



K22U 3268

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree (C. B. C. S. S. – Supplementary)  
Examination, November 2022  
(2016 – 2018 Admissions)  
**COMPLEMENTARY COURSE IN PHYSICS**  
**1C01PHY : Mechanics**

Time : 3 Hours

Max. Marks : 32

*Instruction : Write answers in **English only**.*

SECTION – A

(Very short answer type – **Each** carries **1** mark – Answer **all 5** questions).

1. Theoretical limiting values of Poisson's ratio are \_\_\_\_\_ and \_\_\_\_\_.
2. Velocity of longitudinal waves moving in rods is given by \_\_\_\_\_.
3. Period of torsion pendulum is given by \_\_\_\_\_.
4. Moment of inertia of a circular disc about an axis through its centre and perpendicular to its plane is given by \_\_\_\_\_.
5. Write the expression for de-Broglie wavelength. (5×1=5)

SECTION – B

(Short answer type – **Each** carries **2** marks – Answer **4** questions out of **6**).

6. Give the relation connecting Young's modulus, bulk modulus and Poisson's ratio.
7. Write the expression for energy density and explain the terms.
8. Represent graphically the variation of potential energy, kinetic energy and total energy of a harmonic oscillator.
9. Define quality factor. Give its expression.
10. Explain the parallel axes theorem.
11. State the uncertainty principle. (4×2=8)

P.T.O.



## SECTION – C

(Short essay/problem type – **Each** carries **3** marks – Answer **3** questions out of **5**).

12. Calculate the work done in twisting a rod through an angle  $\theta$ .
13. Check whether  $y = 2\sin x \cos vt$  is a solution to the one dimensional wave equation.
14. A particle executing SHM has an acceleration of  $0.02 \text{ m/s}^2$  when its displacement is  $0.08\text{m}$ . Find its time period of oscillation.
15. Show that the moment of inertia of a sphere of radius 'R' and mass 'M' about a tangent line in the plane of the sphere is  $\frac{7}{5} MR^2$ .
16. Calculate the de-Broglie wavelength of an electron with a velocity of  $10^7 \text{ m/s}$ ,  
 $m = 9.1 \times 10^{-31}\text{Kg}$ . **(3×3=9)**

## SECTION – D

(Long essay type – **Each** carries **5** marks – Answer **2** questions out of **4**).

17. What is a cantilever ? Derive an expression for the depression at the free end of a cantilever clamped at one end and loaded at the other end.
  18. Derive an expression for the velocity of transverse vibrations in stretched string.
  19. Derive an expression for the period of oscillation of a compound pendulum. Also describe the experiment to determine 'g' using compound pendulum.
  20. Derive an expression for the moment of inertia of a solid cylinder :
    - i) about its axis.
    - ii) about an axis passing through its centre and perpendicular to its length.**(2×5=10)**
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K22U 3429

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/  
Improvement) Examination, November 2022  
(2019 Admission Onwards)

**COMPLEMENTARY ELECTIVE COURSE IN PHYSICS**  
**1C01PHY : Mechanics**

Time : 3 Hours

Max. Marks : 32

SECTION – A

Answer **all** questions, **each** carries **1** mark.

1. State Hooke's law of elasticity.
2. The moment of inertia of a ring about an axis perpendicular to the plane passing through the center of gravity is  $MR^2$ . Its radius of gyration about a parallel axis at a distance,  $2R$  from the first axis is \_\_\_\_\_
3. The differential equation of a damped harmonic oscillator is \_\_\_\_\_
4. How a roaring sea can be made calm ? (Explain using the concept of surface tension.)
5. Unit of intensity of a wave is \_\_\_\_\_

(5×1=5)

SECTION – B

Answer **any 4** questions, **each** carries **2** marks.

6. What is Elastic Hysteresis ?
7. Explain the excess of pressure of the curved surfaces of a liquid.
8. Why two streamlines cannot cross each other ?
9. State and prove parallel axes theorem.

P.T.O.



10. Distinguish between free oscillation and damped oscillation.
11. Prove that equation of plane progressive harmonic wave is periodic in  $x$  and  $t$ . (4×2=8)

## SECTION – C

Answer **any 3** questions, **each** carries **3** marks.

12. Find the work done in twisting a steel wire of radius  $10^{-3}$  m and length 0.25 m through an angle of  $45^\circ$ . Given the rigidity modulus  $n = 8 \times 10^{10} \text{ Nm}^{-2}$ .
13. Calculate the work done in spraying a spherical drop of mercury of radius  $10^{-3}$  m into a million drops of equal size. Surface tension of mercury is  $0.465 \text{ Nm}^{-1}$ .
14. A uniform thin bar of mass 3 kg and length 0.9 m is bent to make an equilateral triangle. Calculate the moment of inertia about an axis passing through the centre of mass and perpendicular to the plane of the triangle.
15. A simple harmonic motion is represented by  $x = 2 \sin\left(t + \frac{\pi}{3}\right)$ . Find the maximum acceleration and maximum velocity.
16. Plane harmonic waves of frequency 500 Hz are produced in air with amplitude  $1 \times 10^{-3}$  cm. Find the pressure amplitude, energy density and energy flux of the wave.  $V = 340 \text{ ms}^{-1}$  and  $\rho = 1.29 \text{ kgm}^{-3}$ . (3×3=9)

## SECTION – D

Answer **any 2** questions, **each** carries **5** marks.

17. Derive Poiseuille's equation and mention the method of determining the coefficient of viscosity.
18. Derive an expression for moment of inertia of solid sphere about the diameter.
19. Derive the differential equation for a damped harmonic oscillator and explain the conditions for underdamped harmonic oscillations.
20. Define plane progressive harmonic wave. Derive the expression for energy density and intensity of a progressive wave. (2×5=10)
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