

C 81815

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Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2020

Physics/Applied Physics

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

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions.

Each question carries 1 mark.

Answer in a word or phrase.

1. There is no Coriolis force at _____.
2. Michelson and Morley performed an experiment to prove the existence of _____.
3. _____ is same in free space for all the observer in every inertial frames.
4. A frame of reference in which Newton's law hold good is called _____.
5. _____ force is a velocity dependent force.
6. For an observer a clock appears to run when in motion.
7. Michelson-Morley experiment is based on principle of _____.
8. Earth is frame of reference.
9. The laws of physics are same in all _____.
10. The length of an object measured by an observer at rest with respect to the object is called _____.

(10 × 1 = 10 marks)

Section B

Answer all questions.

Each question carries 2 marks.

Answer in two or three sentences.

11. Distinguish between laboratory and centre of mass systems.
12. What is Coriolis force ?
13. How is the negative result of Michelson Morley experiment explained.

Turn over

14. Distinguish between conservative and non conservative forces with examples.
15. State the postulates of special theory of relativity.

(5 × 2 = 10 marks)

Section C

Answer any four questions.

Each question carries 5 marks.

Answer in one paragraph.

16. Derive Lorentz transformation equations.
17. Distinguish between centrifugal and Coriolis forces.
18. Derive time dependent Schrödinger equation.
19. State and prove law of conservation of energy.
20. Obtain an expression for the centre of mass of a system of particles.
21. Derive the equation for plane progressive wave.

(4 × 5 = 20 marks)

Section D

Answer any two questions.

Each question carries 5 marks.

22. Calculate the horizontal component of Coriolis force acting on a body of mass 0.1kg moving northward with a horizontal velocity of 100m/s at 30°N latitude on earth ? (angular velocity of earth = 7.27×10^{-5} rad/s).
23. A metre scale is moving along its length with a velocity 0.7c. What will be its length as it appears to an observer (a) on earth (b) moving with the scale itself ?
24. A particle with a mean proper life time of $2\mu\text{s}$ moves through the laboratory with a speed of 0.9c. Calculate its life time as measured by an observer in laboratory ?
25. At t what speed a particle should move so that its mass is equal to three times its rest mass?
26. The rest mass of an electron is 9.1×10^{-31} kg. What will be its mass if it were moving with $(4/5)^{\text{th}}$ of speed of light ?

(2 × 5 = 10 marks)

Section E

Answer any two questions.

Each question carries 15 marks.

27. What are Galilean transformations ? Show that all the three fundamental quantities of mechanics are invariant under Galilean transformation ?
28. (a) Distinguish between centrifugal and Coriolis force.
- (b) Prove that effect of centrifugal force due to rotation of earth on the acceleration due to gravity is maximum at the equator and minimum at the poles.
29. Explain the working of electron microscope and scanning tunnelling microscope.

(2 × 15 = 30 marks)