Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The percentage of uncertainty for V and I is 2% and 6% respectively. Hence, total uncertainty in the value of $R = V/I$ is

(A) 8% (B) $\frac{1}{3}$% (C) 3% (D) 4%

2) How many years are there in 1 Second?
(A) $3.15 \times 10^{+7}$ years (B) 3.1×10^{-8} years (C) 3.15×10^{16} years (D) 3.1×10^{-6} years

3) A vector of 10N making an angle of 60° with y-axis. Its x-component is equal to
(A) 7 N (B) 5 N (C) 8.66 N (D) 10 N

4) When a massive body collides with a body of negligible mass. What is the final velocity of massive body if its initial velocity is 5 m/s
(A) 10 m/s (B) 15 m/s (C) 20 m/s (D) Information is not enough

5) Which of the following can be possessed by a moving object
(A) Force (B) Momentum (C) Impulse (D) Power

6) The formula $W = \vec{F}.\vec{d}$ have two restrictions. Pick the correct one
(A) $\vec{F}$ can vary but $\vec{d}$ must be in circle
(B) $\vec{F}$ can vary but $\vec{d}$ must be in straight line
(C) $\vec{F}$ is constant and average but $\vec{d}$ is in straight line
(D) $\vec{F}$ is constant and average but $\vec{d}$ can be curved

7) $\theta , \omega , \alpha , \tau , L$ all these five parameters can have the same direction only if
(A) Torque should be applied externally
(B) Angular momentum 'L' is not fixed
(C) Angular velocity 'ω' is decreased
(D) Angular velocity 'ω' is increased

8) Centripetal force is acted along
(A) Straight line (B) Curved line (C) Circular path (D) Elliptical path

9) Bernoulli's theorem can be reduced to
(A) Torricelli's theorem but not to venturi's relation
(B) Both Torricelli's theorem and venturi's relation
(C) Venturi's relation but not to Torricelli's theorem
(D) This equation can not be reduced

10) What is the equation of the phase for a vibrating body in a circle, when intial phase is 270°
(A) $x_o \sin \omega t$ (B) $x_o \cos \omega t$ (C) $- x_o \sin \omega t$ (D) $- x_o \cos \omega t$

11) How speed of sound varies with temperature.
(A) $v \propto \frac{1}{T}$ (B) $v \propto 1/\sqrt{T}$ (C) $v \propto T$ (D) $v \propto \sqrt{T}$

12) At which angle, we get more orders of spectra in diffraction
(A) 45° (B) 90° (C) 60° (D) 30°

13) If a gas is maintained at 8000 N/m^2 in a container with piston having area 0.10 m^2. If the gas expands and piston is pushed up through a distance of 10 cm then the work done by the gas is
(A) 8000 J (B) 400 J (C) 40 J (D) 80 J

14) For diatomic gas $C_v = \frac{5R}{2}$, therefore "γ" for this gas is
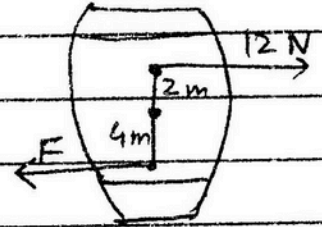(A) $7/5$ (B) $5/7$ (C) 7.5 (D) 5.7

15- For rotational equilibrium, the value of force in the following figure is

a) 12 N   b) 4 N

c) 2 N   d) 6 N

16- In the organ pipe shown in the figure has the frequency

a) $f_5 = 5 f_1$ b) $f_9 = 9 f_1$
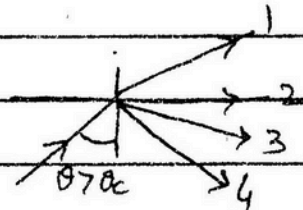
c) $f_3 = 3 f_1$ d) $f_7 = 7 f_1$

17- If a light ray is incident with an angle higher than critical angle, then the predicted ray of light after incidence

a) light ray follows path 1
b) light ray follows path 2
c) light ray follows path 3
d) light ray follows path 4

Physics (Subjective) Group (I) (Session 2020-22 to 2023-25) (Inter Part - I) Paper (I)

Time Allowed: 2.40 hours   Section ----------------- I   Maximum Marks: 68

2.   Answer briefly any Eight parts from the followings:-   8 × 2 = 16

(i)   Why do we find it useful to have two units for the amount of substance kilogram and the mole?

(ii)   Write the dimensions of pressure and density   (iii) What are supplementary units? Define only one unit.

(iv)   Add the following masses given in kg upto appropriate precision. 2.189 , 0.089 , 11.8 and 5.32?

(v)   Under what circumstances would a vector have components that are equal in magnitude?

(vi)   What is the unit vector in the direction of the vector $\hat{A} = 4\hat{i} + 3\hat{j}$?

(vii)   Is it possible to add a vector quantity to a scalar quantity? Explain.

(viii) What is ballistic missile? Define its trajectory.

(ix)   Show that the area between the velocity time graph is numerically equal to the distance covered by the object.

(x)   Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.

(xi)   Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.

(xii)   Differentiate between geyser and aquifer.

3.   Answer briefly any Eight parts from the followings:-   8 × 2 = 16

(i)   Why does a diver change his body positions before and after diving in the pool?

(ii)   Show that orbital angular momentum, $L_o = mvr$

(iii)   State the direction of the following vectors in simple situations; angular momentum and angular velocity.

(iv)   Prove that $a_T = r\alpha$ where, a_T = tangential acceleration, r = radius of circle, α = angular acceleration.

(v)   Why does droplets appear to be suspended in air?   (vi) What is meant by drag force?

(vii)   Name two characteristics of simple harmonic motion.

(viii) Describe some common phenomena in which resonance plays an important role.

(ix)   Define the phenomenon of resonance.   (x) Prove that $v = f\lambda$

(xi)   Explain why sound travels faster in warm air than in cold air?   (xii) Explain the terms (a) trough (b) Antinode

4.   Answer briefly any Six parts from the followings:-   6 × 2 = 12

(i)   How is the distance between interference fringes affected by the separation between the slits of Young's experiment? Can fringes disappear?

(ii)   Write two steps of Huygen's principle. What is its importance.

(iii)   How would you distinguish between un-polarized and plane-polarized lights?

(iv)   How you can increase the resolving power of a telescope?

(v)   How the power is lost in optical fibre through dispersion? Explain.

(vi)   A telescope is made of an objective of focal length 30 cm and an eye piece of 5 cm, both convex lenses. Find the angular magnification.

(vii)   Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.

(viii) How "Human Metabolism" provides an example of energy conservation and satisfy the first law of thermodynamics.

(ix)   What is Boltzman Constant. Calculate its numerical value.

Note: Attempt any three questions.   Section ------------- II   (8 × 3 = 24)

5.   (a)   Define and explain the term torque. Derive expression for torque due to force acting on a rigid body.

(b)   Prove that for angles of projection, which exceed or fall short of 45° by equal amounts, the ranges are equal.

6.   (a)   Discuss interconversion of Potential energy and Kinetic energy.

(b)   A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency.

7.   (a)   What is the simple pendulum. Show that the motion of a simple pendulum is simple harmonic. Also derive expression for its time period and frequency.

(b)   A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev min^{-1} in 1.60 s. What is its average angular acceleration.

8.   (a)   Define molar specific heat of gas. Also prove $C_p - C_v = R$

(b)   Water flows through a hose, whose internal diameter is 1cm at a speed of 1ms^{-1}. What should be the diameter of the nozzle if the water is to emerge at 21ms^{-1}.

9.   (a)   Describe the working of compound microscope, derive an expression for magnifying power and write the formula of length of compound microscope.

(b)   X – rays of wavelength 0.150 nm are observed to undergo a first order reflection at a Bragg angle of 13.3° from a quartz (SiO_2) crystal. What is the interplanar spacing of the reflecting planes in the crystal?