Reg. No ..... Name **21U226**

B. Sc. DEGREE END SEMESTER EXAMINATION - JULY 2021

SEMESTER 2 : PHYSICS (CORE COURSE)

COURSE : **19U2CRPHY02 : MECHANICS AND PROPERTIES OF MATTER**

(For Regular - 2020 Admission and Improvement / Supplementary - 2019 Admission)

Time : Three Hours Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. It is more likely for a cantilever of uniform cross section to break near its free end why?
2. Distinguish between neutral surfaces and neutral axis of a beam
3. What is the significance of Reynold's number
4. Define surface tension with unit
5. List the characteristics of a medium which could support wave motion.
6. Discuss the action of a shock absorber made up of a spring, when subjected to a stress beyond its elastic limit.
7. Sketch kinetic energy Vs time plot of a damped harmonic oscillator.
8. Compare the frequency of a tuning fork a) oscillating in air, b) in oil and c) driven by an oscillator, when the same tuning fork is subjected to the three scenarios.
9. Compare angular velocity and linear velocity.
10. Give two applications of a flywheel.

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. A disc 0.1 m in radius and weighing 1 kg is suspended in a horizontal plane by a vertical wire 2 m long attached to its center. The diameter of the wire is 2 mm and period of oscillations of the disc is 10 sec. find the rigidity modulus of the material
12. A cylindrical bar of length 0.2 m and diameter 0.05 m is suspended by a wire 0.5 m long and 1 mm in radius such that the axis of the bar is horizontal. The arrangements make 10 oscillations in 24 sec. find the rigidity modulus of the material. Density of the material is 8000 kg/m^3
13. The excess pressure inside a soap bubble of radius 8 mm is balanced by a 2.5 mm column of oil of density 800 kg/m^3. Determine the surface tension of the soap solution
14. 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
15. 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.
16. A particle is moving in SHM along a straight line. When the distance of the particle from the equilibrium position has the values x1 and x2, the corresponding values of the velocity are u1 and u2. Find an expression for the time period of motion.
17. A particle of mass 50 g, moving with an initial velocity of 100 cm/s is acted upon by a damping force which brings it to rest in a distance of 10m. Assuming the damping force to be proportional to the velocity, calculate a) its relaxation time and b) the time in which the velocity is halved.
18. A hoop of radius 0.5 m and mass 16 kg is rolling along a horizontal floor, such that its center of mass has a velocity of 0.25 m/s. What work will have to be done to stop it?

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. How do you arrange a beam to have uniform bending? Obtain an expression for the young's modulus of the material of the bar arranged in uniform bending. Describe an experiment find the young's modulus of the material of the bar.
20. Discuss about viscosity, equation of continuity and energy possessed by a flowing liquid.
21. Explain the construction of a Kater's pendulum. Discuss the theory behind the measurement of acceleration due to gravity using a Kater's pendulum.
22. State and prove a) parallel axes theorem and perpendicular axes theorem. Using these theorems, derive the moment of inertia of a regular object.

(10 x 2 = 20)