1. *(3 points) identify at least 2 informal queries and 2 update operations that you would expect to apply to the database shown in Figure 1. (e.g. an example query can be: List the name of the student whose Student\_number is 17; an example update can be: Insert a new course in the database whose Course\_name = Algorithm, Course\_number = CS4300, Credit\_hours = 4, Department = CS. These 2 examples CANNOT be used as your answers)*
   1. Retrieve all student info such as name, major and GPA if their Major = ‘CS’.
   2. Retrieve a student’s classes for the current quarter if their Name = ‘Smith’.
   3. Retrieve all students who are in the Course\_number = ‘CS1310’.
   4. Add/insert a new student in the database whose Name = Elyse, Student\_number = 6, Class = 3, Major = CS.
   5. Update/edit a grade for the student 17, Section\_identifier = 112, update Grade = A.
2. *(3 points) Name all the relationships among the records of the database shown in Figure 1 (e.g., each SECTION record is related to a COURSE record. This example can be included in your answer).*
   1. Each single STUDENT is related to one or many GRADE\_REPORT
   2. Each COURSE is related to SECTION.
   3. Each PREQUISITE is related to currently two records in the SECTION table.
   4. Each GRADE\_REPORT is related to a SECTION.
3. *(3 points) Cite at least 5 examples of integrity constraints that you think should hold on the database shown in Figure 1. The 5 examples of integrity constraints you pick should at least belong to 2 (and* ***preferably 3****) categories as discussed in class.*
   1. The Course\_number should be unique for each COURSE record [key constraint].
   2. The Student\_number should be unique for each STUDENT record [key constraint].
   3. The Section\_identifier should be unique for each SECTION record [key constraint].
   4. The Student\_number and Section\_identifer should be both unique keys for GRADE\_REPORT [key constraint].
   5. Course\_number should be the unique id for the PREREQUISITE table [key constraint].
   6. Semester in SECTION should be limited to the options Fall, Spring, Summer, and Winter [domain constraint].
   7. A STUDENT’s major should also match the Department in COURSE [referential integrity].
   8. Grade in GRADE\_REPORT should be limited to A, B, C, D, F and other grades that the University has [domain constraint].
   9. A value for CourseNumber must also exist in the COURSE table [referential integrity].
   10. Ensure Credit\_hours data type is always a number [domain constraint].
4. *(11 points) Choose a database application (cannot be the same as the University or Company examples in the textbook) with which you are familiar and contains at least 3 entity types (tables). Design & draw the schema and show a sample database for that application, using the notation similar to Figures 1. List (or draw) all relationships and constraints you think are necessary for this schema. Think of at least 2 types of different users for your database, and design a view for each. Need to describe or draw the view and list what type of users the view is designed for.*

The chosen database application for this is housing data with the three tables HOUSE\_INFO, NEIGHBORHOOD\_INFO, and REGION\_INFO. Below is a sample database schema with sample data for the database application.

HOUSE\_INFO

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| House\_ID | SQ\_Foot | Bath | Bed | Neighborhood\_ID | Lot\_Size |
| 379204 | 3000 | 2.5 | 3 | 694 | 4000 |
| 473958 | 1000 | 1.5 | 1 | 697 | 2000 |
| 485025 | 1500 | 2 | 2 | 700 | 1500 |

NEIGHBORHOOD\_INFO

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Neighborhood\_ID | School\_District | Neighborhood\_Name | Crime\_Rating | Region\_ID |
| 694 | Issaquah | Downtown Issaquah | 3 | 1003 |
| 697 | Mountlake Terrace | Downtown Mountlake Terrace | 4 | 1004 |
| 700 | Seattle | Roosevelt | 6 | 1005 |

REGION\_INFO

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Region\_ID | City | State | Zip | Population |
| 1003 | Issaquah | WA | 98027 | 48000 |
| 1004 | Mountlake Terrace | WA | 98043 | 21000 |
| 1005 | Seattle | WA | 98125 | 1500000 |

**List of Database Relationships:**

Each single house in HOUSE\_INFO relates to a single NEIGHBORHOOD\_INFO.

Each Neighborhood in NEIGHBORHOOD\_INFO relates to a single region.

**Views for Database (in table format per the slide):**

Home Owner: Single house with all info related to that house except for population. This is to help the owner of the home to get critical info on the house and the neighborhood/region the house resides in.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| House\_ID | SQ\_Foot | Bath | Bed | Neighborhood\_ID | Lot\_Size | School\_District | Neighbor\_Name | Crime\_Rating | Region\_ID | City | State | Zip |
| 379204 | 3000 | 2.5 | 3 | 694 | 4000 | Issaquah | Downtown Issaquah | 3 | 1003 | Issaquah | WA | 98027 |

City Official: All neighborhood and regional info, would not include individual houses. This view is designed for this as city planners would not need to worry about individual houses but focus on macro trends such as population, crime, and school districts.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood\_ID | School\_District | Name | Crime\_Rating | Region\_ID | City | State | Zip | Population |
| 694 | Issaquah | Downtown Issaquah | 3 | 1003 | Issaquah | WA | 98027 | 48000 |
| 697 | Mountlake Terrace | Downtown Mountlake Terrace | 4 | 1004 | Mountlake Terrace | WA | 98043 | 21000 |
| 700 | Seattle | Roosevelt | 6 | 1005 | Seattle | WA | 98125 | 1500000 |

**Conceptual View**

