INDIAN SCHOOL MUSCAT

CLASS : 11

SUBJECT : PHYSICS

WORKSHEET 5

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DATE :……..

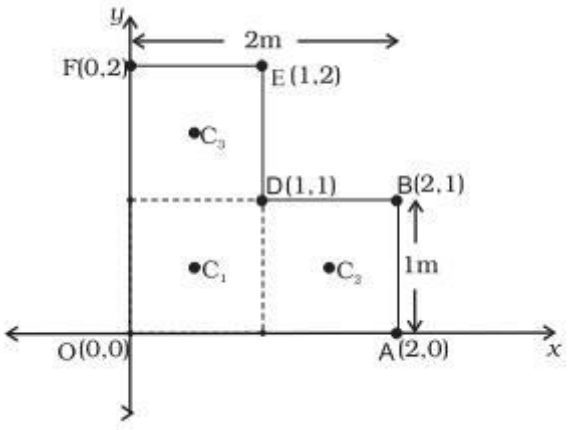
TOPIC : SYSTEMS OF PARTICLES AND ROTATIONAL MOTION

SECTION – A CONCEPTUAL AND APPLICATION TYPE QUESTIONS

1. Does the centre of mass of a solid necessarily lie within body? If not, give an example.
2. Standing is not allowed in double decker bus. Why?
3. A person is sitting in the compartment of a train moving with uniform velocity on smooth track. How will the velocity of C.M. of compartment change if person begins to run in compartment?
4. While turning the page of book, we usually apply force perpendicular to the plane of the page at farthest end. Explain why?
5. Why is it more difficult to revolve a stone tied to a large string than a stone tied to a smaller string?
6. State the law of conservation of angular momentum.
7. Explain why the speed of whirl wind in a tornado is alarmingly high?
8. State the theorem of perpendicular axes for moment of inertia.
9. State the theorem of parallel axes for moment of inertia.
10. What are the factors on which the moment of inertia of a body depend ?

SECTION – B NUMERICAL PROBLEMS

1.



Find the centre of mass of uniform L-shaped lamina (a thin flat plate) with dimensions as shown in figure. The mass of lamina is 3kg.

2. Three identical spheres each of radius R, placed touching each other on a horizontal table. Locate the position of the centre of mass of the system.

3. Three balls of masses 1, 2 and 3 kg respectively are arranged at the corners of an equilateral triangle of side 1m. What will be the M. I. of the system about an axis through the centroid and perpendicular to the plane of triangle?

4. A metre stick is balanced on a knife edge at its centre. When two coins, each of mass 5g are put one on top of the other at 12.0 cm mark, the stick is found to be balanced at 45.0 cm. Find the mass of the metre stick.

5. A car weighs 1800 kg. The distance between its front and back axles is 1.8 m. Its centre of gravity is 1.05 m behind the front axle. Determine the force exerted by level ground on each front wheel and each back wheel.

6. What will be the duration of the day, if the earth suddenly shrinks to 1/64 of its original volume, mass of earth remains unchanged?

7. To maintain a rotor at a uniform angular speed of 200 rad s^{-1}, an engine needs to transmit a torque of 180 Nm. What is the power required by the engine?

8. A rope of negligible mass is wound round a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N? What is the linear acceleration of the rope? Assume that there is no slipping.

9. A ring of diameter 0.4 m and of mass 10 kg is rotating about its axis at the rate of 2100 rpm. Find (i) moment of inertia (ii) angular momentum and (iii) rotational kinetic energy of the ring.

10. A disc of radius 0.5 m is rotating about an axis passing through its centre and perpendicular to its plane. A tangential force of 2000 N is applied to bring the disc to rest in 2 s. Calculate its angular momentum.

11. A solid sphere is rolling on a frictionless surface about its axis of symmetry. Find the rotational energy and the ratio of its rotational energy to its total energy.

12. A ring, a disc and a sphere all of the same radius and mass roll down an inclined plane from the same height 'h'. Which of the three reaches the bottom (i) first (ii) last?

13. What is the moment of inertia of a ring about a tangent to the circle in the plane of the ring?

14. What is the moment of inertia of a circular disc about one of its diameters?