Chapter 9 Problems

(15) 1. Redesign the following schema into first normal form. List any functional or multivalued dependencies that you assume. Also list all referential-integrity constraints that should be present in the first-normal-form schema.

$Emp = (ename, \text{ChildrenSet \ multiset}(Children), \text{SkillSet \ multiset}(Skills))$

$Children = (name, birthday)$

$Skills = (type, \text{ExamSet \ setof}(Exams))$

$Exams = (year, city)$

(20) 2. Consider the schemas for the table people, and the tables students and teachers, which were created under people using the following SQL. Give a relational schema in 3NF that represents the same information. Recall the constraints on subtables, and give all constraints that must be imposed on the relational schema so that every database instance of the relational schema can also be represented by an instance of the schema with inheritance.

```sql
create type Person (name varchar(20), address varchar(20) )
create type Student under Person (degree varchar(20), department varchar(20) )
create type Teacher under Person (salary integer, department varchar(20) )
create table people of Person
create table students of Student under people
create table teachers of Teacher under people
```

(15) 3. Explain the distinction between a type $x$ and a reference type $\text{ref}(x)$. Under what circumstances would you choose to use a reference type?
Chapter 10 Problems

(15) 4. Give a DTD to represent the Non-1NF books relation from the following XML relation.

<table>
<thead>
<tr>
<th>title</th>
<th>author_array</th>
<th>publisher</th>
<th>keyword_set</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(name, branch)</td>
<td>(McGraw-Hill, NewYork)</td>
<td>parsing, analysis</td>
</tr>
<tr>
<td>Compilers</td>
<td>[Smith, Jones]</td>
<td>(Oxford, London)</td>
<td>Internet, Web</td>
</tr>
<tr>
<td>Networks</td>
<td>[Jones, Frick]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(20) 5. Provide an XML Schema for the following XML, which describes a neural network. A neural network can be thought of as a digraph with continuous values that has nodes with properties, and weighted edges. Neural networks may be of different sizes. Additionally, weights not included in the xml are 0. The neural network must have at least two nodes.

(15) 6. Produce an html page with tables from the XML in problem 5. You are free to use whatever method you want, though I would recommend using an external library, such as javax.xml.parsers.DocumentBuilder. If you validate your schema via the xml schema in problem 5, I will give 10 bonus points.