

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

SECTION – I

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. The period of pendulum is measured by a stop watch. What types of errors are possible in the time standard?
- ii. Does a dimensional analysis give any information on constant of proportionality that may appear in algebraic expressions? Explain.
- iii. Differentiate between precision and accuracy.
- iv. How many seconds are there in one year? Explain.
- v. Can a vector have a component greater than the vector's magnitude?
- vi. A force of 10 N makes an angle of 60° with x-axis. Find its x and y components.
- vii. Give two factors on which turning effect depends.
- viii. Explain the circumstances in which velocity $\vec{v}$ and acceleration $\vec{a}$ are perpendicular to one another.
- ix. A rubber ball and a lead ball of same size are moving with same velocity. Which ball has greater momentum and why?
- x. How will you differentiate between uniform and variable velocity?
- xi. An object has 1 J of potential energy. Explain.
- xii. What is escape velocity? Write the formula of escape velocity.

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?
- ii. Why centripetal force is required to keep a body moving on a circular track?
- iii. State the direction of the following vectors in simple situations: angular momentum and angular velocity
- iv. What does (INTELSAT) stand for?
- v. Explain the term viscosity.
- vi. What is difference between laminar flow and turbulent flow?
- vii. Does frequency depend on amplitude for harmonic oscillator?
- viii. Differentiate between undamped and damped oscillations with the help of a graph between amplitude and time.
- ix. Name two characteristics of simple harmonic oscillator.
- x. As a result of a distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference.
- xi. How are beats useful in tuning musical instruments?
- xii. How bats navigate their food?

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. An oil film spreading over a wet footpath shows colours. Explain.
- ii. How will you differentiate between interference and diffraction of light waves?
- iii. 20000 lines per centimeter has been ruled on a diffraction grating. Find its grating element.
- iv. How the power is lost in optical fibre through dispersion? Explain.
- v. Why would it be advantageous to use blue light with a compound microscope?
- vi. Find magnifying power of convex lens of 15 cm focal length acts as a magnifying glass.
- vii. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- viii. Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero?
- ix. State Second Law of Thermodynamics in terms of entropy.

(Turn Over)

SECTION – II

5. (a) What is an isolated system? State and explain law of conservation of linear momentum. (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 $\vec{A}$ and $\vec{B}$ (3)
6. (a) Discuss the interconversion of potential and kinetic energy when frictional force is not considered. (5)
(b) The wavelength of the signals from a radio transmitter is 1500 m and the frequency is 200 KHz. What is wavelength for a transmitter operating at 1000 KHz and with what speed the radio waves travel? (3)
7. (a) What is meant by real and apparent weight? Develop a relation between real and apparent weight (in case of an elevator). (5)
(b) What should be length of a simple pendulum whose period is 1.0 second at a place where $g = 9.8 \text{ ms}^{-2}$ (3)
8. (a) Derive Bernoulli's Equation for an ideal fluid. (5)
(b) 336 J of energy is required to melt 1 g of ice at 0°C . What is the change in entropy of 30 g of water at 0°C as it is changed to ice at 0°C by a refrigerator? (3)
9. (a) What is Michelson's interferometer? Explain its working and derive its equation. (5)
(b) A glass light pipe in air will totally internally reflect a light ray if its angle of incidence is at least 39° . What is the minimum angle for total internal reflection if pipe is in water (Refractive index of water = 1.33) (3)