

SECTION – I

2. Write short answers to any EIGHT (8) questions :

16

- (i) Write down dimensions of : (i) Co-efficient of viscosity. (ii) Pressure.
- (ii) A light year is the distance travelled by light in one year. How many meters are there in one light year? (Speed of light = $3 \times 10^8 \text{ m/s}$)
- (iii) What is an error? Write down its types.
- (iv) How the uncertainty is reduced in a timing experiment?
- (v) Two vectors have un-equal magnitudes. Can their sum be zero? Explain.
- (vi) Under what circumstances would a vector have components that are equal in magnitude?
- (vii) \vec{A} and \vec{B} are two non-zero vectors. How can their scalar product be zero? How can their vector product be zero?
- (viii) At what point or points in its path does a projectile have its minimum speed, its maximum speed?
- (ix) As an object is thrown vertically upwards, its velocity decreases. Is this against the law of conservation of linear momentum?
- (x) If 'H' is height attained by a projectile and 'T' is the time of flight, then $H = \frac{gT^2}{8}$
- (xi) What is impulse? How it is related to momentum?
- (xii) A person is standing near a fast moving train. Is there any danger that he will fall towards it?

3. Write short answers to any EIGHT (8) questions :

16

- (i) Calculate the work done when a 50 kg bag of books is lifted through 50 cm.
- (ii) When a rocket re-enters the atmosphere, its nose cone becomes very hot? Where does this heat energy come from?
- (iii) Discuss the relation and the importance of -ve sign in the relation $U_g = -\frac{GMm}{r}$.
- (iv) How centripetal force acts and give two forces which can provide centripetal force to the circulating system?
- (v) How would you explain the concept of moment of inertia in orbital and spin angular momentum?
- (vi) Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V. transmission?
- (vii) What should be the length of simple pendulum whose period is 2 sec.?
- (viii) Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is acceleration ever zero? Explain.
- (ix) What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
- (x) Why Newton's formula of speed of sound has 16% error? Support your answer by proper reasoning.
- (xi) How beats are useful in tuning musical instruments?
- (xii) Define the terms crest and trough.

(Turn Over)

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

- (i) Can visible light produce interference fringes? Explain.
- (ii) How would you distinguish between un-polarized and plane-polarized light?
- (iii) Define air film. Write its two examples.
- (iv) Why would it be advantageous to use blue light with a compound microscope?
- (v) What are the uses of spectrometer?
- (vi) Why does the pressure of a gas in a car tyre increases when it is driven through some distance?
- (vii) Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- (viii) Derive Charles' law from kinetic theory of gases.
- (ix) Define triple point of water, also write its value.

SECTION – II

Note : Attempt any THREE questions.

- 5. (a) Define vector or cross product. Give examples. Give at least four characteristics of vector product. 5
- (b) How large force is required to accelerate an electron ($m=9.1 \times 10^{-31} \text{ kg}$) from rest to a speed of $2 \times 10^7 \text{ ms}^{-1}$ through a distance of 5.0 cm? 3
- 6. (a) What are geostationary orbits and geostationary satellites? Derive the relation for the radius of a geostationary satellite. 5
- (b) A football is thrown upward with an angle of 30° with respect to the horizontal. To throw a 40 m pass what must be the initial speed of the ball? 3
- 7. (a) State and prove the Bernoulli's equation in fluid dynamics that relates the pressure to the fluid speed and height. 5
- (b) A heat engine performs 100 J of work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine? 3
- 8. (a) What is simple pendulum? Show that its motion is SHM. Derive an expression for its time period. 5
- (b) The wavelength of the signal from a radio transmitter is 1500 m and the frequency is 200 KHz. What is the wavelength for a transmitter operating at 1000 KHz and with what speed the radio waves travel? 3
- 9. (a) What is diffraction of light? Calculate the wavelength of light used by diffraction grating. 5
- (b) A simple astronomical telescope in normal adjustment has an objective of focal length 100 cm and an eye piece of focal length 5.0 cm. Calculate the angular magnification. 3