Roll No _____ (To be filled in by the candidate) **(Academic Sessions 2020 – 2022 to 2023 – 2025)**

PHYSICS 224-1st Annual-(INTER PART – I) Time Allowed : 20 Minutes

Q.PAPER – I (Objective Type) GROUP – I Maximum Marks : 17

PAPER CODE = 6475

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question. LHR-1-24

1-1	Two S.H.M having displacements are $x_1 = a\sin\omega t$ and $x_2 = b\cos\omega t$. The path difference between them will be : (A) Zero (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π
2	A particle of 1 Kg moving with initial velocity $5\,ms^{-1}$ is acting upon by a constant force 10N. After 5 seconds its velocity becomes : (A) $50\,ms^{-1}$ (B) $55\,ms^{-1}$ (C) $5\,ms^{-1}$ (D) $10\,ms^{-1}$
3	Dolphins detect small differences in the shape, size and thickness of objects through : (A) Beats (B) Radio waves (C) Echolocation (D) Both A and B
4	The ratio of dimensions of torque to angular momentum is : (A) I : T (B) M : T (C) T : I (D) L : T
5	Potential energy associated to the molecules of an ideal gas is considered to be : (A) 100 J (B) Low (C) Zero (D) High
6	A particle moves in a circle of radius r. In half the period of revolution, its displacement and distance covered are : (A) $2r, \pi r$ (B) $2r, 2\pi r$ (C) $\sqrt{2}r, \pi r$ (D) $r, \pi r$
7	The magnitude of $-\hat{i}.(\hat{k}\times\hat{j})$ is equal to : (A) 0 (B) $-2\hat{i}$ (C) [illegible] (D) $2\hat{i}$
8	The percentage uncertainty in mass and radius of earth is 2% and 5% respectively. The total percentage uncertainty in the volume of earth is : (A) 7% (B) 15% (C) 9% (D) 2%
9	The frequency of heart of normal human being is : (A) 1.2 Hz (B) 0.83 Hz (C) 72 Hz (D) 2 Hz
10	The magnifying power of a magnifying glass is 3. Its focal length will be : (A) 15 cm (B) 20 cm (C) 8.3 cm (D) 12.5 cm
11	A flywheel gains an angular speed of 540 rev / min in 9 second. Its angular acceleration is : (A) $9\,\pi$ rad s^{-2} (B) $6\,\pi$ rad s^{-2} (C) $12\,\pi$ rad s^{-2} (D) $2\,\pi$ rad s^{-2}
12	The horizontal range of a projectile is : (A) Equal to height at 30° (B) Double of height at 45° (C) One fourth of the height at 90° (D) Four times of height at 45°
13	The efficiency of diesel engine is : (A) 25% to 35% (B) 35% to 40 % (C) 45% to 50% (D) 20% to 25%
14	A mass is lifted to a height in 10 seconds. Now if the same mass is lifted to the same height in 20 seconds then work done in two cases are in the ratio : (A) 1 : 2 (B) 2 : 1 (C) 1 : 1 (D) 4 : 1
15	Which of the vector can not be represented on graph : (A) Unit vector (B) Position vector (C) Negative vector (D) Null vector
16	Energy cannot flow away in the : (A) Transverse waves (B) Stationary waves (C) Longitudinal waves (D) Sound waves
17	The direction in which light energy is carried called a : (A) Ray (B) Wave front (C) Locus (D) Spherical wave

. No _____ (To be filled in by the candidate) **(Academic Sessions 2020 – 2022 to 2023 – 2025)**

PHYSICS 224-1st Annual-(INTER PART – I) Time Allowed : 2.40 hours

PAPER – I (Essay Type) GROUP – I Maximum Marks : 68

LHR-1-24

SECTION – I

2. Write short answers to any EIGHT (8) questions : 16

(i) Write down dimensions of : (a) Pressure. (b) Density.

(ii) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression?

(iii) Name two major types of errors.

(iv) Write down factors of prefixes atto and tera.

(v) Can magnitude of a vector have a negative value?

(vi) If $\overline{A} - \overline{B} = \overline{O}$, what can you say about the components of the two vectors?

(vii) Can you add zero to a null vector?

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

(ix) An object is thrown vertically upward. Discuss sign of acceleration due to gravity relative to velocity, while the object is in air.

(x) How impulse is equal to change in momentum?

(xi) An object has 1J of potential energy. Explain what does it mean?

(xii) Prove that $P = \overline{F} . \overline{v}$ where P , $\overline{F}$ and $\overline{v}$ are power, force and velocity.

3. Write short answers to any EIGHT (8) questions : 16

(i) A wheel covers 200 m distance between two points. If its radius is 0.2 m, find the number of revolution completed by the wheel.

(ii) Describe what should be the minimum velocity for a satellite, to orbit close to the earth around it.

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

(iv) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.

(v) A person is standing near a fast moving train. Is there any danger that he will fall towards it?

(vi) Explain the working of a carburetor of a motorcar using Bernoulli's principle.

(vii) Time period of a simple pendulum is 2.0 s and amplitude 20 cm, find its maximum speed.

(viii) What are the conditions of constructive and destructive interference of two sound waves from coherent sources?

(ix) Can we realize an ideal simple pendulum?

(x) What is the total distance travelled by an object moving with SHM in a time equal, to its period, if its amplitude is A?

(xi) Explain the terms : (i) crest. (ii) antinode.

(xii) Why does sound travel faster in solids than in gases?

(Turn Over)

4. Write short answers to any SIX (6) questions : **12**

(i) Which principle is helpful to determine the shape and location of new wavefront? Explain briefly.

(ii) Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

(iii) What are different methods to get polarized light?

(iv) What is multimode step index fibre? Explain in short.

(v) Draw the ray diagram of compound microscope.

(vi) Describe in short the construction and working of collimator.

(vii) What will be efficiency of an engine if it performs 100 J of work and rejects 400 J of heat energy to the cold reservoir?

(viii) Why the efficiency of real heat engine is always less than one?

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

SECTION – II

Note : Attempt any THREE questions.

5. (a) Find resultant of $\overline{A}$ and $\overline{B}$ using addition of vectors by rectangular components. 5

(b) A football is thrown upward at an angle of 30° with respect to horizontal. To throw a 40 m pass what must be the initial speed of the ball? 3

6. (a) How would you describe the analytical approach of formula of absolute P.E., also derive the formula with diagrammatic explanation. 5

(b) The frequency of the note emitted by a stretched string is 300 Hz. What will be the frequency of this note when the tension is increased by one third without changing the length of the wire? 3

7. (a) Define angular momentum and explain orbital and spin angular momentum. 5

(b) A block of mass 4.0 kg is dropped from height of 0.80 m on to a spring of spring constant $k = 1960\ Nm^{-1}$. Find the maximum distance through which the spring will be compressed? 3

8. (a) Define pressure of gas. Prove that pressure exerted by the gas is directly proportional to the average translational kinetic energy of the gas molecules. 5

(b) How large must a heating duct be if air moving along it can replenish the air in a room of 300 m^3 volume every 15 min.? Assume the air's density remains constant. 3

9. (a) Explain Young's Double slit experiment to study the phenomenon of interference of light. 5

(b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses. 3