

B. Sc DEGREE END SEMESTER EXAMINATION : MARCH 2023**SEMESTER 2: PHYSICS****COURSE : 19U2CRPHY02: MECHANICS AND PROPERTIES OF MATTER***(For Regular - 2022 Admission and Improvement / Supplementary – 2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

PART A**Answer any 8 (2 marks each)**

1. Compare angular acceleration and linear acceleration.
2. Give the expression for the energy possessed by a flowing liquid
3. What is meant by resonance? What is resonant frequency?
4. What is Poisson's ratio and what is the limiting values of Poisson's ratio
5. Write short note on hydrodynamics
6. What are the major disadvantages of using simple pendulum in the determination of acceleration due to gravity?
7. Distinguish between neutral surfaces and neutral axis of a beam
8. Describe what is a tidal wave.
9. Show that the solution of harmonic motion is a special case of the general solution of damped harmonic motion.
10. Make a comparison between torque and work, in terms of the related dimensions.

(2 x 8 = 16)**PART B****Answer any 6 (4 marks each)**

11. A particle is moving simple harmonically along a straight line. When the distances of the particle from the mean position are x_1 and x_2 , the corresponding velocities are v_1 and v_2 . Obtain an expression for Time period in terms of the above said parameters.
12. A metal plate 10^{-2} square meter in area rests on a layer of castor oil 2 mm thick. η of castor oil is 1.55 Nsm^{-2} . Calculate the horizontal force necessary to move the plate with a speed of $3 \times 10^{-2} \text{ m/sec}$.
13. A particle executes SHM of period 5s. Its velocity is found to be 4 cm/s after 0.8 sec it has crossed the mean position. Calculate its velocity when the displacement is 2.5 cm.
14. A bar 1m long, 0.04 m broad and 0.005 m thick is supported on two knife edges 0.8 m apart. The depression produced by a 2 kg mass suspended from the center of the knife edges is 0.005 m. calculate the young's modulus of the material
15. An air bubble of radius 5 mm rises steadily through a liquid of relative density 0.83 at the rate of 22.6 m/s. calculate the viscosity of the liquid by neglecting the density of air.
16. Two masses 4g and 6g respectively are attached to the ends of a 10cm long light rod of negligible mass and the rod rotates anticlockwise at 2 revolutions per second about an axis passing through its center of mass and perpendicular to its length. Obatin the (a) angular momentum of each mass about the center of mass and (b) the total angular momentum of the system about the center of mass.

17. A wire of length 0.75 m and radius 10^{-3} m is fixed at one end twisted at the other end through 30° by applying a couple 7.4×10^{-2} N/m². Calculate a) the angle through which a line lying on the surface and parallel to the length has turned b) torsional rigidity of the wire and c) rigidity modulus of the material of the wire
18. A train of simple harmonic wave is traveling in a gas along with the positive direction of the x-axis, with an amplitude equal to 2 c, velocity 300 m/s and frequency 400 Hz. Calculate the displacement, particle velocity and particle acceleration at a distance of 4 cm from the origin after an interval of 5 s.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. What do you mean by a simple pendulum? Obtain an expression for the time period of a simple pendulum?
20. Derive expressions for moments of inertia of hollow sphere and spherical shell, about a tangent.
21. What is a cantilever? Derive an expression for the depression at the loaded end of a cantilever. Describe an experiment find the young's modulus of the material of the bar.
22. Discuss about viscosity, equation of continuity and energy possessed by a flowing liquid.

(10 x 2 = 20)