential. [09]

(B) Discuss about boundary condition for magnetic field ( $\vec{H}$ ). [05]

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

- (B) If the average density of electrons in an atmosphere is given by  $6 \times 10^{10}$  electron/m<sup>3</sup>. Then calculate, (a) Plasma frequency (b) Phase constant and (c) Phase velocity of plane EM wave of frequency 10 MHz. Neglect the effect of collision. [04]

OR

- Que.3 (A) Derive wave equation for electric and magnetic field for plane EM Waves in matter. [10]

- (B) Explain boundary condition for electric displacement vector  $\vec{D}$ . [04]

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

- (B) What is Laser? State the characteristics of lasers. [04]

OR

- Que.4 (A) Derive an expression for Einstein co-efficient  $A_{21}$  and  $B_{21}$  and relation between them. [10]

- (B) Explain term: 'Absorption' in Laser. [04]

- Que.5 (A) Explain construction and working of Semi conductor Laser with help of appropriate energy level diagram. [12]

- (B) Write Maxwell's equation in Differential and Integral form. [02]

OR

- Que.5 (A) What is holography? Explain the method of recording of hologram and re-construction. [12]

- (B) Define Homogeneous medium and Isotropic medium. [02]