

C 41788

(Pages : 3)

Name.....

Reg. No.....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL/MAY 2013

(CCSS)

Physics

PH 2B 03—PROPERTIES OF MATTER, WAVES AND ACOUSTICS

Time : Three Hours

Maximum : 30 Weightage

Section I

Answer all questions.

1. Which of the following substance has the highest elasticity ?
 - (a) Steel.
 - (b) Copper.
 - (c) Rubber.
 - (d) Sponge.
2. For the same cross-sectional area and for a given load, the ratio of depressions for the beam of a square cross-section and circular cross-section is :
 - (a) $3 : \pi$.
 - (b) $\pi : 3$.
 - (c) $1 : \pi$.
 - (d) $\pi : 1$.
3. The practical limits of Poisson's ratio lies between :
 - (a) $-\infty$ to $+\infty$
 - (b) 0 & 1.
 - (c) 0 & $\frac{1}{2}$.
 - (d) 0 & -1 .
4. In a beam the line of intersection of the plane of bending with the neutral surface is known as _____.
5. The total energy of a particle executing SHM is proportional to the :
 - (a) Displacement from equilibrium position.
 - (b) Frequency of oscillation.
 - (c) Velocity in equilibrium position.
 - (d) Square of amplitude of motion.
6. The motion of a particle executing SHM is given by $x = 0.01 \sin 100\pi(t + 0.05)$ where x is in metre and t in second. The period is
 - (a) .01 sec.
 - (b) 0.02 sec.
 - (c) 0.1 sec.
 - (d) .02 sec.
7. The potential energy U of a simple harmonic oscillator when the particle is half way to its end point is :
 - (a) $U/4$.
 - (b) $U/8$.
 - (c) $2U/3$.
 - (d) $3U/2$.

Turn over

8. A _____ is an example of two body harmonic oscillator.
9. Ripples on the surface of water is an example of _____.
- (a) Longitudinal waves. (b) Non-mechanical waves.
(c) Transverse waves. (d) None of the above.
10. A tone which has a frequency that is an integral number of times of the fundamental is called
- (a) Harmonic. (b) Fundamental mode.
(c) First overtone. (d) First mode of vibration.
11. Intensity of sound has :
- (a) An objective existence. (b) A subjective existence.
(c) No existence. (d) All are true.
12. The walls of the hall built for music concerts should :
- (a) Amplify sound. (b) Reflect sound.
(c) Transmit sound. (d) Absorb sound.

(12 × ¼ = 3 weightage)

Section II

Answer all questions.

13. Define Stress and Strain.
14. Define Bulk modulus of elasticity.
15. Why is a cantilever of uniform cross-section more likely to break near its fixed end ?
16. What is the necessary condition for a motion to be simple harmonic ?
17. What is sharpness or frequency selectivity of an oscillator ?
18. Give two important characteristics of wave motion.
19. State the law of transverse vibrations of strings.
20. What is Piezoelectric effect ?
21. What is absorption Co-efficient ?

(9 × 1 = 9 weightage)

Section III

Answer any **five** questions.

22. A gold wire 3.2×10^{-4} m in diameter elongates by 10^{-3} m when stretched by a force of 0.33 kgWt. Find the Young's modulus of the material if the length of the wire is 0.6 metre.
23. A cantilever of length 0.5 m is depressed by 1.5×10^{-3} m at the loaded end. Calculate the depression at a distance 0.3 m from the fixed end.
24. Derive an expression for the couple per unit twist of a uniform solid cylinder.
25. What is a simple pendulum? Derive an expression for the period of oscillation of a simple pendulum.
26. What is a forced harmonic oscillator? Give an example.
27. A source of sound has a frequency of 512 Hz and an amplitude of 25×10^{-4} m. What is the flow of energy across unit area per second. Density of air = 1.29×10^6 kg /m³ and velocity of sound in air = 340 m/s.
28. What are ultrasonic waves? A quartz crystal of thickness 10^{-3} m is vibrating at resonance. Calculate the fundamental frequency. Young's modulus = 7.9×10^{10} N/m². Density of quartz = 2.65×10^3 kg/m³.

(5 × 2 = 10 weightage)

Section IV

Answer any **two** questions.

29. What is Poisson's ratio? Derive the relation connecting Young's modulus, bulk modulus and Poisson's ratio.
30. Explain what a damped harmonic oscillator is. Obtain the differential equation of a damped harmonic oscillator and solve it for :
 - (a) Underdamped case.
 - (b) Critically damped case.
31. How are ultrasonic waves experimentally produced? Describe a method to determine the velocity of ultrasonic waves through a liquid.

(2 × 4 = 8 weightage)