PHYSICS   PAPER-I   GROUP-II MTN-11-2-23

TIME ALLOWED: 20 Minutes   **OBJECTIVE**   **MAXIMUM MARKS: 17**

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	Dimensions of ratio of angular momentum to linear momentum is _____.	$[M^0LT^0]$	$[MLT]$	$[ML^2T]$	$[M^{-1}L^{-1}T^{-1}]$
2	Which of the following is a derived quantity?	Length	Mass	Time	Force
3	If a force of 5N is applied parallel to momentum arm of 5m, the torque is equal to:	Zero	5Nm	10Nm	25Nm
4	$AB\sin\theta\,\hat{n} \times AB\sin\theta\,\hat{n}$ is:	$A^2B^2\sin^2\theta$	A^2B^2	$A^2B^2\hat{n}$	$\vec{0}$
5	Impulse has the same units as that of:	Linear momentum	Force	Energy	Mass
6	The angle of projection for which its maximum height and horizontal range are equal:	$46''$	$56''$	$66''$	$76''$
7	If velocity and mass of a moving object are doubled, then K.E. becomes:	Double	4 times	6 times	8 times
8	The moment of inertia of thin rod is given by:	$12ML^2$	$\frac{1}{12}ML^2$	$\frac{2}{5}ML^2$	ML^2
9	The ratio of escape velocity to the critical orbital velocity is:	2	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\sqrt{2}$
10	The dimensions of gh is similar as that of:	K.E.	Pressure	Power	Volume
11	The dimensions of spring constant is:	$[MLT]$	$[MLT^{-2}]$	$[MLT^{-3}]$	$[M L^0 T^{-2}]$
12	The value of 'γ' for polyatomic gas is:	1.67	1.69	1.40	1.29
13	In sonar, we use:	Ultrasonic waves	Ultraviolet waves	Radio waves	Micro waves
14	Bending of light around the edges of an obstacle is called:	Refraction	Interference	Diffraction	Polarization
15	Refractive index is given by:	$\frac{c}{v}$	$\frac{v}{c}$	$\sqrt{\frac{c}{v}}$	$\sqrt{\frac{v}{c}}$
16	Absolute zero corresponds to:	$-360''F$	$-460''F$	$360''F$	$373''F$
17	Carnot cycle consists of:	Single step	Two steps	Three steps	Four steps

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NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

$8 \times 2 = 16$

2. Attempt any eight parts.

(i) The wavelength 'λ' of a wave depends on the speed 'v' of the wave and its frequency f. Knowing that $[\lambda] = [L]$, $[V] = [LT^{-1}]$ and $[f] = [T^{-1}]$ Decide which of the following is correct $f = v\lambda$ or $f = \dfrac{v}{\lambda}$

(ii) The period of simple pendulum is measured by a stop watch. What type of errors are possible in the time period.

(iii) What is the Absolute uncertainty? What is its actual value?

(iv) Check the correctness of the relation $v = \sqrt{\dfrac{F \times \ell}{m}}$ where 'v' is the speed of transverse wave on a stretched string of tension 'F', length 'ℓ' and mass 'm'.

(v) Name the three different conditions that could make $A_1 \times A_2 = 0$.

(vi) Can a body rotate about its centre of gravity under the action of its weight?

(vii) Write two conditions of Equilibrium.

(viii) Can the velocity of an object reverse direction when acceleration is constant? If so, give an example.

(ix) Define impulse and show that how it is related to linear momentum?

(x) How is the Time of Flight? Calculated for Projectile.

(xi) What is the Maximum Range? Write its mathematical formula.

(xii) Two row boats moving parallel in the same direction are pulled towards each other. Explain.

$8 \times 2 = 16$

3. Attempt any eight parts.

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

(ii) When a rocket re-enters in the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?

(iii) A 70kg man runs up a long flight of stairs in 4.0s. The vertical height of the stairs is 4.5m. Calculate his power output in watts.

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

(v) A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?

(vi) A disc without slipping rolls down a hill of height 10.0m. If the disc starts from rest at the top of the hill, what is its speed at bottom?

(vii) What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?

(viii) Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain.

(ix) Define Resonance. Give its types.

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

(xi) How are beats useful in tuning musical instruments?

(xii) Why did Newton fail to calculate the velocity of sound accurately?

$6 \times 2 = 12$

4. Attempt any six parts.

(i) How does one can obtain a plane wave?

(ii) An oil film spreading over a wet footpath shows colours. Explain how does it happen?

(iii) Why the polaroid sunglasses are better than ordinary sunglasses?

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

(v) A telescope is made of an objective of focal length 20cm and an eye piece of focal length 5.0cm, both convex lenses. Find the angular magnification.

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

(vii) For an Adiabatic Process, write down the form of first law of thermodynamics.

(viii) A thermos flask containing milk as a system is shaken rapidly. Does the temperature of milk rise?

(ix) Does entropy of a system increase or decrease due to friction?

SECTION-II

$3 \times 8 = 24$

NOTE: Attempt any three questions.

5.(a) Define Gravitational Field. Prove that work done in the Earth's gravitational field is independent of path followed. **5**

(b) Find the angle between the two vectors, $A = 5\hat{i} + \hat{j}$ and $B = 2\hat{i} + 4\hat{j}$. **3**

6.(a) Define Linear momentum and explain the Law of Conservation of Linear momentum. **5**

(b) A body of moment of inertia $I = 0.80 \, kgm^2$ about a fixed axis, rotates with a constant angular velocity of $100 \, rad \, s^{-1}$. Calculate its angular momentum L and the torque to sustain this motion. **3**

7.(a) What is Carnot's engine? Explain its working and calculate its efficiency. Also state Carnot's theorem. **5**

(b) What gauge pressure is required in the city mains for a stream from a fire hose connected to the mains to reach a vertical height of 15.0m? **3**

8.(a) What is Doppler effect? Find the change in frequency due to doppler effect when (i) Observer is moving towards the source at rest. (ii) Source is moving towards the observer at rest. **5**

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

9.(a) Describe the diffraction of X-rays through crystals. Also verify Bragg's equation and describe its use. **5**

(b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24cm apart. Find the focal length's of these lenses. **3**