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1.1 Introduction With few exceptions, structures must be stable under all conditions of load; thatis, they must be able to support applied loads(their own weight, anticipated liveloads, wind, and so forth) without changing shape, undergoing large displacements, or collapsing. Since structures that are stable do not move perceptibly when loaded, their analysis-the determination of both internal and external forces(reactions)-is based in large part on the principles and techniques contained in the branch of engineering mechanics called statics. The subject of statics, which you have studied previously, covers force systems acting on rigid bodies at rest(the most common case) ormoving at constant velocity; that is, in either case the acceleration of the body is zero. Although the structures we will study in this book are not absolutely rigid because they undergo small elastic deformations when loaded, in most situations the deflections are so small that we can(1) treat the structure or its components as rigidbodies and(2) base the analysis on the initial dimensions of the structure. We begin this chapter with a brief review of statics. In this review we considerthe characteristics of forces, discuss the equations of static equilibrium for two-dimensional(planar) structures, and use the equations of static equilibrium to determine the reactions and internal forces in a variety of simple determinate structuressuch as beams, trusses, and simple frames. We conclude this chapter with a discussion of determinacy and stability. By determinacy, we mean procedures to establish if the equations of statics alone are sufficient to permit a complete analysis of a structure. If the structure cannot be analyzedby the equations of statics, the structure is termed indeterminate. To analyze an indeterminate structure, we must supply additional equations by considering the geometryof the deflected shape. Indeterminate structures will be discussed in later chapters.

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