A high-level data model provides the database designer with a conceptual framework in which to specify the data requirements of the database users, and how the database will be structured to fulfill these requirements. The initial phase of database design, then, is to characterize fully the data needs of the prospective database users. The database designer needs to interact extensively with domain experts and users to carry out this task. The outcome of this phase is a specification of user requirements. Next, the designer chooses a data model, and by applying the concepts of the chosen data model, translates these requirements into a conceptual schema of the database. The schema developed at this conceptual-design phase provides a detailed overview of the enterprise. The designer reviews the schema to confirm that all data requirements are indeed satisfied and are not in conflict with one another. The designer can also examine the design to remove any redundant 16 features. The focus at this point is on describing the data and their relationships, rather than on specifying physical storage details. In terms of the relational model, the conceptual-design process involves decisions on what attributes we want to capture in the database and how to group these attributes to form the various tables. The “what” part is basically a business decision, and we shall not discuss it further in this text. The “how” part is mainly a computer-science problem. There are principally two ways to tackle the problem. The first one is to use the entity-relationship model the other is to employ a set of algorithms (collectively known as normalization) that takes as input the set of all attributes and generates a set of tables. A fully developed conceptual schema indicates the functional requirements of the enterprise. In a specification of functional requirements, users describe the kinds of operations (or transactions) that will be performed on the data. Example operations include modifying or updating data, searching for and retrieving specific data, and deleting data. At this stage of conceptual design, the designer can review the schema to ensure it meets functional requirements. The process of moving from an abstract data model to the implementation of the database proceeds in two final design phases. In the logical-design phase, the designer maps the high-level conceptual schema onto the implementation data model of the database system that will be used. The designer uses the resulting system-specific database schema in the subsequent physical-design phase, in which the physical features of the database are specified. These features include the form of file organization and the internal storage structures