1. From the following list of characteristics of the relational database model,
   (a) Only one relation is allowed.
   (b) Data is contained in tuples.
   (c) Recursive tuples may have many tuples.
   (d) A key identifies a particular tuple.
   (e) Domain constraints prevent multiple tuples from having the same values in corresponding attributes.

Which of the preceding are true?
   (a) a, b, c
   (b) b, d
   (c) b, d, e
   (d) a, c
   (e) none of the above

2. Which of the following is a correct statement regarding database design.
   (a) The full design process is independent of the final implementation.
   (b) The ER model is a result of the schema iteration loop.
   (c) The design process is composed of the conceptual, logical, and physical design.
   (d) ER generalizations are allow the configuration of the third normal form.
   (e) All are correct.

3. From the following list of characteristics related to SQL.
   (a) The SQL is a programming language.
   (b) The SQL select implements relational joins, selects, and projects.
   (c) There are several database systems that implement SQL.
   (d) SQL is both a DDL and DML.
   (e) SQL cannot be used for network servers.

Which of the preceding are true?
   (a) a, c, d
   (b) b, c
   (c) a, b, c, d
   (d) b, c, e
   (e) a, b, c
   (f) all of the above

4. An inter-relational constraint
   (a) constrains the domain type of attributes that are referenced by other relations.
   (b) supports the correct operation of relational joins.
   (c) requires that super keys are composed of attributes of the same domain.
   (d) is not required when there are complete tuple constraints.
   (e) all of the above
5. From the following list of characteristics related to database normal forms:

(a) Any properly formed relation is in first normal form.
(b) A goal of normal form structures is to eliminate insert, delete, and update anomalies.
(c) As a database is configured from first, to second, and to third normal form the amount
of redundant data is reduced by reducing the number of relations.
(d) All databases are required to be in third normal form.
(e) A database is in third normal form if it is in second normal form and has no reverse
independent constraint dependencies.

Which of the preceding are true?

(a) a, b, d
(b) a, d, e
(c) a, b
(d) b, c, e
(e) all of the above

6. Which of the following are characteristics of the ER model.

(a) Provides an implementation independent mechanism for the description of a database
system.
(b) Reduces the instance of inconsistent data by sharing non-redundant data.
(c) Is composed of entities, relationships, attributes and joins.
(d) Is the result of the logical design.
(e) a and c

7. Which of the following is NOT a benefit of relational DBMSs.

(a) Provides common centralized data resource.
(b) Provides sharing and reduces redundancy of data.
(c) Allows data models to be independent of implementation.
(d) Allows a precise and formal mathematical model for data.
(e) All of the above are benefits.

8. Which of the following does NOT represent the following ER schema.

![ER Schema Diagram]

(a) \( E_1(A_{E11}, A_{E12}) \\
E_2(A_{E21}, A_{E22}, A_{E11}, A_R) \\
(b) \ E_1(A_{E11}, A_{E12}, A_{E21}, A_R) \\
E_2(A_{E21}, A_{E22}) \\
(c) \ E_1(A_{E11}, A_{E12}) \\
E_2(A_{E21}, A_{E22}) \\
R_1(A_{E11}, A_{E21}) \\
(d) \ E_1(A_{E11}, A_{E12}) \\
E_2(A_{E21}, A_{E22}) \\
R_1(A_{E11}, A_{E21}, A_R) \\

2
9. Which of the following SQL statements output the following relation from the student database?

<table>
<thead>
<tr>
<th>cnum</th>
<th>cname</th>
<th>facultynum</th>
<th>roomnum</th>
<th>periodnum</th>
</tr>
</thead>
<tbody>
<tr>
<td>csn 360</td>
<td>Database Systems</td>
<td>1</td>
<td>shc 108</td>
<td>7</td>
</tr>
<tr>
<td>csn 310</td>
<td>Computer Architecture</td>
<td>1</td>
<td>shc 108</td>
<td>8</td>
</tr>
<tr>
<td>csn 320</td>
<td>Programming Languages</td>
<td>3</td>
<td>shc 108</td>
<td>5</td>
</tr>
<tr>
<td>csn 301</td>
<td>Theory of Computing</td>
<td>2</td>
<td>shc 108</td>
<td>10</td>
</tr>
</tbody>
</table>

(a) `studentdb=# select * from enrollment, courses;`
(b) `studentdb=# select * from courses;`
(c) `studentdb=# select cnum, cname, fname from courses, faculty;`
(d) `studentdb=# select courses from relation='courses' where *;`
(e) `studentdb=# select * from courses, enrollment where cname = 'Database Systems';`

10. Which of the following does NOT list the course names that Professor Debure teaches.

(a) `studentdb=# select cname from courses natural join faculty where last_name = 'Debure';`
(b) `studentdb=# select cname from courses as c, faculty as f where last_name = 'Debure' and f.num = c.facultynum;`
(c) `studentdb=# select cname from courses join faculty on courses.facultynum = faculty.num where last_name = 'Debure';`
(d) `studentdb=# select cname from courses, faculty where last_name = 'Debure' and courses.facultynum = faculty.num;`
The following student database sql is related to questions 9 and 10.

```
CREATE TABLE students (
    first_name CHAR(20),
    last_name CHAR(20),
    snum INTEGER PRIMARY KEY,
    addr1 CHAR(30),
    addr2 CHAR(30),
    city CHAR(20),
    state CHAR(2),
    zip CHAR(5),
    UNIQUE (first_name, last_name)
);

CREATE TABLE faculty (
    first_name CHAR(20),
    last_name CHAR(20),
    num INTEGER PRIMARY KEY,
    officenum CHAR(10),
    telnum CHAR(7),
    jobtitle CHAR(20),
    UNIQUE (first_name, last_name)
);

CREATE TABLE courses (cnum CHAR(7) PRIMARY KEY,
    cname CHAR(30),
    facultynum INTEGER REFERENCES faculty(fnum),
    roomnum CHAR(8),
    periodnum INTEGER
);

CREATE TABLE enrollment (cnum CHAR(7) REFERENCES courses(cnum),
    snum INTEGER REFERENCES students(snum),
    UNIQUE (cnum, snum)
);