



K20U 3330

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree CBCSS (OBE) Reg./Sup./Imp.  
Examination, November 2020  
(2019 Admn. Onwards)

COMPLEMENTARY ELECTIVE COURSE IN PHYSICS  
1C01PHY : Mechanics



Time : 3 Hours

Max. Marks : 32

SECTION – A

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

1. If 'a' and 'b' are lateral and longitudinal strains respectively on stretching a wire, then Poisson's ratio is given by \_\_\_\_\_
2. The dimensional formula for coefficient of viscosity is given by \_\_\_\_\_
3. \_\_\_\_\_ of a body about an axis is equal to the torque producing unit angular acceleration in it about that axis.
4. If the mass of the bob gets doubled, the time period of a simple pendulum \_\_\_\_\_ (increases/decreases/remains unchanged)
5. A one-dimensional wave equation is given by \_\_\_\_\_

SECTION – B

(Answer **any four** questions, **each** carries 2 marks.)

6. Why are girders constructed in the shape of the letter 'I' ?
7. Define 'critical velocity'. What are the factors affecting it ?
8. Why do free surfaces of a liquid always tend to have minimum possible area ?
9. State the theorems on moment of inertia.
10. What does a high value of quality factor indicate ? Give the quality factor of (a) an undamped oscillator and (b) an LCR circuit.
11. Distinguish between reflection of sound waves from rigid and free boundaries.

P.T.O.



## SECTION – C

(Answer **any three** questions, **each** carries **3** marks.)

12. Find the amount of work done in stretching a wire of cross-section  $1 \text{ mm}^2$  and length  $2 \text{ m}$  through  $0.1 \text{ mm}$ , if the Young's modulus of the material of the wire is  $2 \times 10^{11} \text{ N/m}^2$ .
13. Calculate the mass of water flowing in  $10$  minutes through a tube  $0.1 \text{ cm}$  in diameter,  $40 \text{ cm}$  long, if there is a constant pressure head of  $20 \text{ cm}$  of water. The coefficient of viscosity of water is  $0.00089$  S.I. units.
14. Two spheres, each of  $100 \text{ gm}$  mass and  $5 \text{ cm}$  diameter, are joined by a weightless rod so that their centres are  $10 \text{ cm}$  apart. Calculate the moment of inertia of the system about (a) a line PQ joining the centres of the spheres and (b) a line bisecting PQ and perpendicular to it.
15. A particle executes simple harmonic motion. (a) When the displacement is one-half of the amplitude, what fraction of the total energy are kinetic and potential? (b) At what displacement, the energy is half kinetic and half potential?
16. What is the wavelength of longitudinal waves of frequency  $400 \text{ Hz}$  in an alloy whose density is  $5,500 \text{ kg/m}^3$  and Young's modulus is  $8.8 \times 10^{10} \text{ N/m}^2$ .

## SECTION – D

(Answer **any two** questions, **each** carries **5** marks.)

17. Deduce an expression for couple per unit twist of a uniform solid cylinder. Show that a hollow rod is a better shaft than a solid one of the same material, mass and length.
18. Discuss the theory and method to determine the moment of inertia of a flywheel.
19. Set up the differential equation for a simple harmonic oscillator. Also, obtain the expressions for velocity, displacement and period.
20. Derive an expression for the energy density of a plane progressive harmonic wave. Show that in such a wave, the average kinetic energy is equal to its average potential energy.