Assignment One

Please turn in this homework with hardcopy (in class) at the starting of the class in October 2th 2017 (Mondy)

1. Design an ER schema for keeping track of information about votes taken in the U.S. House of Representatives during the current two-year congressional session. The database needs to keep track of :

   a) Each U.S. **STATE**'s **Name** (e.g., 'Texas', 'New York', 'California') and include the **Region** of the state (whose domain is {'Northeast', 'Midwest', 'Southeast', 'Southwest', 'West'}).

   b) Each **CONGRESS_PERSON** in the House of Representatives is described by his or her **Name**, plus the **District represented**, the **Start_date** when the congressperson was first elected, and the political **Party** to which he or she belongs (whose domain is {'Republican', 'Democrat', 'Independent', 'Other'}).

   c) Each **BILL** (i.e., proposed law) including the **Bill_name**, the **Date_of_vote** on the bill, whether the bill **Passed_or_failed** (whose domain is {'Yes', 'No'}), and the **Sponsor** (the congressperson(s) who sponsored—that is, proposed—the bill).

   d) How each congressperson voted on each bill (domain of **Vote** attribute is {'Yes', 'No', 'Abstain', 'Absent'}

   Draw an ER schema diagram for this application. State clearly any assumptions you make. (Involving Chapter 3 and 4. Hint: first figure out which are Entities, which are Attributes, Which are Relationships)

2. Suppose that each of the following **Update** operations is applied directly to the database state shown in Figure 1. Discuss **all integrity constraints** violated by each operation (Involving Chapter 5)

   1) Insert <'Robert', 'F', 'Scott', '943775543', '1972-06-21', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1> into EMPLOYEE.

   2) Insert <'Production', 4, '943775543', '2007-10-01'> into DEPARTMENT.

   3) Modify the Mgr_ssn and Mgr_start_date of the DEPARTMENT tuple with Dnumber = 5 to '123456789' and '2007-10-01', respectively.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

Figure 1: One possible database state for the COMPANY relational database schema

3. Specify the following query on the database in Figure 2 in SQL. Show the query results if the query is applied to the database state in Figure 1. (Involving Chapter 6 and Chapter 7)

    1) For each department whose average employee salary is more than $30,000, retrieve the department name and the number of employees working for that department.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

Figure 2: Schema diagram for the COMPANY relational database schema

4. Specify the following queries on the COMPANY relational database schema shown in Figure 2 using the relational operators discussed in this chapter. Also show the result of each query as it would apply to the database state in Figure 1. (Involving Chapter 8)

    1) Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.
    2) For each project, list the project name and the total hours per week (by all employees) spent on that project.
    3) For each department, retrieve the department name and the average salary of all employees working in that department.

5. Figure 3 shows an ER schema for a database that can be used to keep track of transport ships and their locations for maritime authorities. Map this schema into a relational schema and specify all primary keys and foreign keys. (Involving Chapter 9)

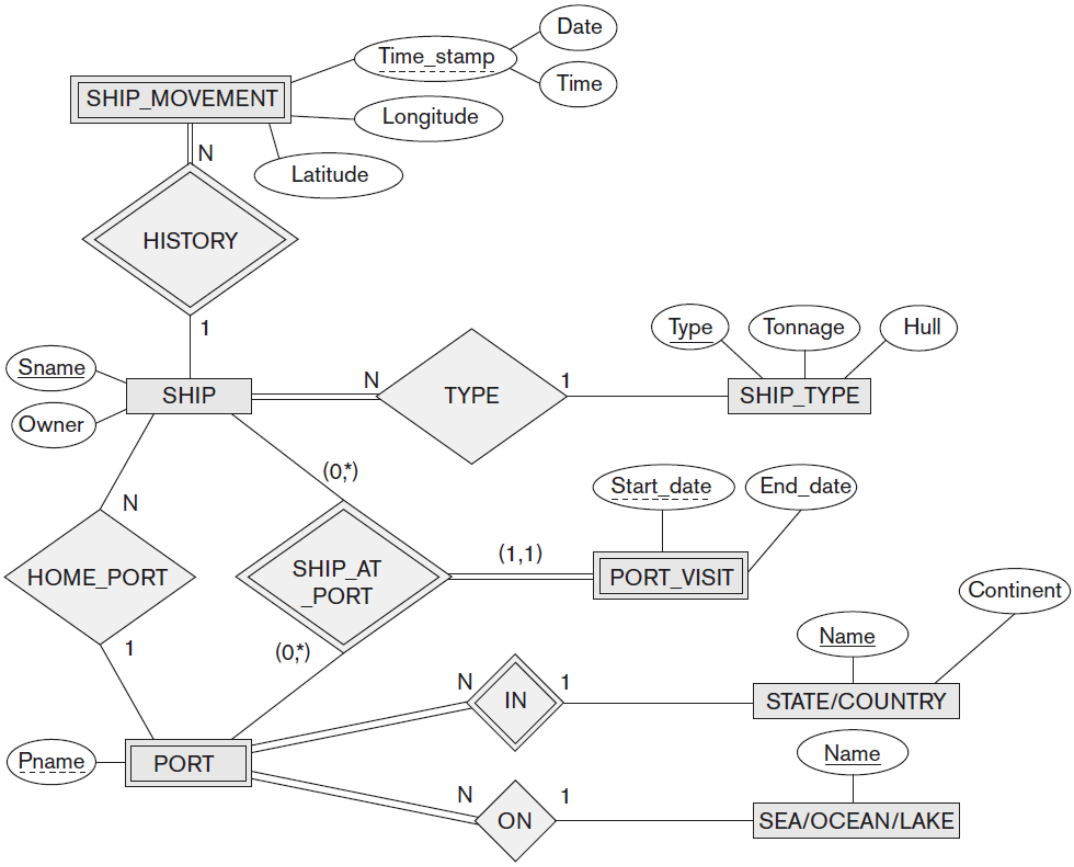

Figure 3: An ER schema for a SHIP_TRACKING database