

TB242252A

Reg. No :

Name :

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2023 ADMISSIONS REGULAR

SEMESTER II - CORE COURSE PHYSICS

PH2C02B23 - Mechanics and Properties of Matter

Time : 3 Hours

Maximum Marks : 60

Part A

I. Answer any Ten questions. Each question carries 1 marks

(10x1=10)

1. Sketch displacement versus time of a simple harmonic motion and list the values of some sample data points.
2. Explain free oscillations.
3. Express one dimensional wave travelling along positive X direction and explain the terms involved in it.
4. Define beats.
5. Explain the physical significance of moment of inertia.
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. Write down the expression for velocity of escape from the solar system.
8. State Hook's law of elasticity.
9. Define a cantilever.
10. List any two methods to determine the rigidity modulus of a rod or wire.
11. Review the characteristics of viscous force.
12. Define sphere of influence of a fluid.



Part B

II. Answer any Six questions. Each question carries 5 marks

(6x5=30)

13. A particle executes simple harmonic motion of amplitude 25 cm and time period 8 s. Determine the minimum time required for the particle to move between two points 12.5 cm on either side of the mean position.
14. A plane progressive wave is given by $y = 5 \sin (40t - 3x)$ m. Determine the wavelength of the wave and the phase difference between two points at $x = 2$ m and $x = 5.762$ m.
15. A flywheel in the form of a solid disc of mass 5000 kg and a radius 1 metre is rotating, making 120 revolutions/ minute. Compute the kinetic energy and the angular impulse, if the flywheel is brought to rest in 2 seconds: friction is to be neglected.
16. 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.
17. Obtain an expression for the limiting velocity required by an artificial satellite for orbiting around the earth. If the radius of the earth is 6400 km, calculate the value of this velocity.
18. Find the expression for work done per unit volume when a rigid body undergoes shearing strain.
19. A disc of mass 2 kg and radius 10 cm is suspended horizontally by a vertical wire attached to its centre. If the radius of the wire is 0.6 mm, length is 1.25 m and the period of torsional oscillations is 6 s, find the rigidity modulus of the material of the wire.

20. A pipe is running full of water. At a certain point A in the pipe it tapers from 0.4 m diameter to 0.3 m diameter at another point B. If the pressure difference between A and B is 1.5 m of water column, find the rate of flow of water through the pipe.
21. Calculate the energy released when 30 droplets of water of radius 1mm coalesce to form a single drop. Surface tension of water =0.072 N/m.

Part C

III. Answer any Two questions. Each question carries 10 marks

(2x10=20)

22. Deduce the differential equation for a damped harmonic oscillator and discuss the three cases of damping.
23. Explain the formation of beats and standing waves and analyse beats mathematically.
24. Derive an expression for the moment of inertia of an annular ring about (i) an axis passing through the centre and perpendicular to its plane.
25. Obtain an expression for the depression at the midpoint of a beam subjected to non- uniform bending.

