Given the following database schema:

- Course(Course#, Offered_dept, Credit_hours, Title)
- Student(SID, Sname, GPA, Classification)
- Instructor(Fname, Department, Status, Seniority)
- Is_taking(SID, Course#, Section#, Instructor)
- Has_taken(SID, Course#, Semester, Grade)

Construct and specify the corresponding constraints in an SQL DDL definition using either a CREATE TABLE or ALTER TABLE statement for each of the following queries. After you have constructed each SQL DDL definition, create one or more SQL DML statements to verify the correctness of the action, i.e., when new constraints are added or existing ones are modified, you should create one or more SQL statements, such as insertion, deletion, or modification of tuples, that cause the corresponding constraints to be violated.

1. Create the Course table in which Course# is the primary key and Credit_hours is non-NULL.

2. Create the Student table in which SID is the primary key and a permitted value of Classification is either “Freshman,” “Sophomore,” “Junior,” or “Senior.”

3. Create the Instructor table in which Fname is the primary key, the default value of Status is “Full Time,” and the default value of Seniority is 1.

4. Create the Is_taking table in which SID and Course# are foreign keys that reference Student and Course, respectively, the data values of Section# must be between ‘00’ and ‘99’, inclusively, and Instructor references Fname in the Instructor table.

5. Create the Has_taken table in which SID and Course# form the primary key of the table, a delete cascade clause on SID and Course# are declared, and Grade cannot be ‘NS’ (i.e., not submitted) or ‘T’ (i.e., course work in progress).

6. Redefine the Student table (i.e., drop the table created in Query 2 and create a new Student table) with an additional attribute Sem_GPA. A new constraint should also be specified that requires the value of Sem_GPA to be greater than the value of GPA in the same tuple.

7. Redefine the Instructor table in Query 3 with an additional attribute Supervisor who is the supervisor of an instructor. (The supervisor of an instructor is himself/herself an instructor.)

8. Create a new table called Repeating, which includes attributes SID and Course#. The table should maintain the information of which student (identified by SID) is repeating which course (identified by Course#). Specify all the necessary constraints in the table.

9. Redefine the Has_taken table in Query 5 in which the default value of Grade is ‘E’, and a permitted value of Semester is in the form of X-YYYY, where ‘X’ is either ‘F,’ ‘W,’ ‘S,’ or ‘U,’ and YYYY is in the range of 1900 and 2000.

10. Redefine the Is_taking table in Query 4 so that the foreign key constraints must be specified with the constraint names Student_FK, Course_FK, and Instructor_FK, respectively. In addition, the default value of Section# must be ‘000,’ and the permitted values of Section# are between ‘000’ and ‘999.’
(11) Using the drop and add constraint options, alter the Has_taken table in Query 9 so that SID, Course#, and Grade form the primary key of the table.

(12) Using the modify column option, alter the Course table in Query 1 so that the non-NULL constraint is applied to the OfferedDept attribute. Also, alter the same table so that OfferedDept references the Department attribute in the Instructor table in Query 7.

(13) Drop the attribute Department from the Instructor table in Query 7. All the constraints that refer to Department should also be dropped.

(14) Add a new constraint to the Supervisor attribute in the Instructor table in Query 13 so that the supervisor of an instructor cannot be the instructor himself/herself. Also, impose another constraint to the same table that restricts the status of an instructor to be either “Full-time,” “Part-time,” “Temporary,” or “Substitute.”

(15) Add a new column Times, which indicates the number of times a student has repeated a course, and a new constraint to the Repeating table in Query 8 so that the permitted values of Times are between 1 and 3.

(16) Drop the primary-key constraint on the Has_taken table in Query 11. After removing SID, Course#, and Grade as the primary key of the table, redefine the primary key that includes only SID and Course#.

(17) Modify three constraints specified in Query 10 so that the constraints named Student_FK and Course_FK should be disabled, whereas the constraint named Instructor_FK should be modified to initially immediate.

(18) Modify the columns Section# and Instr_name in the Is_taking table in Query 17 so that a Section# must be between ‘A100’ and ‘Z999’ and the default value of Instr_name is ‘Staff.’

(19) Modify the Course table in Query 12 so that the non-NULL constraint on the Offered_dept attribute is eliminated while the attribute Title is a non-NULL attribute, and the non-NULL constraint should be created with the constraint name Title_CST.

(20) List all the constraints that have been defined in your database by querying the ORACLE8i system constraint catalog table. (HINT: Use Web search engines to locate the name of the catalog table.)

NOTE:

(i) You must choose and answer (any) 15 out of the 20 queries listed above.

(ii) You must show the query result after each SQL query (statement).

(iii) Each query and its result should be followed by one or more SQL DML queries and their results that verify the correctness of the corresponding query.

(iv) You only need to show the queries and results directly applicable to the problem.

(v) It may be necessary to modify your existing tables to perform a query.

(vi) This project assignment is worth 100 points.