

SECTION – I

LHR-G-22

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

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- (i) Find the uncertainty in the time period of a vibrating body, if time of 30 vibrations of a simple pendulum recorded by a stopwatch accurate upto one tenth of a second is 54.6 sec.
- (ii) A light year is the distance light travels in one year. How many meters are there in one light year?
- (iii) Show that the famous “Einstein’s equation” $E = mc^2$ is dimensionally consistent.
- (iv) The time period of a simple pendulum is measured by a stopwatch. What types of errors are possible in the time period?
- (v) At what point or points in its path does a projectile have its minimum speed, its maximum speed?
- (vi) Define impulse and show that how it is related to linear momentum?
- (vii) Define instantaneous velocity and instantaneous acceleration and write their mathematical relations.
- (viii) Prove that height gained by the projectile is given by $H = \frac{V_i^2 \sin^2 \theta}{2g}$
- (ix) Derive Charles’ law on the basis of kinetic molecular theory of gases.
- (x) Prove that $W = P\Delta V$
- (xi) Why does the pressure of a gas in a car tyre increases when it is driven through some distance?
- (xii) Specific heat of a gas at constant pressure is greater than specific heat at constant volume, why?

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

16

- (i) Define the terms : (a) Unit vector. (b) Position vector.
- (ii) Can the magnitude of a vector have a negative value?
- (iii) Differentiate between both the types of equilibrium with examples.
- (iv) When rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- (v) What is meant by escape velocity? What is the value of escape velocity for earth?
- (vi) State and derive the work energy principle.
- (vii) Prove that $1 \text{ rad} = 57.3^\circ$.
- (viii) What is the physical significance of moment of inertia?
- (ix) Why does a diver change his body positions before and after diving in the pool?
- (x) What is meant by coherent sources of light?
- (xi) Why the centre of Newton rings is dark? Explain.
- (xii) Can visible light produce interference fringes? Explain.

(Turn Over)

(2)

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

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- (i) How can the laminar flow be changed into turbulent flow?
- (ii) Does frequency depends on the amplitude of harmonic oscillator?
- (iii) What are free and damped oscillations?
- (iv) How can you compare the masses of two bodies by observing their frequencies of oscillation when suspended by a spring?
- (v) Why does sound travel faster in solids than in gases?
- (vi) What is the difference between progressive and stationary waves?
- (vii) What is the effect of density on the speed of sound?
- (viii) Distinguish between magnifying power and resolving power.
- (ix) Name three major components of fibre optic communication system.

SECTION – II

Note : Attempt any THREE questions.

- 5. (a) How can you add two vectors by rectangular components? 5
- (b) Ten bricks, each of 6 cm thick and mass 1.5 kg lie flat on table. How much work is done to stack them one on the top of another? 3
- 6. (a) Derive the expressions for final velocities of two hard smooth balls after their elastic collision in one dimension. 5
- (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km so that there will be no tendency for the pilot to fall down at highest point. 3
- 7. (a) Derive a relation for the frequency of stationary waves set up on a stretched string, if the string is mode to vibrate in n loops. 5
- (b) Certain globular protein particle has a density of 1246 kg m^{-3} . It falls through pure water ($\eta = 8.0 \times 10^{-4} \text{ kg m}^{-1} \text{ s}^{-1}$) with a terminal speed of 3.0 cm h^{-1} . Find the radius of the particle. 3
- 8. (a) Explain phenomenon of resonance. How would you demonstrate resonance? Give examples where resonance plays an important role. 5
- (b) Yellow sodium light of wave length 589 nm emitted by the single source passes through two narrow slits, 1.0 mm apart. The interference pattern observed on a screen 225 cm away. How far apart are two adjacent bright fringes? 3
- 9. (a) How would you determine the speed of light by using Michelson's experiment? Also, make the diagram of this method. 5
- (b) 336 J of energy is required to melt 1 g of ice at 0°C . What is the change in entropy of 30g of water at 0°C as it is changed to ice at 0°C by a refrigerator? 3

41-222-I-(Essay Type) - 58000

Roll No _____ (To be filled in by the candidate) (Academic Sessions 2018 – 2020 to 2021 – 2023)
PHYSICS 222-(INTER PART – I) Time Allowed : 20 Minutes
 Q.PAPER – I (Objective Type) GROUP – II Maximum Marks : 17

PAPER CODE = 6472

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 42-22**

1-1	SI unit of intensity of light is : (A) Mole (B) Kelvin (C) Candela (D) Ampere
2	SI system is built up by how many kinds of units : (A) Six (B) Five (C) Four (D) Three
3	SI unit of torque is : (A) Nm^{-1} (B) Nm (C) Nm^{-2} (D) $Kgm^{-1}s^{-1}$
4	For a body to be in complete equilibrium : (A) $a = 0$ and $\alpha = 0$ (B) $\Sigma \vec{F} = 0$ (C) $\Sigma \vec{\tau} = 0$ (D) $\Sigma \vec{F}_x = \Sigma \vec{F}_y$
5	The acceleration of $1.5 ms^{-2}$ is expressed in kmh^{-2} : (A) 324 (B) 19440 (C) 2.25 (D) 5400
6	For what angle of projection projectile has maximum horizontal range : (A) 90° (B) 0° (C) 45° (D) 30°
7	One kilo watt is equal to : (A) 1000 J/S (B) 10^6 watt (C) 0.1×10^3 watt (D) 6.25×10^{25} J
8	Magnitude of centripetal acceleration is : (A) rw^2 (B) r^2w (C) $\frac{w^2}{r}$ (D) r^2w^2
9	One torr in Nm^{-2} is equal to : (A) 1.333 (B) 133.3 (C) 1333 (D) 13.33
10	Radius of geostationary orbit is : (A) $4.23 \times 10^4 m$ (B) $4.23 \times 10^4 km$ (C) 6400 km (D) $423 \times 10^4 km$
11	Example of mechanical wave is : (A) Water wave (B) Radio wave (C) Infrared wave (D) Ultraviolet wave
12	Distance between node and consecutive antinode is : (A) $\frac{\lambda}{2}$ (B) $\frac{3\lambda}{2}$ (C) $\frac{\lambda}{4}$ (D) λ
13	Open end of an organ pipe act as : (A) Node (B) Antinode (C) Crest (D) Trough
14	In Young's double slit experiment fringe spacing will be maximum if we use : (A) Green light (B) Red light (C) Blue light (D) Yellow light
15	If N is number of ruling on the grating then the resolving power in mth order diffraction is equal to : (A) $R = \frac{N}{m}$ (B) $R = N \times m$ (C) $R = \frac{m}{N}$ (D) $m + \frac{N}{2}$
16	For one mole of an ideal gas , the gas equation becomes : (A) $PV = nRT$ (B) $PV = 3RT$ (C) $PV = \frac{3}{2}RT$ (D) $PV = RT$
17	SI unit of entropy is : (A) $\frac{J}{Kg}$ (B) $\frac{J}{K}$ (C) $Kgms^{-1}$ (D) JK

SECTION – I

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

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- (i) Name several repetitive phenomenon occurring in nature which could serve as reasonable time standard.
- (ii) The period of simple pendulum is measured by a stopwatch. What type of errors are possible in the time period?
- (iii) What choice would have made to take zero as significant figure? Explain your reason.
- (iv) What is your opinion to minimize the systematic error? Support your response.
- (v) Explain the circumstances in which velocity ' v ' and acceleration ' a ' of a car are :
 (a) Parallel. (b) Anti-parallel.
- (vi) An object is thrown upward vertically. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air.
- (vii) What do you think about the acceleration of 3g or more? Is this acceleration safe for us?
- (viii) Water flows out from a pipe at 3kg/s and its velocity changes from 5m/s to zero on striking the ball. Calculate the force of water flow.
- (ix) Does the entropy of a system increase or decrease due to friction?
- (x) What do you understand by adiabatic process?
- (xi) What is the condition for an ideal reversible heat engine?
- (xii) What are the four successive processes in a petrol engine?

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

16

- (i) The vector sum of three vectors gives a zero resultant. What can be orientation of the vectors?
- (ii) Is it possible to add 6 in $4\hat{i}$? Explain.
- (iii) If $\vec{A} = 2\hat{i} - 2\hat{j}$, then what will be the orientation of $\vec{A}$?
- (iv) An object has 1 J of potential energy. Explain what does it mean?
- (v) Prove that $P = \vec{F} \cdot \vec{V}$
- (vi) How energy is obtained from direct combustion and fermentation?
- (vii) Show that orbital angular momentum $L_o = mvr$
- (viii) What is meant by angular momentum? State law of conservation of angular momentum?
- (ix) What are banked track? Explain briefly.
- (x) Can visible light produce interference fringes? Explain.
- (xi) Why the polaroid sunglasses are better than ordinary sunglasses?
- (xii) What is difference between interference and diffraction of light waves?

(2)

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

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- (i) Why fog droplet appears to be suspended in air?
- (ii) What happens to the period of a simple pendulum if its length is doubled? What happens if suspended mass is doubled?
- (iii) Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration ever zero?
- (iv) What is driven harmonic oscillator? Give example.
- (v) What features do longitudinal waves have in common with transverse waves?
- (vi) As a result of a distant explosion, an observer senses a ground tremor and then hear the explosion. Why?
- (vii) What is doppler shift?
- (viii) Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?
- (ix) What are the conditions for detectable interference?

SECTION – II

Note : Attempt any THREE questions.

- 5. (a) Define scalar product of two vectors. Give its any four characteristics. 5
- (b) A diver weighing 750 N dives from a board 10 m above surface of a pool of water. Use the conservation of mechanical energy, to find his speed at a point 5.0 m above the water surface (ignoring friction). 3
- 6. (a) What is meant by centripetal force? Derive its relation. 5
- (b) Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. 3
- 7. (a) State and prove Bernoulli's equation in detail. 5
- (b) Two tuning forks exhibit beats at a beat frequency of 3 Hz. The frequency of one fork is 256 Hz. Its frequency is then lowered slightly by adding a bit of wax to one of its prong. The two tuning forks then exhibit a beat frequency of 1 Hz. Determine the frequency of the second tuning fork. 3
- 8. (a) Explain the Young's double slit experiment by drawing its diagram. How are determine fringe spacing by this method? 5
- (b) A simple pendulum is 50 cm long. What will be its frequency of vibration at a place where $g = 9.8 \text{ ms}^{-2}$? 3
- 9. (a) What is "Carnot Engine"? Derive formula for its efficiency. 5
- (b) An astronomical telescope having magnifying power of 5 consists of two thin lenses 24 cm apart. Find the focal length of the lenses. 3

131-222-II-(Essay Type) - 61000