

QUARTERLY EXAMINATION - 2023

CLASS: XI
PHYSICS

 Reg.No

Time : 3.00 Hours

MAX MARKS : 70
PART - I
15 × 1 = 15

- Note:**
- (i) Answer all the questions
 (ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer
1. Which of the following has the highest number of significant figures?
 a) 600800 b) 5213.0 c) 0.0007 d) 0.0006032
 2. Equivalent value of 30° in radian
 a) $\frac{\pi}{6}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$
 3. If a particle executes uniform circular motion in the xy plane in clock wise direction, then the angular velocity is in
 a) +y direction b) +z direction c) -z direction d) -x direction
 4. An object is dropped in an unknown planet from height 50 m, it reaches the ground in 2 s. The acceleration due to gravity in this unknown planet is
 a) $g = 20 \text{ m s}^{-2}$ b) $g = 25 \text{ m s}^{-2}$ c) $g = 15 \text{ m s}^{-2}$ d) $g = 30 \text{ m s}^{-2}$
 5. Two masses m_1 and m_2 are experiencing the same force where $m_1 < m_2$. The ratio of their acceleration $\frac{a_1}{a_2}$ is
 a) 1 b) less than 1 c) greater than 1 d) all the three cases
 6. Which one of the following physical quantities can be represented by a scalar?
 a) Torque b) Angular momentum
 c) Angular acceleration d) Moment of Inertia
 7. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?
 a) $\sqrt{2gR}$ b) $\sqrt{3gR}$ c) $\sqrt{5gR}$ d) \sqrt{gR}
 8. The coefficient of restitution for elastic collision is
 a) < 1 b) > 1 c) 1 d) zero
 9. The SI unit for torque is
 a) N m^{-1} b) N c) kg m s^{-2} d) $\text{kg m}^2 \text{s}^{-2}$
 10. A closed cylindrical container is partially filled with water. As the container rotates in a horizontal plane about a perpendicular bisector, its moment of inertia,
 a) Increases b) Decreases
 c) remains constant d) depends on direction of rotation
 11. The kinetic energy of the satellite orbiting around the Earth is
 a) equal to potential energy b) less than potential energy
 c) greater than kinetic energy d) zero
 12. The angular momentum of the Earth with respect to Sun is
 a) Maximum at Perihelion b) Maximum at Aphelion
 c) Constant d) zero
 13. If the velocity is $\vec{v} = 2\hat{i} + t^2\hat{j} - 9\hat{k}$, then the magnitude of acceleration at $t = 0.5 \text{ s}$ is
 a) 1 m s^{-2} b) 2 m s^{-2} c) zero d) -1 m s^{-2}
 14. The work done by the conservative force for a closed path is
 a) always negative b) zero c) always positive d) not defined
 15. A couple produces,
 a) pure rotation b) pure translation
 c) rotation and translation d) no motion

PART - II

6 × 2 = 12

Answer any six questions. Question no. 24 is compulsory:

16. What are the limitations of dimensional analysis?
17. What is meant by uniform and non uniform circular motion?
18. Two vectors \vec{A} and \vec{B} are given in the component form as $\vec{A} = 5\hat{i} + 7\hat{j} - 4\hat{k}$ and $\vec{B} = 6\hat{i} + 3\hat{j} + 2\hat{k}$. Find $\vec{A} + \vec{B}$, $\vec{A} - \vec{B}$
19. State Newton's second law.
20. Distinguish between elastic collision and inelastic collision?
21. State law of conservation of angular momentum.
22. Will the angular momentum of a planet be conserved? Justify your answer?
23. State Newton's Universal law of gravitation.
24. Consider a circular road of radius 20 meter banked at an angle of 30 degree. With what speed a car has to move on the turn so that it will have safe turn? (Consider $g=10 \text{ m s}^{-2}$)

PART - III

6 × 3 = 18

Answer any six questions. Question no. 33 is compulsory:

25. Explain the rules for Rounding Off?
26. Define the following. 1. Angular Displacement 2. Angular Velocity 3. Angular Acceleration
27. Give any three properties of vector product of two vectors.
28. Explain Lami's theorem.
29. Compare conservative forces and non-conservative forces (any 3 properties).
30. Derive the relation between torque and angular acceleration?
31. Find the moment of inertia of a disc of mass 3 kg and radius 50 cm about axis passing through the centre and perpendicular to the plane of the disc?
32. State the Kepler's law for the planetary motions.
33. A physical quantity x is given by $x = \frac{a^2 b^3}{c \sqrt{d}}$. If the percentage errors of measurement in a, b, c and d are 4%, 2%, 3% and 1% respectively, then calculate the percentage error in the calculation of x.

PART - IV

5 × 5 = 25

Answer all the questions:

34. a) Explain in detail the various types of errors.
(Or)
b) (i) Derive the relation between momentum and kinetic energy?
(ii) Two objects of masses 2 kg and 4 kg are moving with the same momentum of 20 kg m s^{-1} . Will they have same kinetic energy?
35. a) Derive the kinematic equations of motion for constant acceleration.
(Or)
b) Derive the expression for moment of inertia of a rod about its centre and perpendicular to the rod.
36. a) (i) Define centripetal force? Give two examples?
(ii) If a stone of mass 0.25 kg tied to a string executes uniform circular motion with a speed of 2 m s^{-1} of radius 3 m, what is the magnitude of tensional force acting on the stone?
(Or)
b) Derive an expression for escape speed.
37. a) Explain the four types of motion. Give two examples for each type.
(Or)
b) Arrive at an expression for power and velocity.
38. a) Explain the variation of g with altitude.
(Or)
b) Derive the time period of satellite orbiting the Earth.