

16U216

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Name:

Reg. No.

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY-2017

(Regular/Supplementary/Improvement)

(CUCBCSS – UG)

CC15U PH2 C02 – MECHANICS, RELATIVITY, WAVES AND OSCILLATIONS

(Complementary Course: Physics)

(2015 Admission)

Time: Three Hours

Maximum: 64 Marks

Section A

Answer all questions. Each carries one mark.

1. The acceleration of a body in an inertial frame of reference when it is not experiencing any external force is given by -----.
2. A rod will contract fifty percent along its length when its velocity is -----.
3. The amount of energy equivalent to $1 \text{ amu} = \text{----- eV}$.
4. The expression for a progressive wave is -----.
5. If frequency in S H M is f then frequency of its K E is -----.
6. The amplitude of a damped oscillator becomes half after t seconds. If the amplitude becomes $(1/x)$ after $3t$ seconds, then $x = \text{-----}$.
7. The momentum - energy relation is -----.
8. ----- is not invariant under Galilean transformation.
9. The time dependent Schrodinger equation is -----.
10. A satellite is revolving round the earth, ----- is not conserved.

(10 x 1 = 10 marks)

Section B

Answer all questions. Each carries two marks.

11. What are inertial frames of references?
12. What are forced harmonic oscillations?
13. State the law of conservation of angular momentum.
14. What is meant by length contraction?
15. Discuss the principle of rocket propulsion.
16. Define Eigen values and Eigen functions.
17. State Fourier's theorem.

(7 x 2 = 14 marks)

Section C

Answer any three questions. Each carries four marks.

18. Derive an expression for the energy density of a plane progressive wave.
19. Distinguish between free oscillations and damped oscillations.
20. What is potential energy curve? Draw potential curve and mark points of unstable, stable equilibrium.
21. Deduce the Galilean transformation equations.
22. What are the postulates of special theory of relativity?

(3 x 4 = 12 marks)

Section D

Answer any three questions. Each carries four marks.

23. Calculate the fictitious and total force on a body of mass 2.5 kg relative to a frame moving vertically upwards on earth with an acceleration of 10 m/sec^2 .
24. Calculate the Coriolis acceleration of a rocket moving with a velocity of 2000 m/s at 60° south latitude.
25. Three masses 1 kg, 2 kg and 1 kg are at the vertices of a right angled triangle at A, B and C with $\angle B = 90^\circ$, $AB = 3 \text{ m}$, $BC = 4 \text{ m}$. Find the position of the centre of mass of the system?
26. Find the period of oscillation and maximum acceleration of a simple harmonic motion represented by the equation $x = 2 \sin(\pi t + \pi/2)$.
27. Prove that the oscillations of a simple pendulum are simple harmonic.

(3 x 4 = 12marks)

Section E

Answer any two questions. Each carries eight marks.

28. Describe Michelson – Morley experiment and discuss the importance of its negative result.
29. What are conservative and non-conservative forces? Explain potential energy curve, positions of equilibrium. What is the significance of parabolic potential well?
30. What are the basic postulates of wave mechanics? Derive Schrodinger's time dependent equation.
31. Derive the Galilean transformation equation and explain its invariance.

(2x 8 = 16 marks)
