TB222370W **Reg. No :.....**

Name :.....

B.Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023

2022 Admissions Regular & 2021 Admissions Supplementary / Improvement And 2020, 2019 And 2018 Admissions Supplementary

SEMESTER II - CORE COURSE (PHYSICS)

PH2B02B18 - MECHANICS AND PROPERTIES OF MATTER

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark (10x1=10)

1. State the conditions for an oscillatory motion to be simple harmonic?
2. Express minimum time period of a compound pendulum and explain the terms in it.
3. Relate damping and resonant frequency.
4. Explain intensity of a wave. Give the expression for the intensity of a plane progressive wave.
5. Explain the law of conservation of angular momentum.
6. You are given two circular discs of equal mass and thickness but made from different metals. Identify the one with a larger moment of inertia about its central axis.
7. Define Poisson's ratio.
8. Distinguish between uniform bending and non-uniform bending.
9. Explain Hydrodynamics.
10. Describe different energies possessed by a liquid and express potential energy per unit mass of liquid.
11. Summarise molecular theory of surface tension.
12. Cite factors affecting surface tension of a liquid.

Part B

II. Answer any Six questions. Each question carries 5 marks (6x5=30)

13. A metal disc of radius 3 m with its plane vertical can be made to swing about horizontal axis passing through any one of the holes bored along its diameter. Calculate the minimum time period of the disc.
14. The equation of a plane progressive wave is given by $y = 10 \sin \pi(0.01x - 2t)$, where y and x are in cm and t in seconds. Determine (i) amplitude of the wave (ii) frequency of the wave and (iii) the phase difference between two pints 200 cm apart.
15. A wheel of 6 kg mass and radius 0.4 m of rotation is revolving at the rate of 300 cycles per minute. Calculate its moment of inertia and kinetic energy.
16. A circular metal hoop of mass 1 kg and radius 0.2 m makes 10 revolutions per sec about its centre, the axis of rotation being normal to the plane of the hoop. Find (i) the moment of inertia about this axis (ii) the angular momentum about the same axis and (iii) the torque which will increase the angular momentum by 25 % in 10 sec.
17. Describe the behaviour of a wire under an increasing load.
18. Explain the terms (i) plane of bending (ii) axis of bending and (iii) neutral axis.
19. One end of a steel wire of length 0.2 m and radius 2×10^{-3} m is fixed. If the work done in twisting the free end of the wire is 3.85×10^{-2} J, calculate the angle through which the wire is twisted. Given rigidity modulus of steel $=8.075 \times 10^{11}$ N/m^2.
20. A horizontal pipe of non uniform bore has water flowing through it such that the velocity of flow is $40\ cm/s$ at a point where the pressure is 2 cm of Mercury. Calculate the pressure at a point where the velocity of flow

is $50\ cm/s$. Given the density of water $=1\ gm/cc$.

21. Calculate the pressure inside an air bubble of diameter 0.2 mm situated just below the surface of water. Given surface tension of water = 0.025 N/m.

Part C

III. Answer any Two questions. Each question carries 10 marks (2x10=20)

22. Explain simple pendulum and derive an expression for its time period. Comment on the expression for the time period.
23. Explain a plane progressive wave and derive an expression for the energy density of a plane progressive wave.
24. Find an expression for the moment of inertia of a thin uniform rod about an axis perpendicular to its length and passing through (i) its centre (ii) one end of the rod
25. Discuss Poiseuille's method of determining the viscosity of liquids.