

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 simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
- ii. Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.
- iii. How much distance is covered by light in one year?
- iv. Define significant figures and give its example.
- v. Define the terms (i) unit vector (ii) components of a vector
- vi. Can you add zero to a null vector?
- vii. What is the unit vector in the direction of the vector $\vec{A} = 3\hat{i} + 2\hat{j}$
- viii. An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air.
- ix. Explain the circumstances in which the velocity $\vec{v}$ and acceleration $\vec{a}$ of a car are
(i) Antiparallel (ii) Perpendicular to one another
- x. Define elastic collision and inelastic collision with examples.
- xi. State law of conservation of momentum.
- xii. Explain the term viscosity.

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. An object has 1J of P.E. Explain what does it mean?
- ii. Show that $K.E = \frac{P^2}{2m}$, where P is momentum.
- iii. How can we get energy from tides?
- iv. Define critical velocity, write its formula.
- v. Explain what is meant by centripetal force and why it must be furnished to an object if the object is to follow a circular path?
- vi. Why does a diver change his body positions before and after diving in the pool?
- vii. If mass attached to a vibrating spring-mass is increased by four times, what is the effect on its frequency?
- viii. Why the soldiers are advised to break their steps while marching on a bridge of long span?
- ix. Describe some common phenomena in which resonance plays an important role.
- x. Is it possible for two identical waves travelling in the same direction along a string to give rise to stationary wave?
- xi. Why does sound travel faster in solids than in gases?
- xii. State the principle of super position.

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. Write down two parts of Huygen's principle.
- ii. How is the distance between interference fringes affected by the separation between the slits of Young's experiment?
- iii. How would you distinguish between un-polarized and plane-polarized lights?
- iv. Find the refractive index of the medium if critical angle is 39° .

(Turn Over)

- v. What do you understand by linear magnification and angular magnification ?
- vi. Define triple point of water and give its value for water.
- vii. Give two postulates of kinetic theory of gases.
- viii. Explain that the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero.
- ix. Is it possible to convert internal energy into mechanical energy? Explain with an example.

SECTION – II

Note: Attempt any THREE (3) questions.

- 5. (a) Write down a note on addition of vectors by their rectangular components. (5)
(b) How large a force is required to accelerate an electron ($m = 9.1 \times 10^{-31} \text{ kg}$) from rest to a speed of $2 \times 10^7 \text{ m/s}$, through a distance of 5.0 cm ? (3)
- 6. (a) Derive the equations for final velocities in one dimensional elastic collision. (5)
(b) A 1000 Kg car travelling with a speed of 144 km/h, round a curve of radius 100m. Find the necessary centripetal force. (3)
- 7. (a) State and explain Bernoulli's equation. (5)
(b) 336 J of energy is required to melt 1g 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)
- 8. (a) Discuss the motion of horizontal mass spring system and also derive formula for time period, displacement and velocity. (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 fundamental frequency. (3)
- 9. (a) Describe construction and working of compound microscope. Also derive relation for its magnifying power. (5)
(b) A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wave length of a spectral line for which deviation in second order is 15.0° . (3)