

(i) Printed Pages : 3

Roll No.

(ii) Questions : 7

Sub. Code :

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Exam. Code :

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

1059

PHYSICS

Paper-B : Vibrations, Waves and E.M. Theory-II

Time Allowed : Three Hours]

[Maximum Marks : 22

Note :- (1) Attempt **five** questions in all, selecting **two** each from Unit-1 and Unit-2. Question No. 7 (Unit-3) is compulsory.

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

UNIT-1

1. (a) Discuss the reflection and transmission of waves on a string at a boundary. Also define the reflection and transmission coefficient of amplitude. 3
- (b) Two strings of linear densities 0.5 g/cm and 2 g/cm are joined together and stretched with a force of 50 N. Calculate the reflection and transmission coefficient of amplitude. 1.5
2. (a) Define characteristic impedance of a string. Find an expression for it. On what factors characteristic impedance of a string depends ? 3
- (b) Explain matching of impedances. State condition for perfect impedance matching between two media. 1.5

3. (a) What are transverse waves ? Derive wave equation for transverse wave in a string. 3
- (b) Derive the relation between wave velocity and group velocity. 1.5

UNIT-2

4. (a) Starting from Maxwell equations, derive wave equations for electromagnetic wave in a conducting medium. 3
- (b) Define Poynting vector. What does it represent ? Show that the pointing vector measures the flow of energy per unit area per second in an em wave. 1.5
5. (a) Show that magnetic field in em waves lags behind electric field by $\pi/4$ while propagating in conducting medium. 3
- (b) Find the skin depth for a frequency of 10^{10} Hz if $\sigma = 2 * 10^7 \text{ Sm}^{-1}$, $\mu = 4\pi * 10^{-7} \text{ Hm}^{-1}$. 1.5
6. (a) Discuss the reflection and transmission of electromagnetic of electromagnetic wave incident normally at a boundary separating two media of different impedances. 3
- (b) Does the refractive index of a medium depend on the frequency of the wave ? Explain. 1.5

UNIT-3

7. Attempt any **eight** parts :
- (a) What do you mean by anti-nodes in a stationary wave ?
- (b) What is skin depth ? What is its value for a perfect conductor ?
- (c) Calculate the Poynting vector for a distance of 9 m from a 200 W lamp.

- (d) As the conductivity increases, the conductor behaves like a short circuit to the incident em wave. Justify.
- (e) Are phase velocity and group velocity same, when light travels in vacuum ? Explain.
- (f) In case of string the wave velocity is a function of elasticity and inertia of medium. Comment.
- (g) How is standing wave formed ?
- (h) What is the velocity of em waves in free space and in medium ?
- (i) Differentiate between mechanical and em waves.
- (j) What happens to the amplitude of an em wave when it travels through dielectric and conducting medium ? $\frac{1}{2} \times 8 = 4$