Homework # 2

1. Explain the distinctions among the terms primary key, candidate key, and superkey. (See section 2.1.3)

2. Give an example of
   (a) simple and composite attributes
   (b) single-valued, multi-valued, and derived attribute.

3. What is the difference between a database schema and a database instance? Give an example.

4. What is the difference between a procedural and a non-procedural query language? Give an example.

5. When is the operation "outer join" useful? Give an example.

6. What are the properties of a relation in a relation database system? How does it differ from a simple table of data?

7. Consider the relations in Figures 2.1 till 2.7. Give relational algebra expressions for
   (a) Different account numbers
   (b) Branch names in Brooklyn
   (c) Customer names with an amount of loan greater than or equal to 900

8.
Consider the two tables T1 and T2, show the result of the following operations:

<table>
<thead>
<tr>
<th></th>
<th>Q</th>
<th>R</th>
<th></th>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>a</td>
<td>5</td>
<td></td>
<td></td>
<td>b</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>b</td>
<td>8</td>
<td></td>
<td>25</td>
<td>c</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>a</td>
<td>6</td>
<td></td>
<td></td>
<td>10</td>
<td>b</td>
<td>5</td>
</tr>
</tbody>
</table>

- a. $T_1 \bowtie T_1.P = T_2.A T_2$
- b. $T_1 \bowtie T_1.Q = T_2.B T_2$
- c. $T_1 \bowtie T_1.P = T_2.A T_2$
- d. $T_1 \bowtie T_1.Q = T_2.B T_2$
- e. $T_1 \cup T_2$
- f. $T_1 \bowtie (T_1.P = T_2.A \text{ AND } T_1.R = T_2.C) T_2$