PHYSICS   222-(INTER PART – I)   Time Allowed : 2.40 hours

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

SECTION – I   LHR-Gr-22

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

(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 $H = \dfrac{V_i^2 \sin^2 \theta}{2g}$

(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 rad = 57.3°.

(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)

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

  (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 $(\eta = 8.0 \times 10^{-4} kg\,m^{-1}s^{-1})$ 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 $^{\circ}$C. What is the change in entropy of 30g of water at 0 $^{\circ}$C as it is changed to ice at 0 $^{\circ}$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-G2-22*

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) $\Sigma\vec{Fx}=\Sigma\vec{Fy}$
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) $r^{2}w$	(C) $\dfrac{w^{2}}{r}$	(D) $r^{2}w^{2}$
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) $4.23\times10^{4}m$	(B) $4.23\times10^{4}km$	(C) 6400 km	(D) $423\times10^{4}km$
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) $\lambda/2$	(B) $3\lambda/2$	(C) $\dfrac{\lambda}{4}$	(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) $R=\dfrac{N}{m}$	(B) $R=N\times m$	(C) $R=\dfrac{m}{N}$	(D) $m+\dfrac{N}{2}$
16	For one mole of an ideal gas , the gas equation becomes :			
	(A) $PV=nRT$	(B) $PV=3RT$	(C) $PV=\dfrac{3}{2}RT$	(D) $PV=RT$
17	SI unit of entropy is :			
	(A) $\dfrac{J}{Kg}$	(B) $\dfrac{J}{K}$	(C) $Kgms^{-1}$	(D) JK

PHYSICS   222-(INTER PART – I)   Time Allowed : 2.40 hours
PAPER – I (Essay Type)   GROUP – II   Maximum Marks : 68

SECTION – I LHR-G2-22

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

   (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 $P = \vec{F} . \vec{V}$

   (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?

                                                        (Turn Over)

4. **Write short answers to any SIX (6) questions :** ~~LHR-G2-22~~ 12

   (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 $g = 9.8\,ms^{-2}$? 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