C 22101	(Pages : 3)	Name
		Reg. No

SECOND SEMESTER (CBCSS-UG) DEGREE EXAMINATION, APRIL 2022

Physics/Applied Physics

PHY 2B 02/APH 2B 02-MECHANICS-II

(2021 Admissions)

Time: Two Hours

Maximum: 60 Marks

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

Section A

Answer atleast **eight** questions. Each question carries 3 marks. All questions can be attended. Overall ceiling 24.

- 1. Define the time average of a function f(t) with proper diagrams.
- 2. Explain Coriolis force. What is the effect of Coriolis force on wind moving over the surface of earth?
- 3. Briefly explain the characteristic impedance of a travelling wave.
- 4. Explain the terms:
 - (a) Apogee, and
 - (b) Perigee.
- 5. Define:
 - (a) Phase velocity, and
 - (b) Group velocity.
- 6. Write the equation of a forced damped harmonic oscillator and describe the terms involved.
- 7. Define central force motion and list any two features of central force motion.
- 8. Discuss the condition for non-dispersive wave.
- 9. Two particles are interacting under a central force. Explain how a two-body problem can be reduced to a one-body problem.
- 10. Briefly explain about the two types of wave motion.

Turn over

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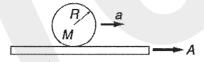
- 11. State and explain the principle of equivalence.
- 12. With proper examples explain simple harmonic motion.

 $(8 \times 3 = 24 \text{ marks})$

Section B

Answer atleast **five** questions. Each question carries 5 marks. All questions can be attended. Overall ceiling 25.

- 13. State and prove Kepler's third law.
- 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 cylinder of mass M and radius R rolls without slipping on a plank that is accelerated at rate A. Find the acceleration of the cylinder.



- 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. Explain the Q factor of an oscillator. In one experiment, a paper weight suspended from a hefty rubber band had a period of 1.2 s and the amplitude of oscillation decreased by factor 2 after three periods. What is the estimated Q of this system?
- 19. Discuss Newton's model to determine the velocity of sound in air. Account for the correction required to obtain observed result.

 $(5 \times 5 = 25 \text{ marks})$

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Section C

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

- 20. Establish the differential equation of motion for a damped harmonic oscillator and write down the general solution for displacement for oscillatory motion and sketch it. Show that the energy falls exponentially with time.
- 21. State Fourier's theorem. Determine the values of Fourier's coefficients. What are conditions of its applicability? Discuss Fourier analysis of a non-periodic function with suitable plots.

 $(1 \times 11 = 11 \text{ marks})$