PREPARATORY EXAMINATION JANUARY - 2025

I PUC - PHYSICS

TIME: 3HOUR **Max Marks: 70**

Instructions:

a) *All parts A to D are compulsory.*
b) *For Part-A questions, first written -answer will be considered for awarding marks.*
c) *Answers without relevant diagram wherever necessary will not carry any marks.*
d) *Direct answers to the numerical problems without relevant formula and detailed solutions will not carry any marks.*

PART-A 15×1=15

I. Pick the correct option among the four given options for ALL of the following questions.

1. The number of significant figures in 0.03400
   (a) 2 (b) 3 (c) 4 (d) 5
2. The numerical ratio of distance travelled to the displacement is
   (a) always equal to one (b) always less than one
   (c) always more than one (d) greater than or equal to one
3. The resultant of two vectors acting at a point is minimum if they are
   (a) in the same direction (b) perpendicular to each other
   (c) in the opposite direction (d) making an angle 120^0 with each other
4. Which of the following is a self-adjusting force?
   (a) limiting friction (b) kinetic friction
   (c) static friction (d) sliding friction
5. A body rotates with constant angular momentum. Then
   (a) torque is maximum (b) torque is minimum
   (c) torque is zero (d) torque is independent of angular momentum
6. Escape speed of a body of mass m on the surface of the earth is 11.2 km s^{-1}, what is the escape velocity of a mass 2m on the surface of the earth
   (a) 44.6 km s^{-1} (b) 22.4 km s^{-1} (c) 11.2 km s^{-1} (d) 33.6 km s^{-1}
7. Energy stored in a stretched string per unit volume is
   (a) $\frac{1}{2} \times stress \times strain$ (b) $\frac{1}{2} \times Y \times (stress)^2$
   (c)) $Y \times (strain)^2$ (d) $stress \times strain$
8. Bernoulli's theorem is in accordance with the law of conservation of
   (a) energy (b) momentum (c)mass (d) angular momentum
9. At atmospheric pressure water boils at 100^0C , if the pressure is reduced it boils at a
   (a) Higher temperature (b) lower temperature
   (c) at same temperature (d) at critical temperature
10. The increase in the internal energy of the system is equal to the work done on the system. Which process does the system undergo?
    (a) Isothermal (b) adiabatic (c)isochoric (d) isobaric
11. The degrees of freedom in case of a monoatomic gas is
    (a)1 (b) 3 (c) 5 (d) none of these
12. Velocity of a body executing simple harmonic motion is
    (a) $\omega^2\sqrt{A^2-y^2}$ (b) $\omega\sqrt{A^2-y^2}$ (c) $\omega\sqrt{A^2+y^2}$ (d) $\omega^2\sqrt{A^2+y^2}$
13. The quantity does not change when a sound wave travel from one medium to other is
    (a) Amplitude (b) frequency (c) wavelength (d) velocity
14. If a body of mass 'm' collides head on, elastically with velocity 'u' with another identical body at rest. After collision the velocity of the second body is
    (a) 2u (b) u (c)zero (d) can't decide
15. Rocket works on the principle of conservation of
    (a) Energy (b) momentum (c) angular momentum (d) mass

II. **Fill in the blanks by choosing appropriate answers given in the bracket for the following questions** $5 \times 1=5$

(zero, hydraulic lift, minimum, constant, maximum, decreases)

16. When no external force is applied on a system, its total momentum is ----------
17. The change in the internal energy of a system in a cyclic process is----------
18. The potential energy of a simple pendulum at extreme position is----------
19. As temperature decreases, the velocity of sound ----------by Laplace correction.
20. ----------works on the principle of Pascal's law.

PART-B

III. **Answer Any FIVE of the following questions.** $5\times2=10$

21. Check the dimensional correctness of the equation, $F\,S = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$ where the symbols have their usual meaning.
22. A body projected at an angle of 45^0 with a velocity of 9.8 m s^{-1}. What is its horizontal range?
23. Distinguish between elastic and inelastic collision.
24. Mention two factors on which moment of inertia of a body depends.
25. Radius of the earth is R_E. Find the depth at which the acceleration due to gravity half the acceleration due to gravity on the surface of the earth.
26. What are elastomers? Give one example.
27. Write any two applications of Bernoulli's principle.
28. Distinguish between isothermal and adiabatic process.

PART-C

IV. **Answer any FIVE of the following questions.** $5\times3=15$

29. Obtain the expression for time of flight of the projectile motion.
30. Mention any three methods of reducing friction.
31. A force of $(5\hat{i}+3\hat{j}+2\hat{k})$ N is applied over a particle which displaces it from its origin to the point $(2\hat{i}-\hat{j})$ meter. Calculate the work done on the particle.
32. State and explain the conservation of angular momentum with one example.
33. Mention any three properties of thermal radiation.
34. State any three postulates of kinetic theory of gases.
35. What is periodic motion? Define the terms (a) period (b) frequency of periodic motion.
36. Distinguish between transverse and longitudinal waves.

PART-D

V. **Answer any THREE of the following questions.** $3\times5=15$

37. Show that trajectory of a projectile is a parabola.
38. State and prove work energy theorem for a constant force.
39. (a) Define torque and angular momentum
    (b) Derive the relation between torque and angular momentum.
40. Explain the different stages of Carnot's cycle with PV diagram.
41. Derive the expression for time period of an oscillating simple pendulum.

VI. **Answer any TWO of the following questions.** $2\times5=10$

42. A player throws a ball vertically up with a speed of 29.4 ms^{-1}. Calculate how heigh the ball will rise and the time taken to reach the highest point.
43. A man pushes a car of mass 2000 kg at rest along a horizontal road with a steady force of 300 N the resistance of the road is 0.05 N/kg. Find the velocity of the car at the end of 20 s and the distance travelled by the car.
44. A metal cylinder 0.628 m long and 0.04 m in diameter has one end in boiling water at 100^0C and the other end in melting ice.The coefficient of thermal conductivity of the metal is $378 Wm^{-1}K^{-1}$, Latent heat of ice is 3.36×10^5 Jkg^{-1}. Find the mass of ice that melts in one hour.
45. $y = 0.4 \sin 10\pi(3t + 2x)$ represents t he equation of a sinusoidal wave travelling along negative x-axis x and y are in meter and t is in seconds. Calculate the wavelength, amplitude, frequency and velocity of the wave.