

C 21836

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Name.....

Reg. No.....

**SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
APRIL 2022**

Physics/Applied Physics

PHY 2C 02—MECHANICS, RELATIVITY, WAVES AND OSCILLATIONS

(2016—2018 Admissions)

Time : Three Hours

Maximum : 64 Marks

Part A

Answer all questions.

Each question carries 1 mark.

1. Equation for period of oscillation of simple pendulum is _____.
2. Write down the mass energy relation.
3. Unit of spring constant is _____.
4. Define wave front.
5. What is the relation between period and frequency ?
6. Write down the equation of time dilation.
7. Define harmonic oscillator.
8. Fourier theorem is applicable for a _____ function.
9. What are nodes and antinodes ?
10. If an external periodic force is applied on a damped harmonic oscillator, then it is called _____ oscillator.

(10 × 1 = 10 marks)

Part B (Short Answer Questions)

Answer all questions.

Each question carries 2 marks.

11. What is proper time ?
12. What is anharmonic oscillator ?

Turn over

13. Write down the postulates of quantum mechanics.
14. Write a note on Coriolis force.
15. Define inertial frame of reference.
16. What is angle of twist ?
17. Write the equation of Fourier's theorem.

(7 × 2 = 14 marks)

Part C (Paragraph Questions)

Answer any **three** questions.

Each question carries 4 marks.

18. Write a note on length contraction.
19. Obtain the expression for velocity of longitudinal waves in rods.
20. Derive the differential equation of a simple harmonic oscillator and find out its solution.
21. Explain K.E. of SHM.
22. Discuss law of conservation of linear momentum.

(3 × 4 = 12 marks)

Part D (Problems)

Answer any **three** questions.

Each question carries 4 marks.

23. Calculate the work done in twisting a steel wire of diameter 2 mm and length 0.25 m through an angle 45° . Given rigidity modulus for steel is $8 \times 10^{10} \text{ N/m}^2$.
24. Water in a river moves east at 6 km/hr and a boat heads north at 8 km/hr with respect to water. Find velocity of boat with respect to ground.
25. A 0.3 kg mass is attached to a spring and oscillates at 2 Hz. Find the spring constant.
26. Calculate the tensile stress in a wire of density 8000 kgm^{-3} , when the velocity of transverse wave on it is equal to 340 ms^{-1} .
27. Calculate the speed of an electron which has kinetic energy 2 MeV.

(3 × 4 = 12 marks)

Part E (Essays)

*Answer any **two** questions.*

Each question carries 8 marks.

28. Write and Explain Galilean transformation equations.
29. Derive time independent Schrödinger equation.
30. Explain Inertial, non-inertial frames and fictitious forces.
31. Explain Conservation of energy of a particle. Define and explain Energy function.

(2 × 8 = 16 marks)