E571 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2010

(CCSS Programme)

Physics—Core Course

PH 2B 03—PROPERTIES OF MATTER WAVES AND ACOUSTICS

Time : Three Hours Maximum weightage : 30

Section I (Objective Type Questions)

Answer **all** *questions (¼ weightage each)*

1. The apparatus used to find the rigidity modulus of the material of a wire is ————.
2. When the amplitude of a particle executing SHM increases, the time period ————.
3. The velocity of longitudinal waves in a rod depends upon ———— of the material besides its density.
4. The loudness of sound is related to ———— of the sound wave.
5. Poisson's ratio for steel if its Young's modulus is 2×10^{11} N/m^2 and rigidity modulus is 8×10^{10} N/m^2 is :

   (a) 0.25 (b) 0.15 (c) 0.35 (d) 0.1.

6. The motion of a particle executing simple harmonic motion is given by $x = 0.01\sin[100\,\pi(t + 0.005)]$ where x is in m and t in s. The time period is :

   (a) 0.01s (b) 0.02 s (c) 0.1 s (d) 0.2 s.

7. The potential energy of a particle executing simple harmonic motion is :

   (a) $\frac{1}{2}kx^2$ (b) kx (c) $\frac{1}{3}kx^2$ (d) $\frac{1}{4}kx^2$

8. When you speak to your friend, which of the following parameters have a unique value in the sound produced ?

   (a) Frequency (b) Wavelength (c) Amplitude (d) Wave velocity.

9. Give *one* example for a damped harmonic oscillator.
10. Write the expression for the quality factor.
11. Write the limiting values of Poisson's ratio.
12. Write the relation between wave velocity and group velocity of a wave.

Section II (Short Answer Type Questions)

Answer **all** *questions (1 weightage each)*

13. Define Bending Moment.
14. Why girders are of I-section form ?

Turn over

15. When a beam is symmetrically placed on two knife edges and is bent by loading at the midpo why the bending is called non-uniform bending ?

16. What are forced harmonic oscillations ?

17. Define Quality Factor and Damped Harmonic Oscillator.

18. Draw graphs showing the variation of amplitude of forced harmonic oscillator with displacem when damping is high and low.

19. Define Pitch and Loudness of sound.

20. What are Ultrasonic waves ?

21. State Fourier theorem.

Section III (Short Essay/Paragraph Questions)

Answer any **five** *questions (2 weightage each)*

22. Find the expression for the twisting couple of a wire.

23. Find the stress to be applied to be a steel wire to stretch it by 0.25% of its original length. You modulus for steel is 90 GPa.

24. Derive the expression for average power dissipation for a damped harmonic oscillator.

25. Calculate the displacement of a body executing simple harmonic motion, in terms of its amplit at which the kinetic energy = 3 × potential energy.

26. Prove that the variation of pressure in the case of a longitudinal progressive wave travel through a gas is given by $P = -E.\frac{dy}{dx}$, where E is the bulk modulus and $\frac{dy}{dx}$ is the volume str

27. Discuss the modes of transverse vibration of a string.

28. If the intensity of sound wave is increased by a factor of 20, by how many decibels is the so level increased ?

Section IV (Essay Questions)

Answer any **two** *questions (4 weightage each)*

29. What are torsional oscillations ? Explain the experimental determination of the rigidity modul a wire using torsion pendulum.

30. Deduce the differential equation for a damped harmonic oscillator and discuss in detail the cas critical damping and underdamping.

31. Derive the expression for a plane progressive harmonic wave. Derive the expressions for en density and energy current for such a wave.