

SECOND SEMESTER B.Sc. DEGREE EXAMINATION MAY 2011

(CCSS)

Core Course

PH 2B 03 – PROPERTIES OF MATTER, WAVES AND ACCOUSTICS

Time : Three Hours

Maximum : 30 Weightage

Section I – Answer all twelve questions. (¼ weightage each)

Section II – Answer all nine questions. (1 weightage each)

Section III – Answer any five questions. (2 weightage each)

Section IV – Answer any two questions. (4 weightage each)

Section I (Objective Type Questions)

I. Answer all questions :

1. The apparatus used to find the rigidity modulus of the material of a wire is _____.
2. For an undamped oscillator, the quality factor is _____.
3. The velocity of transverse waves in a stretched string is given by _____.
4. The quality of sound is related to _____ of the sound wave.
5. The Young's modulus of a wire of length 'L' and radius 'r' is 'Y' Nm². If the length is reduced to L/2, and radius r/2, its Young's modulus will be

(a) Y/2.	(b) Y
(c) 2Y.	(d) 4Y.
6. When a particle executing SHM and passes through the mean position, it has

(a) Both kinetic and potential energies minimum.
(b) Both kinetic and potential energies maximum.
(c) Minimum kinetic energy and maximum potential energy.
(d) Minimum potential energy and maximum kinetic energy.
7. When the amplitude of a particle executing SHM increases, the time period.

(a) decreases.
(b) remains unchanged.
(c) increases.
(d) may increase or decrease depending upon the phase.

Turn over

8. When you speak to your friend, which of the following parameters have a unique value for the sound produced :
- (a) Frequency. (b) Wavelength.
(c) Amplitude. (d) Wave velocity.
9. Write the limiting values of Poisson's ratio.
10. Give one example for a forced vibration system.
11. Write the relation between wave velocity and group velocity of a wave.
12. Write the general equation representing a wave motion.

(12 × ¼ = 3 weight)

Section II (Short Answer Type Questions)

Answer all questions.

13. Out of stress and strain, which is the cause and which is the effect? Explain.
14. Name the factors on which the depression at the free end of a cantilever depend.
15. Define bending moment.
16. What do you mean by quality factor for a damped harmonic oscillator.
17. Obtain the differential equation representing the oscillations of a driven harmonic oscillator.
18. Define a plane progressive harmonic wave.
19. Define pitch and loudness of sound.
20. What is reverberation of sound waves?
21. State Fourier theorem.

(9 × 1 = 9 weight)

Section III (Short Essay / Paragraph Question)

Answer any five questions.

22. Calculate the work done in twisting a steel wire of radius 10^{-3} m and length 0.25 m through an angle 45° . The rigidity modulus of the material of the wire is 8×10^{10} N/m².
23. Show that a hollow shaft is better than a solid shaft of same length and same material transmitting torque.
24. Assuming the results of forced oscillations, discuss the sharpness of resonance.
25. The frequency of the fourth harmonic in a stretched string of length 20 cm is 600 per second. What is the velocity of the wave in the string?
26. Derive the expression for kinetic energy and potential energy of a simple harmonic oscillator.
27. If the intensity of sound wave is increased by a factor of 20, by how many decibels is the sound level increased?
28. Write a brief note on acoustics of buildings.

(5 × 2 = 10 weight)

Section IV (Essay Questions)

Answer any two questions.

29. Describe an experiment with necessary theory to determine the Young's modulus of the given material using a cantilever.
30. Deduce the equation for the simple harmonic motion of a particle. Show that the resultant of two simple harmonic motions having the same period but different phase and amplitude are acting in the same direction on a particle is simple harmonic. What are the uses of Lissajous figures?
31. What are ultrasonic waves? Explain the production of ultrasonic wave by piezoelectric crystal method. What are the applications of ultrasonic waves?

(2 × 4 = 8 weightage)