

VIBRATIONS AND WAVES - I

Semester - I
Paper - B

Time Allowed : 3 Hours]

[Maximum Marks : 30

Note : Attempt *five* questions in all, selecting *two* from each of the section A and B. Section C is compulsory (attempt any *five* questions from this section). Use of Non-Programmable Calculator is allowed.

Section - A

1. When the displacement is one-half of the amplitude, what fraction of the total energy is kinetic and what is potential in SHM? Explain the graphical representation of energy?
2. What is a compound pendulum? Derive an expression for its time period.
3. What is Logarithmic decrement for damped mechanical oscillator? Deduce its value.
4. What is quality factor for damped mechanical oscillator? Deduce its value.

Section - B

5. Write down the equation of a forced oscillator being driven by an alternating force $F_0 \cos \omega t$. Explain the transient behaviour of a forced oscillator.
6. Discuss the variation of displacement amplitude with the driving force frequency.
7. Discuss mathematically Q-value as an amplification factor at low frequency response.
8. Describe the behaviour of velocity versus driving force frequency in case of forced oscillator.

Section - C

9. Write the following in brief (any *five*) :

- (a) What is the phase relation between velocity and acceleration in S.H.M. ?
 - (b) What is meant by steady state behaviour of a forced oscillator ?
 - (c) How the designing of Ballistic galvanometer differs from Dead beat galvanometer ?
 - (d) What is the difference between free, forced and resonant vibration ?
 - (e) Is energy stored in a forced oscillator ? Explain.
 - (f) What is the physical significance of the mechanical impedance of a forced oscillator ?
 - (g) Distinguish between centre of suspension and centre of oscillation of a compound pendulum.
Are they interchangeable? (5×2=10)
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