

2021
B.A./B.Sc.
First Semester
 CORE – 2
PHYSICS
Course Code: PHC 1.21
 (Mechanics)

PART-B
 Total Mark: 30

Answer the following questions.

1. For a system of two particles,
 - (i) show that the centre of mass divides the line joining the two masses in the inverse ratio of the masses. 2
 - (ii) obtain the expression of velocity, acceleration and linear momentum of centre of mass. 4

 2. (a) In case of perfectly elastic collision of two particles of masses M and m having velocities V and v respectively in one dimension, what will happen to their velocities after collision, if their masses are equal? 2
 - (b) Find the moment of inertia of a rectangular lamina about an axis through its centre and parallel to one side. Also using theorem of parallel axes, obtain the moment of inertia about one side of the lamina. 4

 3. (a) The period of a satellite in circular orbit of radius 12000 km around a planet is 3 hours . Obtain the period of another satellite orbiting around the same planet in circular orbit of radius 48000 km . 2
 - (b) Calculate the gravitational potential and field due to a spherical shell of mass 10 kg and radius 0.5 m at a point 1 m from the centre of the shell and on the surface of the shell. 4

 4. (a) A gold wire, 0.32 mm in diameter, elongates by 1 mm when stretched by a force of 330 gm wt and twisted through 1 radian when equal and opposite torques of 145 dyne-cm are applied at its ends. Find the value of Poisson's ratio for gold. 3
 - (b) Prove that the total energy of a harmonic oscillator is a constant and proportional to the square of the amplitude. 3

 5. (a) Prove that the velocity of light is the maximum attainable velocity. 3
 - (b) A proton of mass $1.67 \times 10^{-24}\text{ gm}$ is moving with a speed of 0.9 c . Find its mass and momentum. 3
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