

C 23888

(Pages : 3)

Name.....

Reg. No.....

**SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2022**

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 all questions in two or three sentences.

Each correct answer carries a maximum of 2 marks.

1. Define fictitious force. Deduce an expression for the force experienced by a particle in a co-ordinate system with uniform acceleration A .
2. Explain Coriolis force. What is the effect of Coriolis force on wind moving over the surface of earth ?
3. Define inertial and non-inertial frame of references with proper examples.
4. Explain the terms :
 - (a) Apogee ; and
 - (b) Perigee.
5. What is a central force ? Show that the motion of a particle under central force is always confined to a single plane.
6. Write the equation of a forced damped harmonic oscillator and describe the terms involved.
7. Define :
 - (a) Phase velocity ; and
 - (b) Group velocity.
8. Discuss the condition for nondispersive wave.
9. Define the time average of a function $f(t)$ with proper diagrams.

Turn over

10. Briefly explain about the two types of wave motion.
11. Write down the general expression for a plane progressive wave traveling in :
 - (a) Positive x direction ; and
 - (b) Negative x direction.
12. With proper examples explain simple harmonic motion.

(Ceiling 20)

Section B (Paragraph / Problem Type)

Answer **all** questions in **a paragraph** of about **half a page to one page**, each correct answer carries a maximum of 5 marks.

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. Explain the Foucault pendulum. Calculate the time it will take the plane of oscillation of a Foucault's pendulum to turn through 90° at a point where the co-latitude is 60° .
15. Find the spring constant k and damping constant b of a damped oscillator having a mass of 5 kg, frequency of oscillation 0.5 Hz, and logarithmic decrement 0.02.
16. A satellite of mass $m = 2000$ kg is in elliptic orbit about the earth. At perigee it has an altitude of 1100km and at apogee its altitude is 4100 km. Calculate the energy needed to put the satellite into orbit by neglecting losses due to friction.
17. The centre of mass of a 1600 kg car is midway between the wheels and 0.7 m above the ground. The wheels are 2.6 m apart.
 - (a) What is the minimum acceleration A of the car so that the front wheels just begin to lift off the ground ?
 - (b) If the car decelerates at rate g , what is the normal force on the front wheels and on the rear wheels ?
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.

(Ceiling 30)

Section C (Essay Type)

Essays-Answer in about two pages, any one question. Answer carries 10 marks.

20. State Fourier's theorem? Determine the values of Fourier's co-efficients. What are conditions of its applicability. 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 × 10 = 10 marks)