

CHAPTER 1: DATABASES AND DATABASE USERS**Answers to Selected Exercises**

1.8 - Identify some informal queries and update operations that you would expect to apply to the database shown in Figure 1.2.

Answer:

- (a) (Query) List the names of all students majoring in Computer Science.
- (b) (Query) What are the prerequisites of the Database course?
- (c) (Query) Retrieve the transcript of Smith. This is a list of <CourseName, SectionIdentifier, Semester, Year, Grade> for each course section that Smith has completed.
- (d) (Update) Insert a new student in the database whose Name=Jackson, StudentNumber=23, Class=1 (freshman), and Major=MATH.
- (e) (Update) Change the grade that Smith received in Intro to Computer Science section 119 to B.

1.9 - What is the difference between controlled and uncontrolled redundancy?

Answer:

Redundancy is when the same fact is stored multiple times in several places in a database. For example, in Figure 1.5(a) the fact that the name of the student with StudentNumber=8 is Brown is stored multiple times. Redundancy is controlled when the DBMS ensures that multiple copies of the same data are consistent; for example, if a new record with StudentNumber=8 is stored in the database of Figure 1.5(a), the DBMS will ensure that StudentName=Smith in that record. If the DBMS has no control over this, we have uncontrolled redundancy.

1.10 - Specify all the relationships among the records of the database shown in Figure 1.2.

Answer:

- (a) Each SECTION record is related to a COURSE record.
- (b) Each GRADE_REPORT record is related to one STUDENT record and one SECTION record.
- (c) Each PREREQUISITE record relates two COURSE records: one in the role of a course and the other in the role of a prerequisite to that course.

1.11 - Give some additional views that may be needed by other user groups for the database shown in Figure 1.2.

Answer:

CHAPTER 2: DATABASE SYSTEM CONCEPTS AND ARCHITECTURE

Answers to Selected Exercises

2.12 - Think of different users for the database of Figure 1.2. What type of applications would each user need? To which user category would each belong and what type of interface would they need?

Answer:

(a) Registration Office User: They can enter data that reflect the registration of students in sections of courses, and later enter the grades of the students. Applications can include:

- Register a student in a section of a course
- Check whether a student who is registered in a course has the appropriate prerequisite courses
- Drop a student from a section of a course
- Add a student to a section of a course
- Enter the student grades for a section

Application programmers can write a number of canned transactions for the registration office end-users, providing them with either forms and menus, or with a parametric interface.

(b) Admissions Office User: The main application is to enter newly accepted students into the database. Can use the same type of interfaces as (a).

(c) Transcripts Office User: The main application is to print student transcripts. Application programmers can write a canned transaction using a report generator utility to print the transcript of a student in a prescribed format. The particular student can be identified by name or social security number. Another application would be to generate grade slips at the end of each semester for all students who have completed courses during that semester. Again, this application could be programmed using a report generator utility.

2.13 - No solution provided.

2.14 - if you were designing a Web-based system to make airline reservations and to sell airline tickets, which DBMS Architecture would you choose from Section 2.5? Why? Why would the other architectures not be a good choice?

Answer:

2.5.4 Three-Tier Client/Server Architecture for Web Application is the best choice. The Client consists of Web User Interface. The Web Server contains the application logic which includes all the rules and regulations related to the reservation process and the issue of tickets; the Database Server contains the DBMS.

2.5.1 Centralized DBMS Architecture would not work since the user interface and database server are on different machines for a web-based system.

2.5.2 Basic Client/Server Architecture and 2.5.3 Two-Tier Client/Server Architecture would work if the Business Logic can reside on server other than the DBMS Server. In general, if the business logic was on the DBMS Server, it will put an excessive burden on the server. If the business logic were to reside on the web client, it will burden the communication network as well as a possibly thin client.

2.15 - Consider Figure 2.1. In addition to constraints relating the values of columns in one table to columns in another table, there are also constraints that impose restrictions on

values in a column or a combination of columns within a table. One such constraint forces that a column or a group of columns must be unique across all rows in the table. For example, in the STUDENT table, the StudentNumber column must be unique (to prevent two different students from having the same StudentNumber). Identify the column or the group of columns in the other tables that must be unique across all rows in the table?

Answer:

Table	Column(s)
COURSE	CourseNumber Since this contains the combination of the department and the number that must be unique within the department. Note we will overlook the fact this does not accommodate a department from offering several "Special Topics" course with the same CourseNumber but different titles. We could make this a combination of CourseNumber and CourseName, but this is more susceptible to someone mistyping while entering data.
PREREQUISITE	The combination of CourseNumber and PrerequisiteNumber
SECTION	SectionIdentifier We assume that no two sections can have the same SectionIdentifier. If we were to consider that SectionIdentifier is unique only within a given course offered in a given term (such as section 2 of CS101) then the answer changes to the combination of SectionIdentifier, CourseNumber, Semester, and Year.
GRADE_REPORT	StudentNumber and SectionIdentifier As per assumption stated in SECTION, the SectionIdentifier will be different if a student takes the same course or a different course in another term.