Reg. No ………………..   Name ……………………..   **24U233**

B. Sc DEGREE END SEMESTER EXAMINATION - MARCH 2024
SEMESTER 2 - PHYSICS
COURSE : **19U2CRPHY02** - MECHANICS AND PROPERTIES OF MATTER
(For Regular - 2023 Admission and Improvement / Supplementary – 2022/2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1. Sketch kinetic energy Vs time plot of a damped harmonic oscillator.
2. Hollow shafts are better than solid ones of the same mass and area of cross section explain why?
3. Why liquid drops are spherical in shape?
4. Plot the amplitude of a damped harmonic oscillator (with weak damping) as a function of time.
5. Discuss, if the statement "Nothing actually moves in the direction of angular velocity" is true.
6. What is the significance of Reynold's number?
7. Discuss, what is quality factor, of an oscillator.
8. Outline the concept of moment of inertia.
9. Sketch average energy Vs time plot of a damped harmonic oscillator.
10. What is geometrical moment of Inertia?

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

11. Water flows through a pipe of 0.04 m radius and 2 km in length at the rate of 100 liters per minute. Determine the pressure required to maintain the flow if the coefficient of viscosity is 0.001 Ns/ m^2 and atmospheric pressure is 1.01 x 10^5 N/ m^2

12. 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 cm, velocity 300 m/s and frequency 400 Hz.Calculate the displacement and particle velocity at a distance of 4 cm from the origin after an interval of 5 s.

13. Find the load required to stretch a steel wire of diameter 1 mm by 0.03% of its original length. Young's modulus of steel = 210 GPa.

14. The depression of the free end of a cantilever of length L and uniform cross section is 0.02 m. What will be depression at distance L/2 from the fixed position?

15. A simple harmonic motion is represented by the equation x=10 sin($2\pi t/10 + \pi/4$), where x is measured in meters and phase angle in radians. Calculate the frequency, phase, displacement and velocity at 1.25 sec.

16. A particle executes SHM of time period 4s and amplitude 8cm. Find the time it takes to travel 3cm from the positive extremity of oscillation.

17. Two equal drops of water are falling through air with a steady velocity of 0.05 m/sec. If the drops coalesce what will be the new terminal velocity?

18. Four solid spheres each of mass mand radius a are placed with their centers on the four corners ofa square of side b. Calculate the moment of inertia of the system about one side of the square.

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. Discuss with necessary theory the determination of the rigidity modulus of the material of a rod using static torsion apparatus.

20. Discuss an experiment to determine the acceleration due to gravity using a symmetrical compound pendulum.

21. State and prove Bernoulli's theorem.

22. Derive expressions for moments of inertia of hollow cylinder about a) its axis of symmetry, b) about an axis passing through its center and perpendicular to its own axis and c) about an axis passing through its endface and perpendicular to its own axis.

(10 x 2 = 20)