

Time : 65 minutes

Marks: 30

Instructions:

Q.1 to Q.2 are very short answer questions, carrying 1 mark each

Q.3 to Q.6 are short answer questions, carrying 2 mark each

Q.7 to Q. 11 are short answer questions, carrying 3 mark each

Q.12 is long answer question, carrying 5 mark

Rotational Motion

- Q.1 Is radius of gyration for the body a constant quantity?
- Q.2 Why is ladder more apt to slip, when you are high up on it than when you just begin to climb?
- Q.3 Differentiate between center of mass and center of gravity of body giving suitable example.
- Q.4 Why it is difficult to revolve a stone by tying it to a longer string than by tying it to the shorter string?
- Q.5 Derive moment of inertia of ring about an axis passing its one diameter.
- Q.6 What is the physical significance of moment of inertia of the body? Can we change the moment of inertia of the body?
- Q.7 State parallel axis theorem for moment of inertia of the body, and use it find the MI of a rod about its one end.
- Q.8 Establish relation between torque and angular acceleration and thus define moment of inertia of the body.
- Q.9 Deduce Kepler's second law of planetary motion from law of conservation of angular momentum.
- Q.10 Prove that time rate of change of angular momentum is equal to the torque acting on it.
- Q.11 Two particles of mass 100gm and 300gm have position $2\mathbf{i}+5\mathbf{j}+13\mathbf{k}$ and $-6\mathbf{i}+4\mathbf{j}-2\mathbf{k}$ cm respectively at a given time. Find position of center of mass of the system.
- Q.12 [a] A disc of moment of inertia I_1 is rotating freely with angular speed ω_1 , when another disc [non-rotating] with moment of inertia I_2 is dropped on it. The two discs then rotate as one unit. Find the new angular speed.
- [b] Derive the relation for time taken by a cylinder to roll down an inclined plane of height h and inclination θ .