COMP- 8115-M50 Database systems

Assignment – 2

1) **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? (25 points)**

Let’s consider different users for the database given in figure 1.2 Now listing a few of them.

1. International Advising
2. Admissions Office
3. Student centre
4. Professors/Faculty members
5. Students

Now, let’s try to list the application and interface each user would need.

1. International Advising

Applications required are:

a) List of international students
b) Minimum credits/Semester
c) Eligibility for graduation would depend on credits completed by the student.
d) List of students under probation/out of status depends on grades
e) OPT applications would depend on the section

The interface required is: Parametric Interface

2. Admissions Office

Applications required are:

a) New admission each semester
b) List of students who got accepted/denied
c) Applications for an insurance waiver
d) Visa enquiries

The interface required is Form-based or Parametric Interface

3. Student Centre

Applications required are:

a) To provide transcripts of the current and alumni students after/before they graduate

The interface required is: Parametric Interface

4. Professors/Faculty members

Applications required are:

a) Manage records of all students
b) Advising students on their courses
c) Add/modify grades on their overall performances
d) To conduct an exam depends on the course type and number of students
e) To schedule a meeting with the student
f) Monitor whether a student has enrolled in the appropriate prerequisite courses.

The interface uses are Form-based or Parametric Interface

6. Students

Applications required are:

a) While enrolling classes in a new semester
b) To track their performances
c) To apply for a change of major
d) Early/Late registration for the classes
e) To decide on courses
f) Drop/Add a course
g) To request a transcripts

The interface used is Form-based

2)If you were designing a Web-based system to make airline reservations and sell airline tickets, which DBMS Architecture would you choose from Section 2.5? Why? Why would the other architectures not be a good choice? (25 points)

To design a web-based system to make airline reservations and sell airline tickets. I would be using a three-tier architecture because this is an architecture with the client using a GUI (Graphical User Interface) that the user interacts with. The data of the airline reservation is held on the database that the web server the GUI lives on interacts with.

For building a system for making an airline reservation we need a

1. Database system
2. Application Server
3. Client Program

There are advantages to the Three-tier architecture are

1. High Performance, lightweight persistent objects
2. Scalability -Each tier can scale horizontally
3. Performance
   Because the presentation tier can cache requests, network utilization is minimized, and the load is reduced on the application and data tiers.
4. High degree of flexibility in deployment platform and configuration
5. Better Re-use
6. Improve Data Integrity
7. Improved security- The client does not have direct access to the database
8. Easy to maintain and modification is a bit easy, it doesn't affect other modules
9. In three-tier architecture application performance is good

Why not other architecture?

Two-tier Architecture

1. In the two-tier architecture the performance will degrade upon increasing the number of users

2.Cost-ineffective

One-tier Architecture

In one-tier architectures can be beneficial when we are dealing with data that is relevant to a single user and we have a relatively small amount of data.

3) **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 student Number column must be unique (to prevent two different students from having the same Student Number).**

Identify the column or the group of columns in the other tables that must be unique across all rows in the table? (25 points)

The Tables in the given database are

Student which has the columns Name, Student_number, Class, Major

A course which has the column name Course_name, Course_number, Credit_hours, Department

Prerequisite which has the column named Course_number, Prerequisite_number

Section which has the columns named Section_identifier, Course_number, Semester, Year, Instructor

Grade_Report has the columns named Student_number, Section_identifier, Grade

The Unique keys for the following tables are
Student_number is unique for the STUDENT (Name, Student_number, Class, Major)

Course_number is unique for the COURSE (Course_name, Course_number, Credit_hours, Department)

Prerequisite_number is unique for the PREREQUISITE (Course_number, Prerequisite_number)

Section_identifier is unique for the SECTION (Section_identifier, Course_number, Semester, Year, Instructor)

Student_number and Grade is unique for the GRADE_REPORT (Student_number, Section_identifier, Grade)

4) What is the difference between a database schema and a database state? (25 points)

Database schema:

Database schema gives a description of the database. This can be considered a blueprint of a database and gives a list of different fields in the database with their data types. It describes the organization and structure of data in a database system along with the relationships mapped between entities.

1. It is the description of the database

2. It defines how the database is set up and what data it is to contain and control which is useful to manage the database.

3. It is fixed unless the database structure is changed

Database state:

A database state provides the present state of the database and its data. It can be considered an extension of the database schema. When a database is newly defined, the corresponding database state is empty. Factors that affect a database state are entering, deleting, or modifying information in the database.

1. It is an image of how the database looks at any given time
2. It will change whenever new data is entered into the database and the database is updated.

Let’s say, when we define a new database, we specify its database schema only to the DBMS. At this point, the corresponding database state is the empty state with no data. We get the initial state of the database when the database is first populated or loaded with the initial data. From then on, every time an update operation is applied to the database, we get another database state. At any point in time, the database has a current state. The DBMS is partly responsible for ensuring that every state of the database is a valid state-that is, a state that satisfies the structure and constraints specified in the schema. The DBMS stores the descriptions of the schema constructs and constraints-also called the meta-data-in the DBMS catalogue so that DBMS software can refer to the schema whenever it needs to. The schema is sometimes called the intension, and a database state an extension of the schema.