

D 103780

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION**  
**APRIL 2024**

Physics/Applied Physics

PHY 2B 02/APH 2B 02/PHY 2B 22—MECHANICS—II

(2020—2023 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. Most harmonic oscillators are damped and, if undriven, eventually come to a stop. Why ?
2. Define the time average of a function  $f(t)$  with proper diagrams.
3. Explain Coriolis force. What is the effect of Coriolis force on wind moving over the surface of earth ?
4. Write a note on Galilean transformations.
5. Briefly explain the characteristic impedance of a travelling wave.
6. Explain the terms :
  - (a) Apogee ; and
  - (b) Perigee.
7. What is a harmonic oscillator ? Write down its differential equation.
8. Discuss the condition for nondispersive wave.
9. What is a central force ? Show that the motion of a particle under central force is always confined to a single plane.
10. Differentiate between dispersive and nondispersive sinusoidal waves.

**Turn over**

11. What are the two types of wave motion ?
12. What is a plane progressive wave ? Write down the general expression

(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 car hits a speed bump and the chassis is displaced by 1 cm. If the shock absorbers critically damp the resulting vibration, the car weighs 1000 kg, and the damping constant is  $b = 20000 \text{ kg/s}$ , find the displacement of the chassis over time.
14.  $m = 2000 \text{ kg}$  is in elliptic orbit about the earth. At perigee 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.
15. Derive equation for transport energy of a wave
16. 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.
17. Titan, the largest moon of Saturn, has a mean orbital radius of  $1.22 \times 10^9 \text{ m}$ . The orbital period of Titan is 15.95 days. Hyperion, another moon of Saturn, orbits at a mean radius of  $1.48 \times 10^9 \text{ m}$ . Use Kepler's third law of planetary motion to predict the orbital period of Hyperion in days.
18. Write a note on undamped forced oscillator.
19. Briefly explain mechanical radiation pressure.

(Ceiling - 30)

### Section C (Essay Type)

*Essays.*

*Answer in about two pages, any one question.*

*Answer carries 10 marks.*

20. What is forced Damped harmonic oscillator ? derive the equation. Give one example.
21. State and prove Kepler's laws of planetary motion. Prove third law.

(1 × 10 = 10 marks)