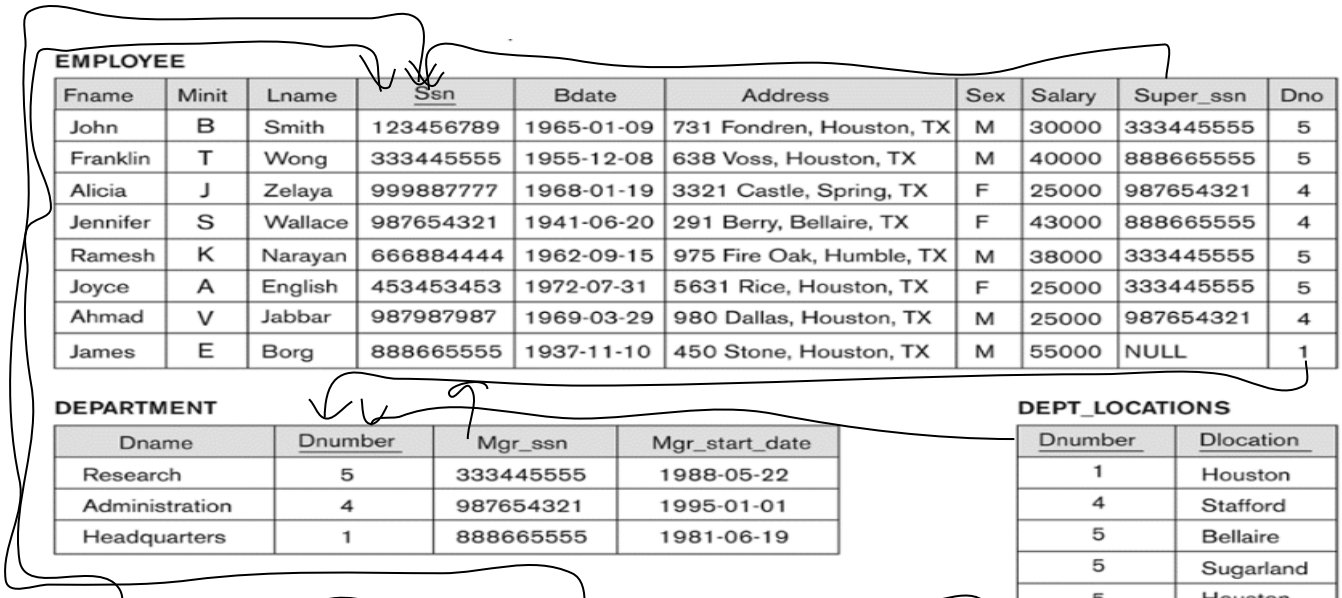
Practice Sheet
Chapter 5 (Relational Database Constraints)

QUESTION:

Consider the following relational database state, primary keys are underlined, foreign keys are shown with arrow:



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

Suppose each of the following update operations is applied directly to the above database state. Discuss **which integrity constraint(s) were violated by each operation** and **how**

you can enforce these constraints to ensure no violation occurs. If an operation does not violate any constraints, briefly explain why.

a. Insert <'D1', 'Stafford'> into Department_Locations table
b. Insert <6, 'Stafford'> into Department_Locations table
c. Insert <null, 'Stafford'> into Department_Locations table
d. Update dno of John B Smith to 3 in Employee table.
e. Delete the employee Franklin T Wong from the Employee table.
f. Delete the third record from works_on table
g. update pnumber of productX to 20 in project table

SOLUTION:
Your solution explanations should be in your own words.

a. Domain constraint, because Dnumber is integer but "D1" is not. Referential Integrity Constraint, because no "D1" in referenced table Department. To prevent violation: Domain constraint -> declare Dnumber as int, Referential Integrity -> declare Dnumber in the Department_Locations table as foreign key. Then DBMS will disallow this operation.

b. Referential Integrity Constraint, because no "6" for Dnumber in referenced table Department. To prevent violation: declare Dnumber in the Department_Locations table as foreign key. Then DBMS will disallow this operation.

c. Entity Integrity Constraint, Dnumber is part of primary key and so cannot be null. To prevent violation: declare (Dnumber, Dlocation) as primary key when creating the table. Then DBMS will disallow this operation.

d. Referential Integrity Constraint, because no "3" for Dnumber in referenced table Department. To prevent violation: declare Dno in the Employee table as foreign key. Then DBMS will disallow this operation.

e. Referential Integrity Constraint, if we notice the SSN of Franklin T Wong, then we can see that this employee is referenced by Department(Mgr_ssn),

Works_On(ESSN) and Dependent(ESSN). If we remove this employee from the Employee table, then the values in the referencing tables will not be existing in the referenced table anymore. To prevent violation: when declaring the columns in the referencing table as foreign key also specify what will happen on delete: restrict->deletion from referenced table not allowed, cascade-> the referencing rows will also be deleted or set null-> the value in the referencing column will be set to null.

f. No violation. This table is not referenced by other tables, so no referential integrity violation. Deletion of a row does not cause other constraint violations in any scenario.

g. Key constraint, Pnumber is the primary key in the Project table, so duplicate values are not allowed and “20” already exists. To prevent violation, declare pNumber as the primary key during table creation. Also, Referential Integrity constraint, “ProductX” pNumber is “1” which is referenced in the Works_On table, if the value is updated, then the referencing table’s value will not be an existing value from the referenced table any more. To prevent violation: when declaring the columns in the referencing table as foreign key also specify what will happen on update: restrict->update of referenced column in the referenced table not be allowed, cascade-> the referencing rows will also be updated or set null-> the value in the referencing column will be set to null.