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

(ii) Questions : 7 Sub. Code : 0149

Exam. Code : 0002

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

(2042)

PHYSICS

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

Time Allowed : Three Hours] [Maximum Marks : 44

Note :—(1) Attempt **five** questions in all, selecting at least **two** questions each from Unit–I and Unit–II. Question No. 7 (Unit–III) is compulsory.

(2) Use of non-programmable calculator is allowed.

UNIT–I

1. (a) Show that all energy arriving at the boundary in the incident wave leaves the boundary in the reflected and transmitted wave. Also define reflection and transmission coefficients of energy. 6

(b) A wave of frequency 400 Hz is travelling with a velocity of 800 m/s along x-axis. How far two points are situated whose displacements differ in phase by $\pi/4$? 3

2. (a) What is progressive wave ? Derive the wave equation for transverse waves in a string. 6

(b) Differentiate between wave velocity and group velocity. 3

3. (a) Prove that in a progressive wave, half the energy of a wave is kinetic and other half is potential. 6

(b) What is the condition for impedance matching when the impedance of the two media are not equal ? 3

UNIT–II

4. (a) What is 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 of radius of Sun is 0.7×10^{9} m. 3

5. (a) Discuss the propagation of plane em wave incident normally at the boundary separating two media of different impedances and show that a perfect conductor is a perfect reflector of em waves. 6

(b) Why a light wave is characterised only by its electric field vector, although it has the magnetic field vector ? Justify. 3

6. (a) Derive an expression for impedance of a conducting medium to em wave and hence show that the phase difference between electric and magnetic field of em waves in a conductor is $\pi/4$. 6

(b) Find the skin depth for a frequency of 10^6 Hz if $\sigma = 5.8 \times 10^7$ Sm^{-1}, $\mu = 4\pi \times 10^{-7}$ Hm^{-1}. 3

UNIT–III

7. Attempt any **eight** parts :

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

(b) What is skin depth ? What is its value for a perfect conductor ?

(c) Calculate the pointing vector for a distance of 7 m from a 200 W lamp.

(d) The magnetic and electric fields are closely related to each other. Comment.

(e) Give two applications of impedance matching.

(f) Two electric cables are joined at a point. What special care should be taken for proper transmission of power ?

(g) What are transverse waves ?

(h) Give the examples of normal and anomalous dispersive medium.

(i) Explain why there is a flick at the free end of a whip of a string.

(j) Why light waves travel through vacuum whereas sound waves cannot ?

$1 \times 8 = 8$