**Chapter 1 - Review Questions**

**3. What is data independence, and why is it lacking in file systems?**

* Data independence exists when changes to the data’s characteristics can be made without requiring changes to be made to the application associated with that data i.e. the data is independent of the application. Within a file system, each file of data requires its own application to organize the data. As a result file system lack data independence

**5. What is structural independence, and why is it important?**

* Structural independence exits when it is possible to make changes in the file structure without affecting the application program’s ability to access the data. It is important so that changes to the file structure will not require modifying file system programs to conform to the new changes.

**7. What is the role of a DBMS, and what are its advantages? What are its disadvantages?**

* The role of DBMS is to serve as the intermediary between the user and the database. Some advantages are:
  + Improved data sharing
  + Better security by controlling user’s access to data.
  + Better data integration
  + Minimized data inconsistency
  + Improved decision making
  + Increased end-user productivity.
  + Lowers data redundancy
  + Provides data independence
  + Allows for different views of the data depending upon the user.
  + Allows for efficient queries to be made.
* Some disadvantages are:
  + Increased costs
  + Requires technical expertise
  + Time consuming to design.
  + Management complexity
  + Maintaining currency
  + Vendor dependence
  + Frequent upgrade/replacement cycles

**9. What are the main components of a database system?**

* The main components of a database system include:
  + Hardware
  + Software
  + People
  + Procedures
  + Data

**11. Explain why database design is important.**

* Database design is important because a poorly designed database may produce difficult to trace errors that result in bad decision making; and bad decision making can lead to the failure of an organization.

**Chapter 1 – Problems**

**2. What problem would you encounter if you wanted to produce a listing by city? How would you solve this problem by altering the file structure?**

* The city names are contained within the MANAGER\_ADDRESS attribute and decomposing this character (string) field at the application level is cumbersome at best. (Queries become much more difficult to write and take longer to execute when internal string searches must be conducted.) If the ability to produce city listings is important, it is best to store the city name as a separate attribute in the table. The table then will consist of 6 columns.

**4. What data redundancies do you detect? How could those redundancies lead to anomalies?**

* The manager named Holly B. Parker occurs three times, indicating that she manages three projects coded 21-5Z, 25-9T, and 29-2D, respectively. This occurrences indicate that there is a 1:M (one to many) relationship between PROJECT and MANAGER. This means that each project is managed by only one manager but, apparently, a manager may manage more than one project. Holly Parker's phone number and address also occur three times. This data redundancy leads to three types of anomalies:
  + **Update anomaly**: If Parker moves and/or changes her phone number, these changes must be made more than once and they must all be made correctly... without missing a single occurrence. If any occurrence is missed during the change, the data are "different" for the same person. After some time, it may become difficult to determine what the correct data is. In addition, multiple occurrences invite misspellings and digit transpositions, thus producing update anomalies. The same problems exist for the multiple occurrences of George F. Dorts
  + **Insertion anomaly**: If a new manager is to be added to the table, this new manager will not have a project assigned to him yet. Hence, to add the manager information, we will insert a tuple in the table with all the project attributes empty. These empty attributes leads to processing difficulties.
  + **Delete anomaly**: If all the projects for which Holly Parker manages are deleted, then we will lose Parker’s information i.e., address and phone number. Sometimes, losing the information of an employee is undesirable because you might want to delete the manager’s project but never its information.