Time allowed: 2.35 hours Total Marks: 68

Note: Sections 'B' 'C' and 'D' comprise pages 1-2 and questions therein are to be answered on the separately provided Answer Book. Use supplementary answer sheet i.e., sheet B if required. Write your answers neatly and legibly.

SECTION - B (Marks 21)

(Chapters 1 to 5)

Q2. Attempt any SEVEN parts. All parts carry equal marks. $(7 \times 3 = 21)$

i. If an equation is dimensionally correct, is that equation a right equation?

ii. Define the number π and show that 2π radian = 360^o

iii. Explain the warning 'Never use a large wrench to tighten a small bolt'.

iv. A central force is one that is always directed toward the same point. Can a central force give rise to a torque about that point?

v. Modern cars are not rigid but are designed to have 'crumple zones' (irregular fold) that collapse upon impact. What is the advantage of this new design?

vi. Why we can hit a long sixer in a cricket match rather than if we toss a ball for ourselves?

vii. How fast would the moon need to travel in order to escape the gravitational pull of Earth, if Earth has a mass of 5.98×10^{24} kg and the distance from Earth to the moon is 3.84×10^8 m?

viii. Calculate the values of the escape velocity of a body and show that it is equal 11.2 km s^{-1}.

ix. Why is the fly wheel of an engine made heavy in the rim?

x. Why is a rifle barrel rifled?

SECTION - C (Marks 21)

(Chapters 6 to 10)

Q3. Attempt any SEVEN parts. All parts carry equal marks. $(7 \times 3 = 21)$

i. From the top of a tall building, you drop two table-tennis balls, one filled with air and the other with water. Which ball reaches terminal velocity first and why?

ii. Why can a squirrel jump from a tree branch to the ground and run away undamaged, while a human could break a bone in such a fall?

iii. What happens to the time period of a simple pendulum if its length is doubled?

iv. What will be the frequency of a simple pendulum if its length is '1 m'?

v. Clearly explain the difference between longitudinal and transverse waves.

vi. How are beats useful in tuning a musical instrument?

vii. A soap bubble looks black when it bursts, why?

viii. What is the difference between interference and diffraction?

ix. Why is the earth not in thermal equilibrium with the sun?

x. A thermometer is placed in direct sunlight. Will it read the temperature of the air, or of the sun, or of something else?

SECTION - D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. $(2 \times 13 = 26)$

Q4. a. What are centripetal acceleration and centripetal force? Derive their equations.

b. What is the kinetic energy of a 5.0 kg solid ball whose diameter is 15 m if it rolls across a level surface with a speed of 2 ms^2?

Q5. a. Explain Newton's formula for the speed of sound. Show that how it was corrected by a French scientist Laplace?

b. What length of open pipe will produce a frequency of 1200 Hz as its first overtone on a day when the speed of sound is 340 m s^{-1}?

Q6. a. What is meant by dimensions of physical quantities? What are limitations and applications of dimensional analysis?

b. A circular pizza into 3 equal parts, one piece of pizza is taken out. Estimate the degree measure of the single piece of pizza and convert the measure into radians. What is the radian measure of the angle of the remaining part of pizza?