

QUARTERLY EXAMINATION - 2023**11** - Std**PHYSICS**

Time : 3.00 Hrs

Marks : 70

PART- I

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.

15 × 1 = 15

- Which of the following pairs of physical quantities have same dimension?
 - force and power
 - torque and energy
 - torque and power
 - force and torque
- If the error in the measurement of radius is 2%, then the error in the determination of volume of the sphere will be
 - 8%
 - 2%
 - 4%
 - 6%
- 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) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$
- 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
 - $\frac{u^2}{2g}$
 - $\frac{u^2}{g}$
 - $\frac{u}{2g}$
 - $\frac{2u}{g}$
- A book is at rest on the table which exerts a normal force on the book. If this force is considered as reaction force, what is the action force according to Newton's third law?
 - Gravitational force exerted by Earth on the book
 - Gravitational force exerted by the book on Earth
 - Normal force exerted by the book on the table
 - None of the above
- When an object is at rest on the inclined rough surface,
 - static and kinetic frictions acting on the object is zero
 - static friction is zero but kinetic friction is not zero
 - static friction is not zero and kinetic friction is zero
 - static and kinetic frictions are not zero
- A ball of mass 1 kg and another of mass 2 kg are dropped from a tall building whose height is 80 m. After a fall of 40 m each towards Earth, their respective kinetic energies will be in the ratio of
 - $\sqrt{2} : 1$
 - $1 : \sqrt{2}$
 - $2 : 1$
 - $1 : 2$
- 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
 - $\sqrt{2gR}$
 - $\sqrt{3gR}$
 - $\sqrt{5gR}$
 - \sqrt{gR}
- A couple produces,
 - pure rotation
 - pure translation
 - rotation and translation
 - no motion
- A rigid body rotates with an angular momentum L . If its kinetic energy is halved, the angular momentum becomes,
 - L
 - $L/2$
 - $2L$
 - $L/2$
- The speed of the center of a wheel rolling on a horizontal surface is V_0 . A point on the rim in level with the center will be moving at a speed of,
 - a
 - V_0
 - $\sqrt{2} V_0$
 - $2V_0$

12. 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) $g = 20 \text{ ms}^{-2}$ b) $g = 25 \text{ ms}^{-2}$ c) $g = 15 \text{ ms}^{-2}$ d) $g = 30 \text{ ms}^{-2}$
13. 1 rad is equal to
 a) 57.20° b) 56.27° c) 57.27° d) 56.20°
14. If an object of mass 1 kg is placed at a height of 10m, then its potential energy is
 a) 100J b) 60J c) 120J d) 140J
15. Which of the following statement(s) is/are correct.
 A. The centripetal force is not a separate natural force.
 B. Any natural force can behave as a centripetal force.
 a) only A is correct c) both A and B is wrong
 b) only B is correct d) both A and B is correct

PART- II**Answer any SIX questions. Question No. 17 is compulsory.****6 x 2 = 12**

16. Define light year.
17. An athlete covers 3 rounds on a circular track of radius 50 m. Calculate the total distance and displacement travelled by him.
18. Under what condition will a car skid on a leveled circular road?
19. Define power. Give its unit.
20. Give any two examples of torque in our day-to-day life.
21. What is initial frame of reference?
22. What is the condition for pure rolling?
23. State conservation of angular momentum.
24. Define angle of friction.

PART - III**Answer any SIX questions. Question No. 33 is compulsory.****(6 x 3 = 18)**

25. What are the limitations of dimensional analysis?
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. Show that impulse is the change of momentum.
29. Write the various types of potential energy. Explain the formulae.
30. What is the relation between torque and angular momentum?
31. Compare elastic and inelastic collision.
32. State and explain the principle of moments.
33. A rolling wheel has velocity of its center of mass as 5 m s^{-2} . If its radius is 1.5 m and angular velocity is 3 rad s^{-1} , then check whether it is in pure rolling or not.

PART - IV**Answer all the questions.****5 x 5 = 25**

34. a) Write a note on triangulation method and radar method to measure larger distances.
(OR) b) Discuss rolling on inclined plane and arrive at the expression for the acceleration.
35. a) Explain in detail the triangle law of addition.
(OR) b) State and prove parallel axis theorem.
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) 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 $k = 2\pi$)
37. a) Explain the similarities and differences of centripetal and centrifugal forces.
(OR) b) State and explain work - energy theorem.
38. a) Derive the kinematic equations of motion for constant acceleration.
(OR) b) Arrive at an expression for elastic collision in one dimension and discuss.