

Exam. Code : 103202

Subject Code : 1266

B.A./B.Sc. 2nd Semester

PHYSICS

Paper—B

(Vibration and Waves)

Time Allowed—Three Hours] [Maximum Marks—35

Note :— Attempt *five* questions in all, selecting at least *one* question from each Section. **Fifth** question can be done from any section.

SECTION—A

1. (a) Write the differential equation of a simple harmonic oscillator and solve it to obtain expression for displacement of oscillator. 5
- (b) The potential energy of a particle of mass 1 kg in motion along x-axis is given by $U = 4(1 - \cos 2x)$ J, where x is in meters. Show that the motion of the particle is simple for small oscillations. 2
2. What is a compound pendulum ? Obtain an expression for its time period. Show that the centre of oscillation and centre of suspension are interchangeable. 7

SECTION—B

3. Define logarithmic decrement and amplitude relaxation time. Find the expression for them and hence derive the relation between them. 7
4. Show that in case of a damped oscillator, the rate of loss of energy is equal to the rate of doing work against resistive force. 7

SECTION—C

5. What are forced oscillations ? Derive an expression for the displacement of a driven harmonic oscillator in steady state. Discuss the case when the displacement is oscillatory in nature. 7
6. Two LC circuits are coupled by mutual inductance. Obtain an expression for normal modes of oscillation of this coupled system. Define coefficient of coupling for magnetically coupled circuits. 7

SECTION—D

7. What do you mean by matching of impedance between two different media ? Find the expression for characteristic impedance of the buffer medium when energy is transferred from medium of impedance Z_1 to Z_2 . 7
8. A simple harmonic wave is travelling on a two piece string of different linear mass density. Obtain an expression for amplitude reflection coefficient and amplitude transmission coefficient. 7