

C 4393

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2021**

Physics/Applied Physics

PHY 2B 02/APH 2B 02—MECHANICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type)*Answer at least **eight** questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. Write Galilean transformation equations for position and velocity for inertial frames of reference.
2. What do you mean by fictitious force ?
3. State and explain Kepler's second law of planetary motion.
4. What do you mean by centre of mass of a system ? Write the expression for position vector of centre mass of a system of two particles with masses m_1 and m_2 and position vectors r_1 and r_2 respectively.
5. State and explain the principle of equivalence.
6. What is the condition for the periodic motion of a damped harmonic oscillator ?
7. Define simple harmonic motion. Give two examples.
8. Write the equation for an undamped forced harmonic oscillator and explain the terms in it.
9. Show that the transverse wave on a continuous string is non-dispersive.
10. What is Refraction ? Why does it happen ?
11. Show that the total energy of a simple harmonic oscillator is constant.
12. What is Modulation ?

(8 × 3 = 24 marks)

Turn over

Section B (Paragraph/Problem)

*Answer at least **five** questions.*

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 25.

13. Deduce an expression for the apparent force on a particle of mass m in a rotating co-ordinate system with angular velocity Ω .
14. What is a Foucault pendulum ? Find the time for the plane of oscillation to rotate once at a latitude 45° for a pendulum with mass m , length l and frequency $\sqrt{\frac{g}{l}}$.
15. For what values of n are circular orbits stable with the potential energy $U(r) = -A/r^n$, where $A > 0$?
16. A satellite of mass $m = 2000$ kg is in elliptical orbit about the earth. At perigee, it has an altitude 1,100 km and at apogee its altitude is 4,100 km. What is the energy required to put the satellites into orbit ?
17. Perform Fourier analysis of a travelling wave in a homogeneous non-dispersive medium.
18. Derive an expression for the superposition of two sinusoidal travelling waves. Find out the expression for modulation frequency and average frequency.
19. Obtain the relation between group velocity and the phase velocity.

(5 × 5 = 25 marks)

Section C (Essay Type)

*Answer any **one** question.*

The question carries 11 marks.

20. (a) Explain the general properties of central force motion.
(b) Plot and explain energy diagram for planetary motion.
21. Set up the equation of motion for the undamped forced oscillator. Analyse the system and explain the variation of amplitude with the driving frequency.

(1 × 11 = 11 marks)