C 4393-B **(Pages : 2)** **Name.....**

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2021

Physics/Applied Physics

PHY 2B 02/APH 2B 02—MECHANICS—II

(2020 Admissions)

Time : Two Hours Maximum : 60 Marks

The symbols used in the question paper have their usual meanings.

Section A (Short Answer Type)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Define fictious force ? Deduce an expression for the force experienced by a particle in a co-ordinate system with uniform acceleration A.
2. State and explain the principle of equivalence.
3. Define inertial and non-inertial frame of references with proper examples.
4. Explain what is meant by the Galilean transformations.
5. What is a central force ? Show that the motion of a particle under central force is always confined to a single plane.
6. State law of equal areas. How is it related to angular momentum ?
7. Establish the differential equation of a harmonic oscillator and write down its general solution.
8. Explain Simple Harmonic Motion and discuss its characteristics.
9. Briefly explain about (a) Phase velocity ; and (b) Group velocity
10. Differentiate between dispersive and non-dispersive sinusoidal waves.
11. Write down the general expression for a plane progressive wave traveling :
    (a) Positive x direction ; and
    (b) Negative x direction.
12. Write two important properties of travelling waves.

(8 × 3 = 24 marks)

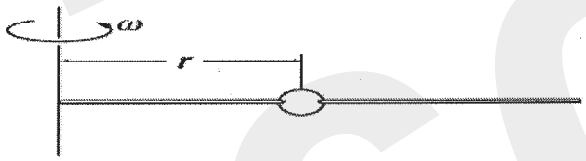
Turn over

Section B (Paragraph / Problem Type)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. A small weight of mass m hangs from a string in an automobile which accelerates at rate A. What is the static angle of the string from the vertical, and what is its tension ? Analyze the problem both in an inertial frame and in a frame accelerating with the car.

14. A bead slides without friction on a rigid wire rotating at constant angular speed ω. Find the force exerted by the wire on the bead.



15. Define the Foucault Pendulum. If m is the mass and l is the length of the pendulum, find the time for the plane of oscillation to rotate once.

16. A satellite of mass m = 2000 kg is in elliptic orbit about the earth. At perigee (closest approach to the earth) it has an altitude of 1100 km and at apogee (farthest distance from the earth) its altitude is 4100 km. Calculate the energy needed to put the satellite into orbit by neglecting losses due to friction.

17. What are stationary satellites ? Calculate the height at which such a satellite must revolve in its orbit around the earth.

18. Evaluate the time average values of the potential and kinetic energies of a frictionless harmonic oscillator.

19. Define Q factor of an oscillator. A musician's tuning fork rings at A above middle C, 440 Hz. A sound level meter indicates that the sound intensity decreases by a factor of 5 in 4 s. Calculate the Q of the tuning fork.

(5 × 5 = 25 marks)

Section C (Essays)

Answer any **one** *question.*
The question carries 11 *marks.*

20. What is a Pulse ? Discuss Fourier analysis of a non-periodic function with suitable plots.

21. State and prove Kepler's laws of planetary motion. Show that the areal velocity of a planet around the sun is constant.

(1 × 11 = 11 marks)