



SYSTEMS OF PARTICLES AND ROTATIONAL MOTION

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7.1 INTRODUCTION

In the earlier chapters we primarily considered the motion of a single particle. (A particle is ideally represented as a point mass having no size.) We applied the results of our study even to the motion of bodies of finite size, assuming that motion of such bodies can be described in terms of the motion of a particle.

Any real body which we encounter in daily life has a finite size. In dealing with the motion of extended bodies (bodies of finite size) often the idealised model of a particle is inadequate. **In this chapter** we shall try to go beyond this inadequacy. **We shall attempt to build an understanding of the motion of extended bodies.** **An extended body, in the first place, is a system of particles.** We shall begin with the consideration of motion of the system as a whole. The centre of mass of a system of particles will be a key concept here. We shall discuss the motion of the centre of mass of a system of particles and usefulness of this concept in understanding the motion of extended bodies.

A large class of problems with extended bodies can be solved by considering them to be rigid bodies. **Ideally a rigid body is a body with a perfectly definite and unchanging shape. The distances between all pairs of particles of such a body do not change.** It is evident from this definition of a rigid body that **no real body is truly rigid, since real bodies deform under the influence of forces. But in many situations the deformations are negligible.** In a number of situations involving bodies such as wheels, tops, steel beams, molecules and planets on the other hand, we can ignore that they warp (twist out of shape), bend or vibrate and treat them as rigid.

Def. of rigid body

7.1.1 What kind of motion can a rigid body have?

Let us try to explore this question by taking some examples of the motion of rigid bodies. Let us begin with a rectangular