

Time: 2:40 Hours

SUBJECTIVE

Marks: 68

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)

- Calculate the dimension of physical quantities, if possible, 2π and rupees hundred.
- Add the following masses given in kg upto appropriate precision 2.189, 0.089, 11.8 and 5.32.
- State the principle of homogeneity of physical quantities equation.
- What are the dimensions and units of gravitational constant G in the formula $F = \frac{G m_1 m_2}{r^2}$?
- Find the dot product of two vectors, if $\vec{A} = 3\hat{k}$ and $\vec{B} = -5\hat{j}$.
- Write down the five steps to find addition of vectors by rectangular components.
- Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?
- Add a vector $\vec{A} = 2\hat{i} + 3\hat{j}$ and thirty chairs.
- When two identical masses collide with each other in elastic collision. What will be the velocities after collision?
- Is momentum is conserved in an inelastic collision? Explain the reason.
- How the hair acts like a crumple zone on your skull?
- Is law of conservation of momentum is valid in an inelastic collision?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- An object has one J of potential energy. Explain what does it mean?
- Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.
- State law of conservation of energy.
- Define escape velocity. Give its units.
- State law of conservation of angular momentum. Also define isolated system.
- State the direction of following in simple situation, angular momentum, angular velocity.
- Is it possible for two identical waves travelling in same direction along a string to give rise to a stationary wave?
- How are beats useful in tuning musical instruments?
- What is relation between total energy, potential energy and kinetic energy of a body executing SHM?
- What is meant by phase angle; does it define angle between maximum displacement and driving force?
- Describe some common phenomena in which resonance plays an important role.
- Define free and forced oscillations.

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- How would you get more orders of spectra using a diffraction grating?
- Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?
- Define diffraction grating. Write the formula for grating element.
- Why would it be advantageous to use blue light with compound microscope?

(Turn Over)

- v. Define isothermal process and adiabatic process.
- vi. Differentiate between reversible and irreversible processes.
- vii. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- viii. Briefly explain total internal reflection.
- ix. Derive Boyles law from kinetic molecular theory of gases.

(SECTION - II)

5. (a) Define elastic collision. Show that relative speed of approach is equal to relative speed of separation for one dimensional collision. 5
- (b) The magnitude of dot and cross product of two vectors are $6\sqrt{3}$ and 6 respectively. Find the angle between the vectors. 3
6. (a) Define stationary waves. Show that frequencies of stationary waves in a stretched string are quantized. 1+4
- (b) A car of mass 800 kg travelling at 54 km h^{-1} is brought to rest in 60 metres. Find the average retarding force on the car. 3
7. (a) Define moment of inertia. Give its unit and dimension. Derive its relation for a rigid body. 5
- (b) Certain globular protein particle has a density of 1246 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 3.0 cm h^{-1} . Find radius of the particle. 3
8. (a) What is SHM? Derive a relation for instantaneous velocity and acceleration in terms of ω in SHM and uniform circular motion. 1+4
- (b) A thermodynamic system under goes a process in which its internal energy decreases by 300 J. If at the same time 120 J of work is done on the system. Find the heat lost by the system. 3
9. (a) What is a simple microscope? Calculate its magnifying power. 5
- (b) A second order spectrum is formed at an angle of 38° when light falls normally on a diffraction grating having 5400 lines per centimetre. Determine wavelength of the light used. 3

214-321-45000