

21U304

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Name:

Reg.No:

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U PHY3 C03 / CC20U PHY3 C03 - MECHANICS, RELATIVITY, WAVES AND
OSCILLATIONS**

(Physics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. What are the Galilean velocity transformation equations?
2. Why a person sitting in a car is pushed towards the door when the car takes a sharp turn?
3. What is centrifugal force?
4. Explain the conservation of linear momentum.
5. What is centre of mass frame of reference? Is it an inertial frame or non-inertial frame of reference?
6. Why ether hypothesis was discarded?
7. Write down the expression for variation of mass with velocity and explain the symbols.
8. What is simple harmonic motion?. Obtain an expression for displacement of the particle.
9. Explain energy density of a plane progressive wave.
10. What is a black body? Define black body radiations.
11. What is de Broglie's phase velocity?
12. What is the importance of schrodinger's time dependent equation?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Show that total mechanical energy of the particle remains constant in a conservative field
14. Show that the work done by a conservative force in a closed path is zero. Show that the force $\mathbf{F}=(y^2-x^2) \mathbf{i}+2y \mathbf{j}+ 4z \mathbf{k}$ is conservative

15. Calculate the mass of an electron accelerated to a kinetic energy of 2MeV. $m_0=9.1 \times 10^{-31}$ kg
16. For a damped oscillator, the mass m of the block is 200g. Force constant=10N/m and the damping constant is 40g/S. Calculate the period of oscillation if oscillatory
17. Derive an expression for plane progressive harmonic wave.
18. The maximum wavelength for photoelectric emission in tungsten is 230 nm. What wavelength of light must be used in order for electrons with a maximum energy of 1.5eV to be ejected?
19. An eigen function of the operator $\frac{d^2}{dx^2}$ in wavefunction $\phi=e^{-2x}$. Find the corresponding eigen value.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. Define central force.
 - (a) Show that angular momentum of a particle in central force field is conserved.
 - (b) Show that the motion under central force occurs in a plane.
21. Explain the consequences of Lorentz transformations.

(1 × 10 = 10 Marks)
