QL
QUARTERLY COMMON EXAMINATION - 2024
11 - Std
PHYSICS

Time : 3.00 Hrs.　　　　　　　　　　　　　　　　　　MARKS : 70

PART - I

I Note : i) Answer all the questions.　　　　　　　　15 X 1 = 15
ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. If the error in the measurement of radius is 3%, then the error in the determination of volume of the sphere will be
   a) 8%　　　　b) 2%　　　　c) 9%　　　　d) 6%

2. The dimensional formula for gravitational constant G is
   a) $[ML^3 T^{-2}]$　　b) $[M^{-1} L^3 T^{-2}]$　　c) $[M^{-1} L^{-3} T^{-2}]$　　d) $[ML^{-3} T^2]$

3. Which of the following pairs of physical quantities have same dimension?
   a) force and torque　　　　　　　b) torque and power
   c) torque and energy　　　　　　　d) force and power

4. If a particle has negative velocity and negative acceleration, its speed
   a) increases　　b) decreases　　c) remains same　　d) zero

5. If an object is thrown vertically up with the initial speed u from the ground, then the time taken by the object to return back to ground is
   a) $\frac{u^2}{2g}$　　　　b) $\frac{u^2}{g}$　　　　c) $\frac{u}{2g}$　　　　d) $\frac{2u}{g}$

6. Which one of the following physical quantities is vector?
   a) mass　　b) length　　c) momentum　　d) magnitude of acceleration

7. The centrifugal force appears to exist
   a) only in inertial frames　　　　b) only in notating frames
   c) in any accelerated frames　　　d) both in inertial and non inertial frames

8. An object of mass m begins to move on the plane inclined at an angle θ. The coefficient of static friction of inclined surface is μ_s. The maximum static friction experienced by the mass is
   a) mg　　b) μ_s mg cosθ　　c) μ_s mg　　d) μ_s mg sinθ

9. When a stationary bus starts to move, the passengers experience a sudden backward push, due to
   a) inertia of direction　　b) inertia of motion　　c) inertia of rest　　d) absence of inertia

10. 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) $\sqrt{gR}$

11. If the linear momentum of the object is increased by 0.1% then the kinectic energy is increased by
   a) 0.1 %　　b) 0.2 %　　c) 0.4 %　　d) 0.01 %

12. 1 KWh = ... Joule.
   a) 3.6 X 10³　　b) 3.6 X 10⁴　　c) 3.6 X 10⁶　　d) 3.6 X 10⁵

13. A couple produces
   a) pure rotation　　b) pure translation　　c) notation and translation　　d) no motion

14. A rigid body rotates with an angular momentum L. If its Kinetic energy is doubled, the angular momentum becomes
   a) L　　b) L/2　　c) $\sqrt{2}$ L　　d) $\frac{L}{\sqrt{2}}$

15. If the masses of the Earth and Sun suddenly double, the gravitational force between them will

    a) remain the same   b) increase 2 times   c) increase 4 times   d) decrease 2 times

PART - II

II Note : i) Answer any six questions. ii) Question No. 24 is compulsory.

16. What are the uses of dimensional analysis?   6 X 2 = 12

17. From a point on the ground, the top of a tree is seen to have an angle of elevation 60°. The distance between the tree and a point is 50m. Calculate the height of the tree?

18. Define displacement and distance.

19. State Newton's second law.

20. Explain the characteristics of elastic and inelastic collision.

21. Define power. Give its unit.

22. State Newton's Universal law of gravitation.

23. What are geostationary satellites?

24. A jester in a circus is standing with his arms extended on a turn table rotating with angular velocity ω. He brings his arms closer to his body so that his moment of inertia is reduced to one third of the original value. Find his new angular velocity. [Given : There is no external Tarque on the turn table in the given situation]

PART - III

III Note : i) Answer any six questions. ii) Question No. 33 is compulsory.

25. Write a note on radar method to measure larger distances.   6 X 3 = 18

26. Discuss the properties of scalar products.

27. Using free body diagram, show that it is easy to pull an object than to push it.

28. Consider a circular road of radius 20 meter banked at an angle of 15 degree. With what speed a car has to move on the turn so that it will have safe turn?

29. How do you distinguish between stable and unstable equilibrium?

30. State and prove perpendicular axis theorem.

31. A box is pulled with a force of 25N to produce a displacement of 15m, if the angle between the force and displacement is 30°, find the work done by the force.

32. State Kepler's three laws.

33. Two vectors are given as $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\vec{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$. Find the resultant vector $\vec{i} = \vec{r} \times \vec{F}$.

PART - IV

IV Answer all the 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 'i' of the pendulum and iii) acceleration due to gravity 'g' at the place where the pendulum is suspended. (constant $K = 2\pi$) **(OR)**
    b) Explain the similarities and differences of centripetal and centrifugal forces.

35. a) Explain in detail the triangle law of addition. **(OR)**
    b) Explain the variation of g with altitude.

36. a) Explain in detail the various types of errors. **(OR)**
    b) Explain why a cyclist bends while negotiating a curve road? Arrive at the expression for angle of bending for a given velocity.

37. a) State and explain work energy principle. Mention by three examples for it. **(OR)**
    b) Explain the motion of blocks connected by a string vertical motion.

38. a) Derive the kinematic equations of motion for constant acceleration. **(OR)**
    b) Explain with graphs the difference between work done by a constant force and by a variable force.

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