18(A)

D2BPH1901 (S3) (PAGES 2) Reg.No.....

Name: .....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(Supplementary- 2019 Admission)

PHYSICS

GPHY2B02T: MECHANICS

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. Write Galilean transformations.
2. What are non-inertial systems? Give two examples.
3. Distinguish between real and pseudo forces.
4. Under what conditions does Coriolis force take maximum and zero values?
5. State the properties of central forces.
6. For motion in an inverse square force field, state the conditions in terms of the total energy E for the path to be a) an ellipse b) a parabola.
7. Why do planets move faster when they are closer to sun?
8. Obtain the expression for the total mechanical energy of a frictionless harmonic oscillator.
9. What is resonance in an undamped forced oscillator?
10. What is the phase velocity of sound as per Newton's model? How was it corrected?
11. What happens to the refractive index of a medium if its dielectric constant is increased by four times.
12. Write the classical wave equation.

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 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?
14. Discuss the origin of tides.
15. Derive the expression for the total energy of a planet moving around Earth.
16. What is quality factor (Q) of an oscillator? Derive its expression.
17. Obtain Snell's law of refraction for a beam of light falling on a surface.
18. Determine the velocity and characteristic impedance for sound waves in air at 1 atm. Given the ratio of specific heats, $C_P/C_V \approx 1.4$ and density of air ≈ 1.2 kg/m^3.
19. Show that a signal cannot be transmitted at a velocity greater than c, the velocity of light in vacuum.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. State Kepler's laws of planetary motion. Derive the law of periods.
21. Derive the solution for the equation of motion of a damped harmonic oscillator. Also discuss the different cases.

(1 × 10 = 10 Marks)