BIS 360
Exercise #4
Applied Database Normalization Theory

I. Objective

For this assignment you’ll work with database normalization to make sure a resulting conceptual model adheres to a set of normalized relations. Basically you will normalize relations, create an ERD and then apply database normalization theory to make sure you can successfully create a normalized database model that contains relations that are all in third normal form (3NF).

II. Case Description

Consider the following list of individual 3NF relations below. These relations were developed from several separate normalization activities.

PATIENT (PATIENT_ID, ROOM_NUMBER, ADMIT_DATE, ADDRESS)
ROOM (ROOM_NUMBER, PHONE, DAILY_RATE)
PATIENT (PATIENT_NUMBER, TREATMENT_DESCRIPTION, ADDRESS)
TREATMENT (TREATMENT_ID, DESCRIPTION, COST)
PHYSICIAN (PHYSICIAN_ID, NAME, DEPARTMENT)
PHYSICIAN (PHYSICIAN_ID, NAME, SUPERVISOR_ID)

Primary Keys should be **bold and underlined**.
Foreign Keys should be **bold and italicized**.

III. What You Need to Do

1. Merge the above relations into a consolidated set of 3NF relations. Make and state whatever assumptions you consider necessary to resolve any potential problems you identify in the merging process.

**On the Assumptions**

During the process you will need to create a table of your assumptions with an explanation as to why you are making the assumption. You should use a table like this:
<table>
<thead>
<tr>
<th>Assumption</th>
<th>Reason for Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each department has only one supervisor.</td>
<td>With these two assumptions we can create only a supervisor or a department relation, but not both. This is sufficient because if the original set of 3NF relations are comprehensive, there are no nonkey attributes dependent on either DEPARTMENT or SUPERVISOR_ID. By doing this we can create both supervisor and department relationships with a 1:1 relationship between them. This allows for evolution of the database model.</td>
</tr>
<tr>
<td>Each supervisor can only supervise one department.</td>
<td></td>
</tr>
<tr>
<td>Next assumption</td>
<td>Explanation</td>
</tr>
</tbody>
</table>

2. **Draw an ER diagram based on your 3NF relations.** Use Microsoft PowerPoint, Word, or Visio for the ER Diagram. Make sure to include all relationships, cardinalities, attributes, and appropriate verbals in the diagram.

**Some Hints**

- It takes six assumptions to normalize during the 3NF merging process. (I gave you two of them above.)
- It takes another four assumptions about minimum cardinalities to create a valid ER diagram
- ER diagrams do not always need to have all parts related to one another. Sometimes there are two similar, but separate ER diagrams included in one larger ER diagram of a system.

**IV. Exercise Deliverables**

Turn in the following items **stapled together in the following order.** (No folder please.)

1. Cover Page with appropriate information
2. 3NF relations
3. Assumption table
4. ER Diagram