

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

SECTION - I

2. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- Name several repetitive phenomenon which could serve as reasonable time standards.
- Give the drawbacks to use the period of pendulum as time standard.
- Check the correctness of $v = \sqrt{\frac{F \times l}{m}}$ where v is speed of transverse wave on a stretched string of tension F , length l and mass m .
- Define base units and name all SI base units.
- At which angle of projection a projectile for which its maximum height and horizontal range are equal.
- What are objectives of velocity time graph.
- Motion with constant velocity is a special case of constant acceleration. Is this statement true? Discuss.
- Define impulse and how it is related to linear momentum.
- Why the pressure of a car tyre increase when it is driven through some distance.
- Is it possible to convert internal energy into mechanical energy. Explain with an example.
- Give an idea of working refrigerator.
- Can mechanical energy be converted into heat energy? If so give an example.

3. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- Define the terms unit vector and position vector.
- Explain the addition of two vectors by head to tail rule.
- Define conservative field and give example.
- Explain fermentation process to get energy from biomass.
- An object has 1J of potential energy. Explain what does it mean?
- Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission.
- What is meant by moment of inertia? Explain its significance.
- Prove that $1 \text{ rad} = 57.3^\circ$.
- What is meant by wave fronts?
- Under what conditions two or more sources of light behave as coherent sources?
- An oil film spreading over a wet footpath shows colours. Explain how does it happen.

4. Write short answers to any SIX questions.

(2 × 6 = 12)

- A person is standing near a fast moving train. Is there any danger that he will fall towards it?
- Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration zero? Explain.
- What is resonance? Give one application.
- Give an application of damped oscillations.
- Why does sound travel faster in solids than in gases?
- What is meant by blue shift in dopplers effect?
- How beats are useful in tuning a musical instrument?
- Why a convex lens of shorter focal length is preferred for a magnifying glass?
- How the power is lost in optical fibre through dispersion? Explain.

SECTION - II

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

- Define vector product of two vectors. Show that it is non commutative. Also write any four characteristics. (5)
 - A car of mass 800 kg travelling at 54 Km h^{-1} is brought to rest in 60 meters. Find the average retarding force. What has happened to original K.E? (3)
- Define centripetal force. Derive a relation for centripetal force on a body of mass m moving with velocity v in a circle of radius r . (5)
 - A ball is thrown horizontally from a height of 10m with velocity of 21m/s. How far off it hit the ground and with what velocity? (3)
- State and prove equation of continuity using Law of conservation of mass. (5)
 - A church organ consists of pipes, each open at one end of different lengths. The minimum length is 30cm and longest is 4m. Calculate the frequency range of fundamental notes. Speed of sound = 340 ms^{-1} (3)
- Derive the expression for time period, displacement and velocity of horizontal mass spring system. (5)
 - A monochromatic light of $\lambda = 588 \text{ nm}$ is allowed to fall on the half silvered glass plate G1, in Michelson interferometer. If mirror M1 is moved through 0.233 mm, how many fringes will be observed to shift? (3)
- Draw ray diagram of a compound microscope and derive expression for its magnification. (5)
 - A heat engine perform 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)