AS/2110
VIBRATIONS AND WAVES-I, P-B
SEMESTER-I

TIME ALLOWED 3 Hrs M.M 30

NOTE: The candidates are required to attempt two questions each from Section A & B . Attempt any five questions from Section C.

Section-A

1. Prove that the average kinetic energy of a harmonic oscillator is equal to its average potential energy and each to half the total energy. (5)

2. (a)Show that the loss of energy of a damped oscillator is equal to rate of doing work against the resistive forces. (3)
(b)In an oscillatory circuit L=0.2H, C=0.0012u F, What is maximum value of resistance so that circuit is oscillatory. (2)

3. What is Compound Pendulum? Derive an expression for its time period. Show that centre of Suspension and centre of Oscillation are interchangeable in Compound Pendulum. (5)

4. Write the equation of motion of a damped simple harmonic oscillator. Find its solution. Discuss briefly the case of Light damping. (5)

Section-B

5. Write expressions for impedance of forced mechanical and electrical oscillator? Give their units. Give condition for their minimum value. (3)

(b) What is absorption resonance curve? Why is it so called? Define absorption band width? (2)

6. Show that the average power supplied by the external periodic force is equal to the average power dissipated by the forced oscillator against damping force. (5)

7. Define quality factor of a forced mechanical oscillator in terms of absorption band width and derive its expression. (5)

8. Discus the variation of magnitude of velocity versus driving force frequency in forced oscillator. Show it graphically. (5)

Section-C

(a) What are the units of damping constant for (i) Damped mechanical oscillator (ii) Damped electrical oscillator?

(b)What is meant by transient and steady state behavior of forced oscillator?

(c) What factors determine the natural frequency of a simple harmonic oscillator?

(d) Is energy stored in a forced oscillator?

(e) What is the phase relationship between velocity and acceleration in simple harmonic motion?

(f)Write difference between natural, forced and resonant vibrations?

(g)What is Critical damping? Write equation for it. 2X5=10