

**SECTION – I**

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

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- (i) Define light year. Calculate its value. (Speed of light  $C = 3 \times 10^8 \text{ ms}^{-1}$ )
- (ii) Give the definition of unit of solid angle.
- (iii) How a vector is subtracted from another vector? Explain using diagram.
- (iv) Find unit vector in the direction of the vector  $\vec{A} = 12\hat{i} - 5\hat{j}$
- (v) Name three different conditions that could make  $\vec{A}_1 \times \vec{A}_2 = \vec{0}$
- (vi) Calculate the work done in kilo joules in lifting a mass of 10 kg ( at steady velocity) through a vertical height of 10 m.
- (vii) Prove that  $1 \text{ kWh} = 3.6 \text{ MJ}$
- (viii) How does a chimney work?
- (ix) Explain, how the swing is produced in a fast moving cricket ball?
- (x) What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?
- (xi) Does frequency depend on amplitude for harmonic oscillator?
- (xii) Define angular frequency. Give its formula and unit.

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

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- (i) A rubber ball and lead ball of same size, are moving with same velocity. Which ball have greater momentum and why?
- (ii) A bullet is fired from a rifle. Derive the relation for velocity of rifle.
- (iii) Define range of projectile. In which situations its value is maximum and minimum.
- (iv) Define impulse of the force and how can it relate with momentum.
- (v) Define radian and degree and what is relation between them.
- (vi) Define critical velocity and find its value.
- (vii) What is difference between Newton's and Einstein's views of gravitation?
- (viii) Define geo-synchronous satellite and what is the height of such satellite above the earth?
- (ix) What are the conditions for interference of two sound waves?
- (x) What is effect of temperature on speed of sound?
- (xi) What is effect on frequency of sound waves, when source and observer are moving towards each other?
- (xii) How are beats useful in tuning musical instruments?

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

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- (i) 5000 lines per centimeter has been ruled on a diffraction grating. Find its grating element.
- (ii) What is optically active crystals?
- (iii) State Huygen's principle.

(Turn Over)

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

- (i) What is Bragg's law? Derive Bragg's equation.
- (ii) Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.
- (iii) How would you manage to get more orders of spectra during a diffraction grating?
- (iv) Write two differences between angular magnification and resolving power.
- (v) How a single bi-convex lens can be used as a magnifying glass?
- (vi) Derive Charles' law from kinetic theory of gases.
- (vii) Justify! Work and heat are similar.
- (viii) Show that : Change in entropy is always positive.
- (ix) What happens to the temperature of the room when an air-conditioner is left running on a table in the middle of the room?

#### SECTION - II

**Note :** Attempt any THREE questions.

5. (a) Prove that molar specific heat of a gas at constant pressure  $C_p$  is greater than molar specific heat at constant volume  $C_v$  by an amount equal to universal gas constant  $R$ . 5
- (b) Suppose, we are told that the acceleration of a particle moving in a circle of radius  $r$  with uniform speed  $v$  is proportional to some power of  $r$ , say  $r^n$ , and some power of  $v$ , say  $v^m$ , determine the powers of  $r$  and  $v$ . 3
6. (a) Explain the method of vector addition by rectangular components. 5
- (b) A foot ball is thrown upward with an angle of  $30^\circ$  with respect to the horizontal. To throw a 40 m pass what must be the initial speed of the ball? 3
7. (a) Define absolute potential energy. Derive relation for absolute P.E. of a body of mass  $m$ . 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 the fundamental frequency. 3
8. (a) Define SHM. Prove that total energy remains conserved in mass-spring system, oscillating with SHM. 5
- (b) A gramophone record turntable accelerate from rest to an angular velocity of  $45.0 \text{ rev min}^{-1}$  in 1.60 s. What is its average angular acceleration? 3
9. (a) What is compound microscope? Describe its construction and working also calculate its magnification. 5
- (b) In a double slit experiment the second order maximum occurs at  $\theta = 0.25^\circ$ . The wavelength is 650 nm. Determine the slit separation. 3