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.

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**

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