

Model Question Paper 1
Dynamics of Rotational Motion 1

11th Standard

Physics

Reg.No. :

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Answer all the Questions

Time : 00:45:00 Hrs

Total Marks : 30

5 x 1 = 5

Part A

- 1) The angular speed of minute arm in a watch is ____
(a) $\pi/21600 \text{ rad s}^{-1}$ (b) $\pi/12 \text{ rad s}^{-1}$ (c) $\pi/3600 \text{ rad s}^{-1}$ (d) $\pi/1800 \text{ rad s}^{-1}$
- 2) The moment of inertia of a body comes into play ____
(a) in linear motion (b) in rotational motion (c) in projectile motion (d) in periodic motion
- 3) Rotational analogue of mass in linear motion is ____
(a) weight (b) moment of inertia (c) torque (d) angular momentum
- 4) The moment of inertia of a body does not depend on ____
(a) the angular velocity of the body (b) the mass of the body (c) the axis of rotation of the body (d) the distribution of mass in the body
- 5) a ring of radius r and mass m rotates about an axis passing through its centre and perpendicular to its plane with angular velocity ω . Its kinetic energy is ____
(a) $m r \omega^2$ (b) $\frac{1}{2} m r \omega^2$ (c) $I \omega^2$ (d) $\frac{1}{2} I \omega^2$

Part B

3 x 2 = 6

- 6) Obtain an expression for position of centre of mass of two particle system.
- 7) Explain the motion of centre of mass of a system with an example.
- 8) What are the different types of equilibrium?

Part C

3 x 3 = 9

- 9) A person weighing 45 kg sits on one end of a seesaw while a boy of 15 kg sits on the other end. If they are separated by 4 m, how far from the boy is the center of mass situated. Neglect weight of the seesaw.
- 10) Four bodies of masses 1 kg, 2 kg, 3 kg, and 4 kg are at the vertices of a rectangle of sides a and b . If $a=1\text{m}$, and $b=2\text{m}$, find the location of the center of mass. (Assume that, 1 kg mass is at the origin of the system, 2 kg body is situated along the positive x -axis and 4 kg along the y -axis)
- 11) Assuming a dumbbell shape for the carbon monoxide(CO) molecule, find the distance of the center of mass of the molecule from the carbon atom in terms of the distance d between the carbon and the oxygen atom. The atomic mass of Carbon is 12 amu and for oxygen is 16 amu ($1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg}$)

Part D

2 x 5 = 10

- 12) Three bodies of masses 2 kg, 4 kg, and 6 kg are located at the vertices of an equilateral triangle of side 0.5 m. Find the center of mass of this collection, giving its coordinates in terms of a system with its origin at the 2 kg body and with the 4 kg body located along the positive X axis.
- 13) A solid sphere of mass 50 g and diameter 2 cm rolls without sliding with a uniform velocity of 5 m s^{-1} along a straight line on a smooth horizontal table. Calculate its total kinetic energy. (Note: Total $E_K = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$)
