

C 4171-B

(Pages : 3)

Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Physics/Applied Physics

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

Time : Three Hours

Maximum : 64 Marks

*Symbols used in this question paper have their usual meanings.***Section A (Answer in a word or phrase)***Answer all questions.**Each question carries 1 mark.*

- A rocket is based on the principle of conservation of :
 - Linear momentum.
 - Angular momentum.
 - Energy.
 - Mass.
- The necessary and sufficient condition for a particle executing S.H.M is :
 - Constant period.
 - Proportional between acceleration and displacement from mean position.
 - Constant acceleration.
 - Proportional between restoring force and displacement from mean position.
- The rest mass of a photon is :
 - $\frac{hv}{c^2}$.
 - $\frac{hv}{c}$.
 - $\frac{h}{c\lambda}$.
 - Zero.
- According to Schrodinger a particle is equivalent to a :
 - Single wave.
 - Wave packet.
 - Light wave.
 - Cannot behave as wave.
- Define Simple Harmonic motion.
- What are the postulates of quantum mechanics ?

Turn over

7. At what velocity the mass of a particle would be 10 times its rest mass ?
- (a) $0.5c$. (b) $0.20c$.
(c) $0.125c$. (d) $0.995c$.
8. A central force is an example of :
- (a) Conservative force. (b) Non-conservative force.
(c) Fictitious force. (d) Frictional force.
9. When a clock is placed in a moving rocket, the clock runs :
- (a) Slow.
(b) Fast.
(c) At same rate.
(d) Show when rocket moves farther and fast when it approaches.
10. What is the relation between conservative force and potential energy ?

(10 × 1 = 10 marks)

Section B

Answer in a short paragraph- three or four sentences.

Answer all questions.

Each question carries 2 marks.

11. What are the postulates of special theory of relativity ?
12. What is Coriolis's force ? Explain its origin.
13. Write down the Lorentz transformation equations.
14. What do you mean by inertial and non-inertial frames ? Explain with examples.
15. State the law of conservation of angular momentum.
16. Write down an expression for equation of plane progressive wave and explain each term.
17. Write the total energy of a simple harmonic oscillator and explain the terms.

(7 × 2 = 14 marks)

Section C

Answer in a paragraph of about half a page to one page.

Answer any three questions.

Each question carries 4 marks.

18. With suitable example explain Eigen value and Eigen function.
19. Write a note on Scanning Tunneling Microscope.
20. What is centrifugal force? Show that the effect of centrifugal force due to rotation of the earth on the acceleration due to gravity is maximum at the equator and minimum at the poles.

21. What were the explanations given for the negative result of the Michelson Moreley experiment ?
22. Explain the concept of time dilation.

(3 × 4 = 12 marks)

Section D

Problems-write all relevant formulas.

All important steps carry separate marks.

*Answer any **three** questions.*

Each question carries 4 marks.

23. A 4kg block extends a spring 0.16 metre from its unstretched position. The block is removed and a 0.50kg body is hung the same spring. If the spring is then stretched and released, what is its period of motion ?
24. In the Michelson - Morley experiment, the wavelength of the monochromatic light used is 4800Angstrom unite. What will be the fringe-shifit on the basis of stationary ether hypothesis if effective length of each path be 6 meters.(Given the velocity of the earth = 3×10^4 m/s and $c = 3 \times 10^8$ m/s)
25. In the laboratory the life time of a particle moving with speed 2.8×10^8 m/s, is found to be 2.5×10^{-7} sec. Calculate the proper life-time of the particle.
26. Calculate the Coriolis force on a mass of 100g placed at a distance of 20cm from the axis of a rotating frame of reference if the angular speed of the frame is 10 rad/s.
27. What is the increase in the relativistic mass of a particle of mass 1g when it is moving with 0.8c ?

(3 × 4 = 12 marks)

Section E (Essays)

*Answer in about **two** pages.*

*Answer any **two** questions.*

Each question carries 8 marks.

28. Derive Lorentz transformation equations.
29. What are the fundamental postulates of Quantum Mechanics ? Explain their significance.
30. Derive the expressions with graphical representations for kinetic energy potential energy and total energy of a simple harmonic oscillator.
31. Derive the time dependent Schrodinger equation of matter waves. Give the Physical interpretation of wave function.

(2 × 8 = 16 marks)