

QP CODE: 25022774



Reg No :

Name :

**B.Sc DEGREE (CBCS) IMPROVEMENT / REAPPEARANCE/ MERCY CHANCE
EXAMINATIONS, APRIL 2025**

Second Semester

Core Course - PH2CRT02 - MECHANICS AND PROPERTIES OF MATTER

(Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 Admission Onwards

5819C94D

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Define the intensity of a plane progressive harmonic wave travelling along the positive x-direction.
2. Explain interference in the context of waves.
3. A particle of mass m is executing simple harmonic motion of frequency n . Give the values of its kinetic energy and total energy.
4. Define centre of oscillations for a compound pendulum.
5. Write down the expression for parallel axis theorem and explain its symbols.
6. In a fly wheel, most of the mass is concentrated at the rim? Explain why.
7. What is the neutral axis or neutral surface of a bend beam?
8. What is a cantilever?
9. Nowadays rectangular steel pipes are commonly used for construction purpose. Why?
10. What is the significance of critical velocity in fluid dynamics?
11. Prove that equation of continuity in hydrodynamics is the law of conservation of mass.
12. What is the effect of temperature on surface tension of water?

(10×1=10)



Part B

Answer any **six** questions.

Each question carries **5** marks.

13. A hospital uses an ultrasonic scanner with operating frequency 4.2 MHz to locate tumours in tissues. Calculate the wavelength of sound in a tissue whose speed of sound is given by 1.7 km/s.
14. A tuning fork is in unison with a stretched wire of length 50 cm and linear density 1 gm/m. What is the frequency of the tuning fork if the tension in wire is 40 N.
15. A particle executes simple harmonic motion. Its velocity at the equilibrium position is 9 cm/s and makes 90 oscillations per minute. Find the length of the path of the particle and its velocity at a point midway between the equilibrium and extreme position.
16. Find the angular velocity of a wheel that rotates 6 times every 4 seconds. b. What is the tangential velocity of the outside of the wheel if radius is 15 cm?
17. How much torque will be required of your hip muscles to swing your leg at an angular acceleration of 5 rad/s^2 , if you assume the leg is a solid stick with mass 20 kg and length of 1 m.
18. One end of a uniform wire of length L and of weight W_1 is attached rigidly to a point in the roof and a weight W_2 is suspended from its lower end. If A is the area of cross-section of the wire, calculate the stress in the wire at a height $(3/4)L$ from its lower end.
19. A uniform metal disc of diameter 0.1m and mass of 1.2kg is fixed symmetrically to the lower end of torsion wire in a torsion pendulum experiment. If the length of the wire is 1m and its diameter is 1.44mm and the time period of torsional oscillations is 1.98s, calculate the modulus of rigidity of the material of the wire.
20. A horizontal tube of 1mm bore is joined to another horizontal tube of 0.5mm bore. Water enters at the free end of the first tube at a pressure equal to 0.5m of water above the atmospheric pressure and leaves at the free end of the second tube at the atmospheric pressure. Calculate the pressure at the junction of the tubes if the lengths of the tubes are equal.
21. Height of water column in two limbs of a venturimeter differs by 0.1m. The diameters of the main pipe where the two limbs connected are 0.2m and 0.15m. Calculate the rate of flow of water through the main pipe.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **10** marks.



22. Arrive at the differential equation of a forced harmonic oscillator. Give its solution. Discuss the resonant frequency.
23. Show that the moment of inertia of a solid sphere about a diameter is $\frac{2}{5} MR^2$ and about its tangent is $\frac{7}{5} MR^2$.
24. Derive the expression for moment of torsional couple for a cylindrical rod. Also explain how static torsion apparatus can be used to measure the rigidity modulus of the material of the rod.
25. Prove that the excess pressure inside a bubble is double that inside a liquid drop by deriving the expression for the excess pressure.

(2×10=20)