

D 71658

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Name.....

Reg. No.....

THIRD SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019
(CUCBCSS—UG)

Physics/Applied Physics

PHY 3B 03/APY 3B 03—MECHANICS

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions.
Each question carries 1 mark.
Answer in a word or phrase.

1. Newton's laws of motion are valid in reference systems, known as _____.
2. C-frame is also known as _____.
3. The simplest frame of reference is a _____ coordinate system.
4. Expression for an areal velocity of a particle gives _____.
5. The limitations on the motion of a system are called _____.
6. The equations which provide the relationship between the coordinates of two reference systems are called _____.
7. A vector in four dimensional _____ space is called a four vector.

True or False :

8. The constraint of a particle moving on an ellipsoid under the influence of gravity is holonomic
9. The angular momentum of a particle is constant of motion in presence of external torque. This is the conservation theorem of angular momentum of a particle.
10. Results of Michelson Morley experiment suggests that the speed of light in vacuum must be the same in all inertial frames.

(10 × 1 = 10 marks)

Section B

Answer all questions.
Each question carries 2 marks.
Answer in two or three sentences.

11. Explain work energy theorem.
12. Define Newton's law of force.

Turn over

13. What you mean by degrees of Freedom ?
14. Define Central force.
15. Write the expression for galilean transformation equations.
16. What is principle of equivalence ?
17. Explain time dilation.

(7 × 2 = 14 marks)

Section C

*Answer any five questions.
Each question carries 4 marks.
Answer in one paragraph.*

18. Explain different type of constraints.
19. Explain conservation of linear momentum.
20. Define Centre of mass.
21. State and deduce Kepler's second law of planetary motion.
22. Briefly explain covariance of the physical laws.
23. What you mean by ether hypothesis in relativity.
24. Deduce a expression of Mass energy relation in relativity.

(5 × 4 = 20 marks)

Section D

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

25. Express for the momentum of a photon in terms of wavelength λ . How much is the rest mass of the photon ? Calculate the relativistic mass of the photon of wavelength 5000Å.
26. A particle, moving in a central force field located at $r = 0$, describes a spiral $r = e^{-\theta}$. Prove that the magnitude of force is inversely proportional to r^3 .
27. A meson has a speed $0.8c$ relative to the ground. Find how far the meson travels relative to the ground. If its speed remains constant and the time of its flight, relative to the system, in which it is at rest, is 2×10^{-8} sec.
28. Consider the motion of a particle of mass m . using Cartesian coordinates as generalized coordinates, deduce Newton's equation of motion from Lagrange's equations.
29. An electron and a positron practically at rest come together and annihilate each other. Calculate the energy released.

30. Obtain equations of motion for a projectile near the surface of the earth.
31. Two objects of masses $m_1 = 200$ gm and $m_2 = 500$ gm possess velocities $\mathbf{V}_1 = 10\mathbf{i}$ m/sec and $\mathbf{V}_2 = 3\mathbf{i} + 5\mathbf{j}$ m/sec just prior to a collision during which they become permanently attached to each other. Calculate (a) the velocity of the centre of mass, (b) the final momentum of the combination in the laboratory frame.

(4 × 4 = 16 marks)

Section E

Answer any two questions.

Each question carries 10 marks.

32. Explain principle of virtual work and derive Lagrangian's equation from D'Alembert's Principle.
33. Briefly explain Kepler's planetary motion and deduce Kepler's third law of motion.
34. Explain Michelson Morley experiment and explain what are the results obtained from the experiment.
35. Explain Minkowski space and Lorentz transformations and deduce Lorentz transformations.

(2 × 10 = 20 marks)