(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0 1 4 9

Exam. Code : 0 0 0 2

B.A./B.Sc. (General) 2nd Semester

(2053)

PHYSICS

Paper : B–Vibrations, Waves & E.M. Theory–II

Time Allowed : Three Hours] [Maximum Marks : 44

Note :—(1) Attempt **FIVE** questions in all, selecting TWO from each Unit–I and Unit–II.

(2) Unit–III is compulsory.

(3) Use of Non-programmable Scientific Calculator is allowed.

UNIT—I

1. (a) What are transverse waves ? Derive wave equation for such waves in a string. 7

(b) How does the wave function of a progressive wave differ from that of a stationary wave. 2

2. (a) Derive an expression for the reflected energy coefficient and transmitted energy coefficient at the boundary between two media. 7

(b) The sinusoidal wave is $y = 0.1 \sin 2\pi(0.01x - 100t)$ where x, y are in metre and t in second. Calculate the speed of the wave. 2

3. (a) Find the relation between wave velocity and group velocity. Is group velocity greater than wave velocity ? Comment. 6

(b) A wave of frequency 600 Hz is travelling with a velocity of 900 ms^{-1} along x-axis. How far are two points situated whose displacements differ in phase by $\pi/4$? 3

UNIT—II

4. (a) Using Maxwell's equations derive wave equation for electromagnetic wave in a conducting medium. 6

(b) Show that in a conducting medium the displacement current leads the conduction current by $\pi/2$. 3

5. (a) Define Poynting Vector. What does it represent ? State and prove Poynting theorem. 6

(b) Calculate the Poynting vector at the surface of the sun. Given that it radiates 3.8×10^{26} joule of energy per second and that the radius of the sun is 0.7×10^{9} m. 3

6. (a) Define Skin depth. Show that it is inversely proportional to square root of conductivity of medium and frequency of electromagnetic waves. 6

(b) Calculate the skin depth for a frequency of 1010 Hz for silver. Given that $\sigma = 2 \times 10^{7}$ Sm^{-1} and $\mu = 4\pi \times 10^{7}$ m^{-1}. 3

UNIT—III

7. Attempt any **EIGHT** parts. Each part carries **1** mark.

(a) What are standing waves ?

(b) What is the velocity of em waves in free space and in medium ?

(c) Differentiate between conduction current and displacement current.

(d) Define Phase velocity and group velocity.

(e) Give two applications of impedance matching.

(f) Define Skin depth.

(g) Define refractive index of an object.

(h) Differentiate between mechanical and EM waves.

(i) What is the value of impedance of dielectric EM waves in vacuum ?

(j) What are nodes and antinodes ? $8 \times 1 = 8$