19U206S (Pages: 2) Name……….……………

Reg No…………………..

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2020

(CUCBCSS – UG)

CC15U PH2 C02 – MECHANICS, RELATIVITY, WAVES AND OSCILLATIONS

(Physics – Complementary Course)

(2015 to 2018 Admissions - Supplementary/Improvement)

Time: Three Hours Maximum: 64 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. In simple harmonic motion, the displacement of a particle in one dimension is …………
2. Write down the general equation of wave motion.
3. The frame attached to any point on earth's surface is ………….. frame.
4. Give example for central force.
5. Negative value of work done by a conservative force on a particle is equal to …………..
6. Write down one Galilean invariant quantity.
7. The CM of a system of particles does not depend on

   a) Masses of the particles b) Positions of the particles

   c) Relative separations between the particles d) Forces acting on the particles
8. Moon has no atmosphere because

   a) There is no vegetation on the moon b) Moon is not a planet

   c) The escape velocity from the moon is small d) It is far away from earth
9. The principle of STM is based on …………..
10. Wave particle duality is applicable to …………..

(10 × 1 = 10 Marks)

Section B

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

11. What is a frame of reference?
12. State Fourier's theorem.
13. What are the conditions for an oscillator to be simple harmonic?
14. What is meant by rest-mass energy?
15. State law of conservation of linear momentum.
16. Define unstable equilibrium in terms of potential energy.
17. What are eigen function and eigen value?

(7 × 2 = 14 Marks)

Section C

Answer any ***three*** questions. Each question carries 4 marks.

18. What are inertial and non-inertial frames? Give examples.
19. Mention the consequences of Lorentz transformations.
20. What is a plane progressive wave? Obtain an equation for a plane progressive harmonic wave.
21. What is meant by a centre of mass frame?
22. Describe the principle of rocket.

(3 × 4 = 12 Marks)

Section D

Answer any ***three*** questions. Each question carries 4 marks.

23. A body of mass 100g is executing S.H.M. along a straight line. At distances 5cm and 10cm from the mean position velocities of the body are $1 ms^{-1}$ and $0.5\ ms^{-1}$ respectively. Find the time period and frequency.
24. Calculate the velocity at which mass of a particle becomes 3 times its rest mass.
25. An astronaut travelling in a rocket moving vertically upwards with an acceleration of $4\ ms^{-2}$ weighs 300kg. Calculate the weight of the astronaut in the laboratory.
26. If a force $(5\,\hat{i} - 3\,\hat{j} + \hat{k})$N acts on a particle during displacement from point A (20,15,0)m to point B (0, 0, 7)m, find the work done on the particle.
27. Determine the wavelength associated with an electron having K.E. equal to 1 MeV.

(3 × 4 = 12 Marks)

Section E

Answer any ***two*** questions. Each question carries 8 marks.

28. Describe Michelson – Morley experiment and explain the inferences drawn.
29. Establish the differential equation for a damped harmonic oscillator and solve it. Under what condition will its motion become oscillatory?
30. State and explain the principle of conservation of angular momentum. Show that for central force motion the angular momentum is conserved and hence the areal velocity remains constant.
31. Develop the time dependent Schrodinger equation.

(8 × 2 = 16 Marks)

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