Time allowed: 2:35 Hours | Total Marks Sections B, C and D: 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 × 3 = 21)

i. Show that the famous Einstein's equations $E = mc^2$ is dimensionally consistent.

ii. Give the draw backs to use the period of a pendulum as a time standard.

iii. Under which circumstances would a vector shall have components of same magnitude?

iv. Explain briefly why buses and heavy trucks have large steering wheels?

v. What is Head-on Collision? Explain briefly with an example.

vi. What is the angle of projection for a projectile for which the maximum height reached and corresponding range are equal?

vii. Does a hydrogen-filled balloon possess P.E? Explain briefly.

viii. A bucket is taken to bottom of a well; does the bucket possess any P.E? Explain briefly.

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

x. A ball is just supported by a string without breaking. If it is set swinging, it breaks. Why?

SECTION – C (Marks 21)

(Chapters 6 to 10)

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

i. Why a sports car has oblong shape design?

ii. Describe the working of an engine carburetor.

iii. Give two applications from daily lives of phenomenon in which resonance plays an important role.

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

v. What are the conditions for constructive and destructive interference?

vi. How one can locate the position of nodes and anti-nodes in a vibrating string?

vii. Can we apply Huygens Principle to radar waves? Explain briefly.

viii. How you can explain Brewster's Law of Polarization?

ix. What are the conditions for a process to be reversible?

x. Entropy has often called as "times arrow". Explain briefly.

SECTION – D (Marks 26)

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

Q.4 a. Prove that Absolute

$$P.E = \frac{GmM_e}{R_e} \quad (8)$$

b. A man whose mass is 70 kg walks up to the third floor of a building which is 12 m above the ground is 20 Sec. Find his power in watts and hp. (5)

Q.5 a. Derive equation for kinetic and potential energy of a body executing S.H.M for a mass-spring system. (8)

b. What should be the length of a simple pendulum whose time period is one second? What is its frequency? (5)

Q.6 a. Describe the experimental arrangement for the production of interference fringes by young's double slit method, and get an expression for the fringe spacing. (8)

b. In a certain X-rays diffraction experiment the first order image is observed at an angle of 5° for a crystal plane spacing of 2.8×10^{-10} m. What is the wave length of X-ray used? (5)