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Reg. No. 1 1 2 5 0 1 32

Time : 3.00 hrs.

Quarterly Examination - 2024

PHYSICS

Max. Marks : 70

PART - I

Note : Answer all the questions. Choose the correct answer **15 x 1 = 15**

1. If $\pi = 3.14$, then the value of π^2 is
   a) 9.8596 b) 9.860 c) 9.86 d) 9.9
2. Identify the unit vector in the following
   a) $\hat{i}+\hat{j}$ b) $\frac{\hat{i}}{\sqrt{2}}$ c) $\hat{k}-\frac{\hat{j}}{\sqrt{2}}$ d) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$
3. If the linear momentum of the object is increased by 0.1 % then the kinetic energy is increased by
   a) 0.1% b) 0.2% c) 0.4% d) 0.01%
4. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of
   a) $\frac{2}{3}$ k b) $\frac{3}{2}$ k c) 3k d) 6k
5. Two masses m_1 and m_2 are experiencing the same force where $m_1 < m_2$ the ratio of their acceleration is
   a) 1 b) less than 1 c) greater than 1 d) all the three cases
6. 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
7. The centre of mass of a system of particles does not depend upon
   a) position of particles b) relative distance between particles c) masses of particles
   d) force acting on particle
8. The speed of the centre of a wheel rolling on a horizontal surface is V_o. A point on the rim in level with the centre will be moving at a speed of
   a) zero b) V_o c) $\sqrt{2}\,V_o$ d) $2V_o$
9. The dimensional formula for gravitational constant G is
   a) $[ML^3T^{-2}]$ b) $M^{-1}L^3T^{-2}]$ c) $[M^{-1}L^{-3}T^{-2}]$ d) $[ML^{-3}T^2]$
10. Which one of the following physical quantities cannot be represented by a scalar?
    a) mass b) length c) momentum d) magnitude of acceleration
11. Force acting on the particle moving with constant speed is
    a) always zero b) need not be zero c) always non zero d) cannot be conducted
12. LED lamps glow for.....hours.
    a) 4000 b) 6000 c) 10000 d) 50000
13. Memoment of inertia of a solid cylinder of mass M length L and radius R about its own axis is
    a) $M\left[\frac{R^2}{2}+\frac{L^2}{12}\right]$ b) MR^2 c) MR^2 d) MR^2
14. If the velocity is $V = 2\hat{i}+t^2\hat{j}-9\hat{k}$ then the magnitude of acceleration at t = 1s is
    a) 1 ms^{-2} b) 2ms^{-2} c) zero d) -1 ms^{-2}
15. If the force on an object is zero, then the Newton's second law is considered as
    a) $m.\frac{dv}{dt} = 1$ b) $m.\frac{dv}{dt} = 0$ c) $m\frac{dv}{dt} = \alpha$ d) none

PART - II

Note : Answer any six questions. Question No.24 is compulsory. 6 x 2 = 12

16. Write the uses (applications) of dimensional analysis method.
17. 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 $\vec{z} = \vec{r} \times \vec{F}$
18. What is meant by Cartesian coordinate system.
19. Define Precision and accuracy.
20. Define torque and mention its unit.
21. What is impulse? Give its unit.
22. State law of conservation of angular momentum.
23. Compare elastic collision with inelastic collision.
24. If an object of mass 2 kg is taken to a height 5m from the ground ($g = 10ms^{-2}$). Calculate the potential energy stored in the object.

PART - III

Answer any six questions. Question No.33 is compulsory. 6 x 3 = 18

25. Write a note on triangulation method to measure large distance.
26. Write the differences between conservative and non conservative forces.
27. Using free body diagram, show that it is easy to pull an object than to push it.
28. Write down the kinematic equation for angular motion.
29. Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$.
30. Define a) coefficient of restitution b) power
31. State and prove perpendicular axis theorem.
32. State Newton's three laws.
33. A train was at the rate of $54kmh^{-1}$ when brakes were applied. It came to rest within a distance of 225m. Calculate the retardation produced in the train.

PART - IV

Answer all the questions. 5 x 5 = 25

34. a) Explain in detail the variouis types of errors.
    (OR)
    b) 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.
35. a) Define scalar product. Write its properties (any six)
    (OR)
    b) Arrive at an expression for final velocity in elastic collision in one dimension.
36. a) State and explain work energy principle. Mention any three examples for it.
    (OR)
    b) Derive the kinematic equations of motion for constant acceleration.
37. a) Derive the expression for moment of inertia of a rod about its centre and perpendicular to the rod.
    (OR)
    b) 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 (iii) acceleration due to gravity 'g' at the place where the pendulum is suspended.
38. a) Explain the similarities and differences of centripetal and centrifugal forces.
    (OR)
    b) Discuss rolling on inclined plane and arrive at the expression for the acceleration.