

## SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, MAY 2019

B.Sc.—Physics/Applied Physics

PHY 2B 02/APY 2B 02—PROPERTIES OF MATTER, WAVES AND ACOUSTICS

Time : Three Hours

Maximum : 80 Marks

**Section A***Answer all questions.**1 mark each.*

1. S.I. unit of Young's modulus  $Y$  is \_\_\_\_\_.
2. Write an expression for Poisson's ratio.
3. The equation for time period of a torsion pendulum is \_\_\_\_\_.
4. Write the differential equation of SHM.
5. The relation connecting time period and frequency is \_\_\_\_\_.
6. Give an example of a harmonic oscillator.
7. The total kinetic energy of a harmonic oscillator is proportional to \_\_\_\_\_.
8. Define Wave front.
9. What is pressure amplitude ?
10. Mention the unit of sound.

(10 × 1 = 10 marks)

**Section B***Answer all questions.**Write in two or three sentences.**2 marks each.*

11. Write a note on bending moment.
12. What is bulk modulus ?
13. Write an expression for potential energy of a harmonic oscillator.
14. What is the condition for critical damping ?
15. Give two examples of damped harmonic oscillator.
16. Obtain an expression for intensity of waves.
17. Discuss about the loudness of sound.

(7 × 2 = 14 marks)

**Turn over**

**Section C**

Write any **five** questions.

Write in **one paragraph**.

4 marks each.

18. Obtain a relation connecting three elastic constants.
19. What is quality factor ?
20. Briefly describe a forced harmonic oscillator.
21. Write a short note on anharmonic oscillator.
22. Discuss about plane progressive harmonic wave.
23. Explain Fourier's theorem.
24. Briefly describe the production of ultrasonic waves.

(5 × 4 = 20 marks)

**Section D**

Solve any **four** problems.

4 marks each.

25. Calculate the Poisson's ratio for steel. Given that Young's modulus is  $2 \times 10^{11}$  N/m<sup>2</sup> and rigidity modulus is  $8 \times 10^{10}$  N/m<sup>2</sup>.
26. A particle having mass 4 g executes SHM. When its displacement is 8 cm, the force acting on the body is 24 gwt. Find its period.
27. The total energy of a harmonic oscillator is E. For what value of the displacement the kinetic and potential energies are equal.
28. A particle of mass 50 g moving with an initial velocity 1 m/s is acted upon by a damping force which brings it to rest in a distance of 10 cm. Calculate relaxation time.
29. Calculate the speed of transverse waves in a wire of 1 mm<sup>2</sup> cross-section under the tension produced by 0.1 kg weight. Density of the material =  $9.8 \times 10^3$  kg/m<sup>3</sup>,  $g = 9.8$  m/s<sup>2</sup>.
30. Find the frequency and period for light of wavelength 600 nm. Given  $c = 3 \times 10^8$  m/s.
31. Calculate the bulk modulus of water under a pressure of 100 atm. Initial and final volume are 100 litres and 100.5 litres respectively.

(4 × 4 = 16 marks)

**Section E**

*Write any two questions.*

*10 marks each.*

32. Explain how to determine  $Y$  by bending of a beam. Describe about I form of Girders.
33. Discuss about the composition of two simple harmonic motions of equal periods in a straight line.
34. What is longitudinal wave motion ? Obtain an expression for the velocity of longitudinal waves in rods.
35. Describe the following :
- (a) Noise pollution.
  - (b) Acoustic grating.
  - (c) Reverberation.
  - (d) Applications of ultrasonic waves.

(2 × 10 = 20 marks)