CSCE 2501 - Fundamentals of Database Systems
Assignment 3

This is an individual assignment. Rules governing academic integrity are strongly enforced without exception.

1. For each of the following relation schemas, Answer the following questions: **(30 points)**
   i) Extract all candidate keys of the given relation
   ii) Draw the functional dependencies for each relation
   iii) Determine the normal form of the given relation as it stands. Justify your answer
   iv) Normalize the relation to the highest possible normal form. Make sure to illustrate your normalization process in each step

   a. Consider a relation SAP that represents sales of products by different salesmen in different areas. Each salesman can work in only one area. All salesmen working in the same area receive equal commission value **(6 points)**

   SAP (SID, name, area, comm, PID, qty)

   ```
   SID   : Salesman ID, (unique) for each salesman,
   name  : Salesman name,
   area  : Area name, (unique) for each area,
   comm  : Commission value,
   PID   : Product number, (unique) for each product,
   qty   : Quantity of the product sold by the salesman in the area.
   ```

   b. Consider a relation ATLANTA that represents data about Players and their positions in the Olympic games. A player may participate in more than one game, and a game may have several players. **(6 points)**

   ATLANTA (PID, name, GID, Gdate, position)

   ```
   PID      :  Player ID, (unique) for each player,
   name     :  Player name,
   GID      :  Game ID, (unique) for each game,
   Gdate    :  Game date,
   position :  Player position in the game.
   ```

   c. Consider a relation GRADE representing grades obtained by students in different courses. **(6 points)**

   GRADE (SID, CRN, Cname, grade)

   ```
   SID         :  Student ID, (unique) for each student,
   CRN         :  Course number, (unique) for each course,
   Cname       :  Course name, (unique) for each course,
   Grade       :  student grade in the course.
   ```

d. Consider relation EXAM with attributes S (student), J (subject), and P (position). The meaning of an EXAM tuple (s, j, p) is that student s was examined in subject j and achieved position p in the class list. The following constraint holds: **(6 points)**

```
No two students obtained the same position in the same subject
```

e. Consider relation PHD with attributes P (patient), H (hospital), and D (doctor). The meaning of a PHD tuple (p,h,d) is that patient p visited hospital h and has been examined by doctor d. The following constraints hold: **(6 points)**

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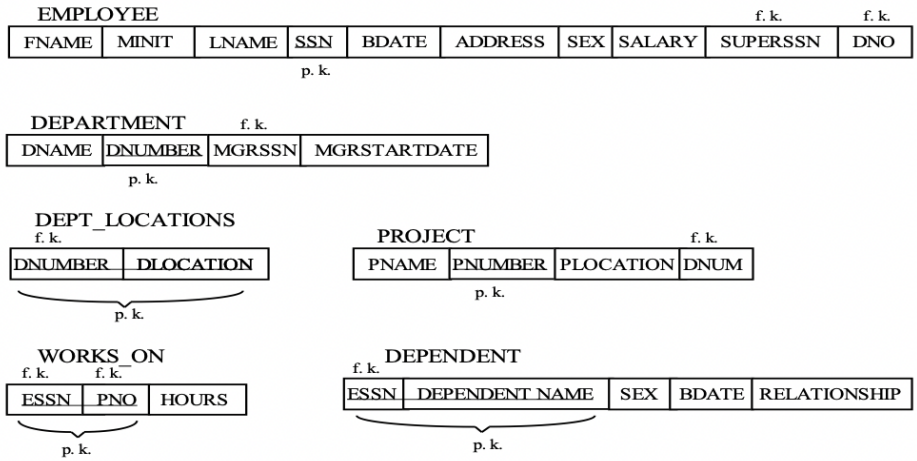
- In each hospital, each patient is examined by only one doctor.
- Each doctor works for only one hospital.
```

2. Consider the following relational database schema for a COMPANY database. Suppose that all the relations were created by (and hence owned by) user X, who wants to grant the following privileges to user accounts A, B, C, D, and E. Write SQL statements to grant these privileges. Use views where appropriate. **(20 points)**



a. Account A can retrieve or modify any relation except DEPENDENT and can grant any of these privileges to other users. **(4 points)**

b. Account B can retrieve all the attributes of EMPLOYEE and DEPARTMENT except for SALARY, MGRSSN, and MGRSTARTDATE. **(4 points)**

c. Account C can retrieve or modify WORKS_ON but can only retrieve the FNAME, MINIT, LNAME, SSN attributes of EMPLOYEE and the PNAME, PNUMBER attributes of PROJECT. **(4 points)**

d. Account D can retrieve any attribute of EMPLOYEE or DEPENDENT and can modify DEPENDENT. **(4 points)**

e. Account E can retrieve any attribute of EMPLOYEE but only for EMPLOYEE tuples that have DNO = 3. **(4 points)**