Part I

Statically Determinate Structures

A structure is an assemblage of components which are connected in such a way that the structure can withstand the action of loads that are applied to it. These loads may be due to gravity, wind, ground shaking, impact, temperature, or other environmental sources. Structures are everywhere in the built environment. Buildings, bridges, tunnels, storage tanks, and transmission lines are examples of a "structure." Structural engineering is the discipline which is concerned with identifying the loads that a structure may experience over its expected life, determining a suitable arrangement of structural members, selecting the material and dimensions of the members, defining the assembly process, and lastly monitoring the structure as it is being assembled and possibly also over its life.

In Part I, we first present an overview of structural engineering so that the reader can develop an appreciation for the broad range of tasks that structural engineers carry out and the challenges that they face in creating structures which perform satisfactorily under the loadings that they are subjected to. We then discuss a particular subgroup of structures called statically determinate structures. This subgroup is relatively easy to deal with analytically since only equilibrium concepts are involved. Also, most structures belong to this category. Trusses, beams, frames, cables, curved members, shallow foundations, and vertical retaining walls are described in separate chapters. The last two topics are not normally covered in elementary texts, but we have included them here for completeness.

In general, all structures can be classified as either statically determinate or statically indeterminate. Part II describes techniques for dealing with statically indeterminate structures.

Part III describes how the methodologies presented in Parts I and II are applied to "engineer" various types of bridges and buildings. This section is intended to identify the key issues involved in structural engineering practice.