

(2)

4. (v) How the power is lost in optical fibre through dispersion? Explain.
- (vi) If a person was looking through a telescope at the full moon, how would the appearance of the moon be changed by covering half of the objective lens?
- (vii) Why is the average velocity of the molecules in a gas zero but the average of the square of the velocities is not zero?
- (viii) Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- (ix) Can the mechanical energy be converted completely into heat energy? If so give an example?

SECTION - II

Note : Attempt any THREE questions.

5. (a) Define elastic collisions. Show that for elastic collisions in one dimension, the velocity of approach is equal to the velocity of separation. 5
- (b) Given that $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{B} = 3\hat{i} - 4\hat{k}$, find the projection of \vec{A} on \vec{B} . 3
6. (a) Define conservative field. Prove that the work done in the earth's gravitational field is independent of the path followed. 5
- (b) What should be the orbital speed to launch a satellite in a circular orbit 900 km above the surface of earth? (Take mass of the earth as 6.0×10^{24} kg and its radius as 6400 km) 3
7. (a) Define molar specific heat and prove the relation $C_p - C_v = R$ 5
- (b) How large must a heating duct be if air moving with 3.0 mS^{-1} along it can replenish the air in a room of 300 m^3 volume every 15 min? (Assume the air's density remains constant) 3
8. (a) Define and explain simple pendulum. 5
- (b) A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency. 3
9. (a) Describe how Michelson measured the speed of light. 5
- (b) In a double slit experiment the second order maximum occurs at $\theta = 0.25^\circ$. The wavelength is 650 nm. Determine the slit separation. 3

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