1. What is program-data dependence?

2. What is primary key constraint, domain constraint and referential integrity?

3. Give two examples for
   a. 1:1, 1:M, and M:M relationships.
   b. recursive relationship.
   c. multi-valued attribute.
   d. attribute of the relationship.
   f. derived attribute
   g. Super type and subtype.

   You must find your own examples and not using my examples.

4. Draw an ERD based on a problem description, similar to assignment 1 and 2.

5. Given this ERD, we can conclude that:
   a. A faculty member may teach many courses. (True/False)
   b. A course may be taught by many faculty members. (True/False).

![ERD Diagram]

6. Design a relational database based on this ERD:
7. Given the ERD in #6, we know that:

a. Every customer must have submitted at least one order (True/False)

b. Customers must include at least one product in the orders they submit. (True/False)

c. This company may keep more than one phone number for customers. (True/False)

8. A University has three kinds of students: resident, non-resident, and international students.

a. Should the line between the supertype and the circle be a single line or double line?

b. When consider the disjointness constraint, should we enter a letter D or O in the circle?
9. A recursive 1:m relationship of employee managing employee is given below. Design the Employee table to keep track of employee’s manager.

10. A 1:m relationship between faculty and student is implemented in the database, and currently we only have 3 faculty members and 4 students. Identify the record that violates the referential integrity.

**Faculty table**

<table>
<thead>
<tr>
<th>fid</th>
<th>fname</th>
<th>phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>f1</td>
<td>chao</td>
<td>1111</td>
</tr>
<tr>
<td>f2</td>
<td>smith</td>
<td>2222</td>
</tr>
<tr>
<td>f3</td>
<td>boxer</td>
<td>3333</td>
</tr>
</tbody>
</table>

**Student table**

<table>
<thead>
<tr>
<th>sid</th>
<th>sname</th>
<th>sex</th>
<th>gpa</th>
<th>major</th>
<th>fid</th>
</tr>
</thead>
<tbody>
<tr>
<td>s2</td>
<td>paul</td>
<td>m</td>
<td>2.20</td>
<td>art</td>
<td>f2</td>
</tr>
<tr>
<td>s1</td>
<td>peter</td>
<td>m</td>
<td>3.20</td>
<td>bus</td>
<td>f1</td>
</tr>
<tr>
<td>s3</td>
<td>mary</td>
<td>f</td>
<td>1.50</td>
<td>bus</td>
<td>f11</td>
</tr>
<tr>
<td>s4</td>
<td>nancy</td>
<td>f</td>
<td>3.50</td>
<td>bus</td>
<td>f1</td>
</tr>
</tbody>
</table>