

N.B. i) Answer SIX questions taking THREE from each section.

ii) All questions are of equal values.

iii) Use separate answer script for each section.

Section-A

- Q.1. a) State and explain the principle of conservation of linear momentum 2.67
- b) Show that when a hard rubber ball is dropped on a hard ground vertically, it rebounds practically with the same velocity upwards 5
- c) A 2.5kg ball travelling with a speed of 7.5m/s makes an elastic collision with another ball of 1.5kg and travelling at the speed of 3.0m/s in the same direction. What are the velocities of the balls immediately after collision? 4
- Q.2. a) Derive Differential equation of a simple harmonic motion 4.67
- b) Show that for a particle executing SHM, the instantaneous velocity is $\Omega \sqrt{a^2 - y^2}$ and instantaneous accelerations is $-\Omega^2 y$. 2
- c) Derive an expression for angular velocity of a forced vibration. 5
- Q.3. a) State and explain the Doppler's principle. 2
- b) Derive the expression for the centripetal acceleration of a body moving with a uniform velocity in a circle. 3
- c) Compare between perfectly elastic and inelastic collision. 3.67
- d) State Wein's law of black body radiation. What is the physical significance of this law? 3
- Q.4. a) For a cyclic process, prove that the 1st law of thermodynamics represent s Joule's law. 3
- b) Define entropy. What is the physical significance of entropy? 2.67
- c) Give the results with figure obtained by Lummer and Pringsheim for energy distribution in the spectrum of a black body. 3
- d) Determine the force of gravitational attraction between the earth 5.98×10^{24} kg and a 70 kg boy who is standing at sea level, a distance of 6.38×10^6 m from earth's center. 3

Section-B

- Q.5. a) Give the conditions of coherent waves. 2.67
- b) What is interference of light? Derive the equation for fringe separation in Young's double slit experiment. 5
- c) In a Newton's ring's experiment the diameter of the 15th ring was found to 0.59cm and that of 5th ring was 0.336cm. If the radius of the plano-convex lens is 100cm, calculate the wavelength of light used. 2
- d) Mention some applications od Newton's ring experiment. 2