ROTATIONAL DYNAMICS||CHAPTER1|| SAMPLE QUESTIONS||

1.A. What is the moment of inertia?

B. State the principle of conservation of angular momentum.

C. A disc of moment of inertia 5x10-⁴kgm² is rotating freely about the axis through its centre at 40 rpm. Calculate new rpm if some wax of mass 0.02 kg dropped gently on the disc 0.08 m from the axis.

2.A. Define radius of gyration.

B. Derive the expression for the kinetic energy in rotational motion.

C. The flywheel of a gasoline engine is required to give up 500 J of kinetic energy while its angular velocity decreases from 650 rpm to 520 rpm. What moment of inertia is required?

SHORT QUESTIONS AND ANSWERS||

1)A. Write down the analogy between rotational motion and linear motion.

B. Define moment of inertia.

2)A. What is the radius of gyration?

B. Also write down the expression of it.

3)A. Write the expression for rotational kinetic energy.

B. Derive the expression for the rotational kinetic energy.

4)A. Define torque.

B. Derive the expression for torque.

5)A. Define a couple of forces.

B. Derive the expression for the work done by a couple and power produced.

6)A. Derive the expression for the moment of inertia due to uniform thin rod rotating about an axis through its centre. Also find out the value of radius of gyration for it.

7)A. What is angular momentum?

B. also write down its expression.

8)A. state and explain principle of conservation of angular momentum.

B. Why is it more difficult to revolve a stone by tying it to a longer string than by a short string?

9)A. a dancer girl is rotating over a turntable with her arm outstretched. If she lowers her arms, how does this affect her motion?

B. the cap of a bottle can be easily opened with the help of two fingers rather than with one finger. Why?

10)A. a fan with blades takes a longer time to come to rest than without the blades. Why?
B. If the earth suddenly shrinks, what happens to the length of the day and night?

11)A. What happens to the speed of revolution of the earth when it comes closer to the sun?
B. write down any two examples of conservation of angular momentum.

NUMERICALS||

1.A wheel of moment of inertia 2×10^3 kgm² rotating at uniform angular speed of 4 rad/sec. What is the torque required to stop it in one second?

2.A constant torque of 1000 Nm turns a wheel of moment of inertia 200 kgm² about an axis through its centre. What is its angular velocity after 3 secs?

3.A fan makes 10 revolutions in 3 seconds which is just switched on. Considering uniform acceleration. What will be the number of revolutions made by fans in the next 3 seconds?

4.The point masses of 1 kg and 2 kg separated by the distance 0.5m constitute a system. Find the distance of the centre of mass of the system from 1 kg mass.

5.A ballet dancer spins with 2.4 rev/sec with her arm outstretched, when the moment of inertia about the axis of rotation is I. with her arms folded, the moment of inertia about the axis of rotation is 0.6I. Calculate new rate of revolution.

6.An electric fan is turned off, and its angular velocity decreases uniformly from 500 rev/min to 200 rev/min in 4 seconds. Find angular acceleration and number of revolutions made by the fan in 4 seconds.