11

Time : 3.00 hrs. Reg. No. | | | | | | | |

Quarterly Examination - 2024

PHYSICS

Max. Marks : 70

PART - I

I. Choose the correct answer **15 x 1 = 15**

1. If the error in the measurement & radius is 2%, then the error in the determination of volume of the sphere will be a) 8% b) 2% c) 4% d) 6%
2. Which of the following pairs of physical quantities have same dimension?
   a) force and power b) torque and energy c) torque and power d) force and torque
3. Which of the following has the highest number of significant figures?
   a) 0.007 m^2 b) 2.64 x 10^{24} kg c) 0.0006032 m^2 d) 6.3200 J
4. If an object is dropped from the top of a building and it reaches the ground at t = 4s, then the height of the building is (ignoring air resistance) (g = 9.8 ms^{-2})
   a) 77.3 m b) 78.4 m c) 80.5 m d) 79.2 m
5. An object is dropped in an unknown planet from height 50m, it reaches the ground in 2s. The acceleration due to gravity in this unknown planet is
   a) g = 20 ms^{-2} b) g = 25 ms^{-2} c) g = 15 ms^{-2} d) g = 30 ms^{-2}
6. 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
7. If a person moving from pole to equator, the centrifugal force acting on him
   a) increases b) decreases c) remains the same d) increases and then decreases
8. 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) $\sqrt{gR}$
9. Two equal masses m_1 and m_2 are moving along the same straight line with velocities 5 ms^{-1} and –9 ms^{-1} respectively. If the collision is elastic, then calculate the velocities after the collision of m_1 and m_2, respectively.
   a) – 4 ms^{-1} and 10 ms^{-1} b) 10 ms^{-1} and 0 ms^{-1} c) –9 ms^{-1} and 5 ms^{-1} d) 5 ms^{-1} and 1 ms^{-1}
10. The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height h is a) $\sqrt{\frac{4}{3}gh}$ b) $\sqrt{\frac{10}{7}gh}$ c) $\sqrt{2gh}$ d) $\sqrt{\frac{1}{2}gh}$
11. A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes a) L b) $\frac{L}{2}$ c) 2L d) $\frac{L}{\sqrt{2}}$
12. A mass m is attached to a thin wire and whirled in vertical circle. The wire is most likely to break when ;
    a) the mass is at the highest point b) the wire is horizontal c) the mass is at the lowest point
    d) inclined at an angle of 60^0 from vertical
13. The speed of swimmer in still water is 20 ms^{-1}. The speed of river water is 10ms^{-1} and is flowing to east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t north is given by
    a) 30^0 west b) 0^0 c) 60^0 west d) 45^0 west
14. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed V_A and V_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be a) $r_A : r_B$ b) $V_A : V_B$ c) $r_B : r_A$ d) 1 : 1

15. A solid cyclinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3rpm. The torque required to stop after 2π revolutions is
a) 2×10^{-6} Nm b) 2×10^{-3} Nm c) 12×10^{-4} Nm d) 2×10^{6} Nm

PART - II

Answer any six questions. (Question number 24 compulsory) **6 x 2 = 12**

16. The temperature of two bodies measured by a thermometer are $t_1 = (20 \pm 0.5)^0C$, $t_2 = (50 \pm 0.5)^0C$, Calculate the temperature difference and the error therein.
17. Define a vector. Give examples.
18. What is the meaning by 'pseudo force'?
19. Under what condition will a car skid on a leveled circular road?
20. Define power. Give its unit.
21. Calculate the work done by a force of 30N in litting a load of 2 kg to a height of 10m ($g = 10\ ms^{-2}$)
22. What is the condition for pure rolling?
23. State the principle of moments.
24. A force of $(4\hat{i} - 3\hat{j} + 5\hat{k})$ N is applied at a point whose position vector is $(7\hat{i} + 4\hat{j} - 2\hat{k})$ m. Find the torque of force about the origin.

PART - III

Answer any six questions. Question nummber 29 is compulsory. **6 x 3 = 18**

25. What are the applications of dimensional analysis?
26. Derive the expression for centripetal acceleration.
27. Two vectors $\vec{A}$ and $\vec{B}$ of magnitude 5 units and 7 units make an angle 60^0 with each other. Find the magnitude of the difference vector $\vec{A} - \vec{B}$ and its direction with respect to the vector $\vec{A}$.
28. State Newton's three laws.
29. Consider a circular leveled road of radius 10m having co-efficient of static friction 0.81. Three cars (A, B and C) are travelling with speed $7ms^{-1}$, $8ms^{-1}$ and $10ms^{-1}$ respectively. Which car will skid when it moves in the circular level road? ($g = 10ms^{-2}$)
30. Write the differences between conservative and non-conservative forces. Give two examples each.
31. Write the various types of potential energy. Explain the formulae.
32. What is the relation between torque and angular momentum?
33. How do you distinguish between stable and unstable equilibrium.

PART - IV

Answer all questions. **5 x 5 = 25**

34. a) Obtain an expression for the time period T of a simple pendulum. The time period T depends on (i) mass 'm' of the bob (ii) length 'l' of the pendulum and (iii) acceleration due to gravity g at the place where the pendulum is suspended (constant $k = 2\pi$) **(OR)**
b) Derive the exopression for moment of inertia of a uniform disc about an axis passing through the center and perpendicular to the plane.
35. a) Derive the kinematic equations of motion for constant acceleration. **(OR)**
b) Arrive at an expression for elastic collission in one dimention.
36. a) Explain the motion of blocks connected by a string in vertical motion. **(OR)**
b) State and prove parallel axis theorem.
37. a) State and explain work energy principle. Mention any three examples for it. **(OR)**
b) Describe the method of measuring angle of repose.
38. a) What do you mean by propagation of errors? Explain the propagation of error in addition. **(OR)**
b) Derive the equation of motion and range reached by the particle thrown at an oblique angle θ with respect to the horizontal direction.