D3BPH2202 (PAGES 2) **Reg.No.....**

Name: .....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(Regular/Improvement/Supplementary)

PHYSICS: COMPLEMENTARY COURSE FOR MATHEMATICS AND CHEMISTRY

GPHY3C03T: MECHANICS, RELATIVITY, WAVES AND OSCILLATIONS

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

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

1. What are the two fictitious forces acting on a rotating frame of reference?
2. Define the centre of mass of a system of particles. Give the expression for centre of mass of system of discrete particles.
3. How do you find the centre of mass of extended bodies?
4. Explain proper time and proper length.
5. Write down the Lorentz transformation equations.
6. Write down the expression for velocity of a particle executing simple harmonic motion. State the conditions under which (i) it is maximum. (ii) it is minimum.
7. A longitudinal wave propagates in the form of compressions and rarefactions. Explain.
8. What are electromagnetic waves?
9. What is Wein's displacement law?
10. Write down Einstein's photoelectric equation and explain the symbols.
11. Explain the considerations that led de Broglie to the concept of matter waves.
12. Calculate the velocity of electromagnetic wave in vacuum.

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. Prove that a frame moving with a constant velocity relative to an inertial frame is also inertial.
14. Derive the Galilean transformation equations.
15. Calculate the angular momentum of a satellite of mass m moves in a circular orbit of radius r referred to the centre of the orbit. Express the result in terms of G, M, m and r, where M is the mass of the earth.

(PTO)

16. Obtain mass-energy relation in special relativity.
17. Derive an expression for average potential energy of a particle executing simple harmonic motion. Graphically represents its variation as a function of displacement.
18. Find: (i) amplitude (ii) wavelength (iii) velocity (iv) frequency of a plane progressive wave represented by the equation $= 0.11 \sin 2\pi(3t + 0.2x)$. Distances are in cm and time in second.
19. Show that the group velocity of a wave packet representing a particle is equal to the classical velocity of the particle.

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

20. Explain potential well and potential energy curve. Show that for small oscillations of any system about an equilibrium position will always be simple harmonic.
21. State the postulates of special theory of relativity and describe the Michelson - Morley experiment.

(1 x 10 = 20 Marks)