

**SECTION – I****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 :**

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- (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)

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

- (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 made to vibrate in $n$ loops.	5
(b) Certain globular protein particle has a density of $1246 \text{ kg m}^{-3}$ . It falls through pure water ( $\eta = 8.0 \times 10^{-4} \text{ kg m}^{-1} \text{s}^{-1}$ ) with a terminal speed of $3.0 \text{ cm h}^{-1}$ . 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 $0^\circ\text{C}$ . What is the change in entropy of 30g of water at $0^\circ\text{C}$ as it is changed to ice at $0^\circ\text{C}$ by a refrigerator?	3