QUARTERLY EXAMINATION - 2024

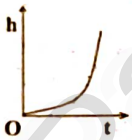
Class : 11 **PHYSICS** **Reg.No**

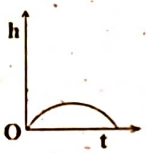
Time : 3.00 Hours **Marks : 70**

PART – I $15 \times 1 = 15$

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. If the length and time period of an oscillating pendulum have errors of 1% and 3% respectively then the error in measurement of acceleration due to gravity is
   a) 4% b) 5% c) 6% d) 7%
2. A uniform force of $(2\hat{i}+\hat{j})N$ acts on a particle of mass 1 kg. The particle displaces from position $(3\hat{j}+\hat{k})$ m to $(5\hat{i}+3\hat{j})$ m. The work done by the force on the particle is
   a) 9 J b) 6 J c) 10 J d) 12 J
3. The velocity of a particle depends upon the time t according to the equation $v = a + bt + \frac{c}{d+t}$. Write the dimension of d
   a) $[LT^{-1}]$ b) $[LT^{-2}]$ c) [T] d) [L]
4. Which one of the following physical quantities cannot be represented by a scalar?
   a) Mass b) Length c) Momentum d) Magnitude of acceleration
5. Two discs of same moment of inertia rotating about their regular axis passing through center and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought in to contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is,
   a) $\frac{1}{4}I(\omega_1-\omega_2)^2$ b) $I(\omega_1-\omega_2)^2$ c) $\frac{1}{8}I(\omega_1-\omega_2)^2$ d) $\frac{1}{2}I(\omega_1-\omega_2)^2$
6. Which of the following is the graph between the height (h) of a projectile and time (t), when it is projected from the ground?
   a) 

   b) 

   c) 

   d) 

7. 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
8. Round of the following number 19.95 into three significant figures.
   a) 19.9 b) 20.0 c) 20.1 d) 19.5
9. A body is under the action of two mutually perpendicular forces of 3N and 4N. The resultant force acting on the body is
   a) 7 N b) 1 N c) 5 N d) Zero
10. A body of mass 1 kg is thrown upwards with a velocity 20 m s^{-1}. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction?
    a) 20 J b) 30 J c) 40 J d) 10 J
11. 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 s is
    a) 1 m s^{-2} b) 2 m s^{-2} c) zero d) -1 m s^{-2}
12. In an elastic collision
    a) momentum and kinetic energy are conserved b) only momentum is conserved
    c) only kinetic energy is conserved d) momentum and kinetic energy are not conserved
13. The ratio of the acceleration for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,
    a) 5:7 b) 2:3 c) 2:5 d) 7:5
14. 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) $\mu_s mg$ c) $\mu_s mg \sin\theta$ d) $\mu_s mg \cos\theta$
15. The unit mass having $\vec{r} = 8\hat{i} - 4\hat{j}$ and $\vec{v} = 8\hat{i} + 4\hat{j}$ in its angular momentum is
    a) $-64\hat{k}$ b) $+64\hat{k}$ c) $+64\hat{j}$ d) $-64\hat{j}$

PART – II 6 × 2 = 12

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

16. Briefly explain the types of physical quantities.
17. Differentiate velocity and speed.
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 $\vec{A} + \vec{B}, \vec{B} - \vec{A}$
19. Define one newton.
20. 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?
21. Define power and mention its unit.
22. Write various types of potential energy.
23. Give any two examples of torque in day-to-day life.
24. Find the moment of inertia of a ring of mass 9 kg and radius 3 m rotating with 240 rpm about an axis passing through its centre and perpendicular to its plane.

PART – III 6 × 3 = 18

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

25. Explain the rules for Rounding Off?
26. Using free body diagram, show that it is easy to pull an object than to push it.
27. In a submarine equipped with sonar, the time delay between the generation of a pulse and its echo after reflection from an enemy submarine is observed to be 80 s. If the speed of sound in water is 1460 ms^{-1}. What is the distance of enemy submarine?
28. Give any three properties of vector product of two vectors.
29. Write the differences between conservative and non-conservative forces.
30. Find the radius of gyration of a disc of mass M and radius R rotating about an axis passing through the centre of mass and perpendicular to the plane of the disc.
31. Derive the relation between momentum and kinetic energy?
32. State and prove parallel axis theorem.
33. If two objects of masses 2.5 kg and 100 kg experience the same force 5 N, what is the acceleration experienced by each of them?

PART – IV 5 × 5 = 25

Answer all the questions:

34. a) Explain the applications of dimensional analysis.

(Or)

b) State and explain work energy principle. Mention any three examples for it.

35. a) Derive the equations of motion for a particle falling vertically

(Or)

b) Discuss rolling on inclined plane and arrive at the expression for the acceleration.

36. a) Prove the law of conservation of linear momentum. Use it to find the recoil velocity of a gun when a bullet is fired from it.

(Or)

b) (i) Give the general rule for error in the power of a quantity.

(ii) A physical quantity x is given by $\frac{a^2b^3}{c\sqrt{d}}$. 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.

37. a) Arrive at an expression for velocity in one dimensional elastic collision.

(Or)

b) Derive the equation of motion, time of flight and horizontal range reached by the particle thrown at the horizontal direction.

38. a) Explain the types of equilibrium with suitable examples.

(Or)

b) Explain the need for banking of tracks.

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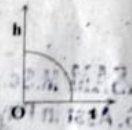
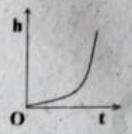
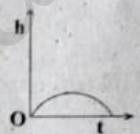
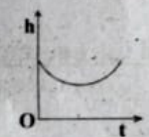
a) 

b) 

c) 

d) 

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