CPCS241-Database I-1st Semester-Project

Investigation Office

Problem Definition and Analysis

Group No: 7

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Contents

PART I: Analysis

1. Problem Definition and Data Requirements

1.1 Problem Definition

Every successful establishment must have a database to manage the system, and control and maintain data. Therefore, the database is the cornerstone of every establishment specifically in the Investigation Office. Investigation Office demands a management system to keep all investigators' data, including their rank, the cases they are working on, and everything relative to their cases such as case type, witnesses, accused, and lawyer of the accused. In addition, all the case requirements data is included in the database and used to link related data sets together.

As mentioned above, the primary purpose of this database is to obtain information about detectives and case information and show the average number of successful and unsuccessful cases.

1.2 Data Requirements

1. Accused

1. Each accused has a name (first, middle, last), unique ID number, gender, address, communication(Email and phone number) and arrest status(arrest or not).

2. Branch

1. Each branch has a unique number and phone number for communication.
2. Each branch is located in a city.

3. Case

1. Each case has a unique number, and accusation (ex: steal, killing, injustice).
2. Each case has actions taken by the detective (reservation, questioning, hearing the witness, secondment of experts, release, arrest).
3. Each case has name that's determined the department name.
4. Each case has number of evidence.

4. Detective

1. Each detective has a name (first, middle, last), unique id number, gender, address, commination (phone number and email),salary.
2. Each detective takes action for a case .

5. Department

1. Each department has a unique name(ex: criminal, civil investigation), a unique number, a location),

6. Witnesse

1. Each witness has a name (first, middle, last), unique id number, address, gender, and communication (Email and phone number)
2. It is required a witness testimony.

7. Lawyer

1. Each lawyer has a name (first, middle, last), unique id number, address, gender, and communication (Email and phone number) specialization.

8. Suspect

1. Each suspect has a name (first, middle, last), unique id number, address, gender, and communication (Email and phone number), and indication of suspicion.

9. Clerk

1. Each clerk has a name (first, middle, last), unique id number, address, gender, and communication (Email and phone number) and salary .
2. It is required to write the accused and victim statement and track the current number of statements per week that a clerk collecting on each case.

10. Victim

1. Each Victim has a name (first, middle, last), unique id number, address, gender, and communication (Email and phone number).

1.3 Business Rules

Our system follows some of the rules to facilitate Investigation Office and avoid mistakes in all its parts and services:

1- Each supervisor supervises many Supervisee in the detective office.
2- Each Branch contains more than one department, and each department founds in all branches.
3- A department controls several cases, and each case has one department control it.
4- A detective can manage one department, and each department has one detective manager.
5- Each detective work in one department, and each department has many detectives work on it.
6- A detective work on several cases and a case has only one detective.
7- Each clerk has more than one case and the case has only one clerk.
8- A case can have more than one witness and vice versa.
9- A case can have more than one suspect and vice versa.
10- A case can have more than one victim and vice versa.
11- A case can have more than one accused and vice versa.
12- A lawyer can have more than one defendant, and every defendant has a lawyer. (Defendant means suspect and victim and accused)

1.4 Intended Output of the system

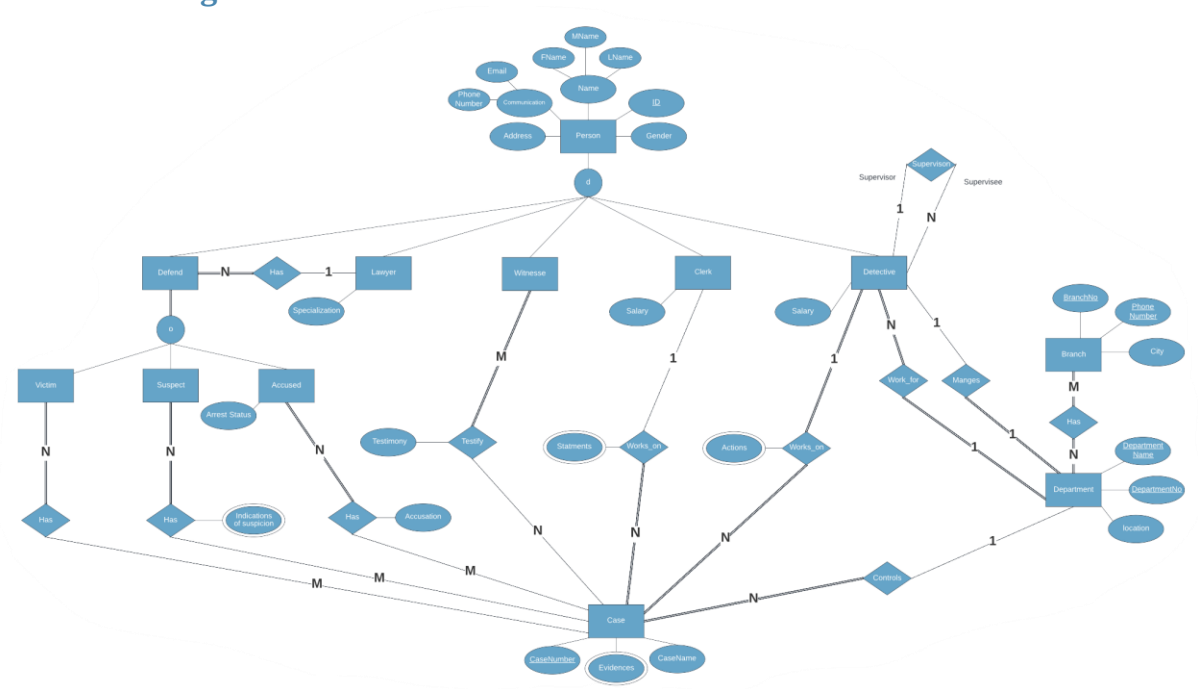
We can query the investigation office DB as follows:

1. List the cases with maximum number of witnesses.
2. List the detectives who are responsible of cases with the highest number of witnesses.
3. List number of victims, accused, suspects in the system.
4. List the department with the highest number of detectives.
5. List the cases that have at least 3 evidences.

PART II: DB DEISGN

2 ER Diagram Design

1.1 ER diagram



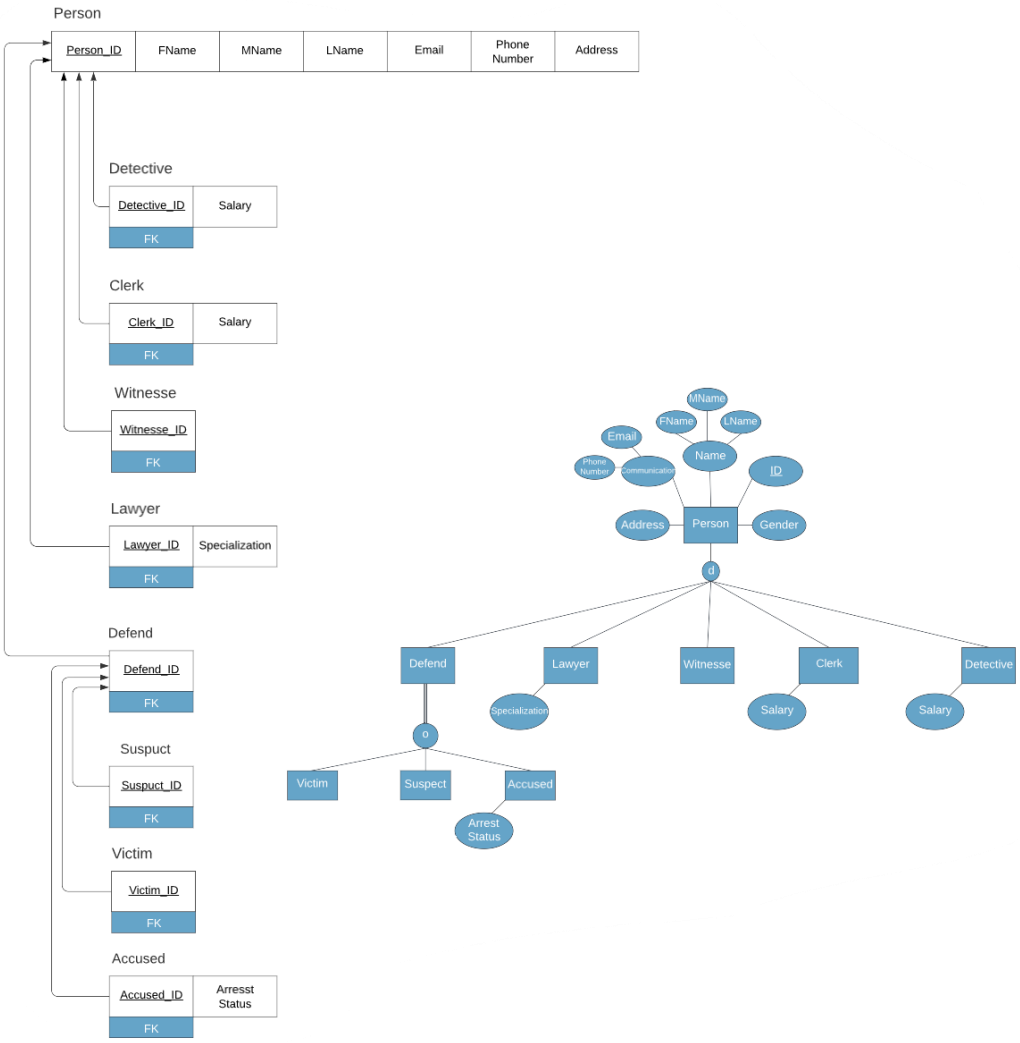
2.2 Design of Business Rules

Business Rule	Design Decisions	Justification (if any)
Each supervisor supervises many supervisee in the detective office.	1: N binary recursive relationship	
Each person must have a specialization.	Superclass/subclass relationship with disjoint Ness and completeness constraints	
Each department control many cases.	1: N binary relationship between DEPARTMENT and CASE	One Department control many case (partially participation). The case must be controlled by department (total participation).
Each defendants must have lawyer.	1: N binary relationship between DEFEND and LAWYER	A lawyer has many defendants (Partially participation). defendants has only one lawyer. (Total participation)
A detective work in one department.	N:1 binary relationship between DETECTIVE and DEPARTMENT	A detective must work in one department AND each department must has many

		detectives. (Full participation on both side)
A detective must work for many case.	1: N binary relationship between DETECTIVE and CASE	A detective work on many cases. The case has one detective works on it. (Total participation on both side)
Each clerk work on at least one case.	1: N binary relationship between CLERK and CASE	A clerk work on many case (partially participation). The case must write by single clerk (total participation).
A case can have more than one witness.	N:M binary relationship between WITNESS and CASE	A case testifying by many witness (partially participation). Each witness testify a case (total participation).
Each branch contains more than one department.	M: N binary relationship between BRANCH and DEPARTMENT	Each branch must have more than one department. Each Department must be found in all branches. (Total participation on both sides)
Each defend must have a specialization.	Superclass/subclass relationship with overlapping constraint.	
Each case can have more than one accused.	M: N binary relationship between ACCUSED and CASE	Each case can have more than one accused (partially participation). Accused may have more than one case. (Total participation).
Each case can have more than one suspect.	M: N binary relationship between SUSPECT and CASE	Each case can have more than one Suspect (partially participation). A suspect may have more than one case. (Total participation).
Each case can have more than one victim.	M: N binary relationship between VICTIM and CASE	Each case can have more than one victim (Partially participation). A victim may have more than one case. (Total participation).

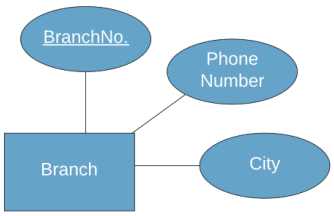
3 ER-to-logical schema mapping

3.1 Mapping of Regular Entity Types



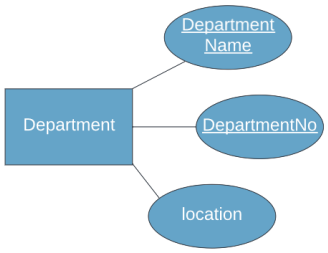
Branch

BranchNo	‣ Phone Number	City



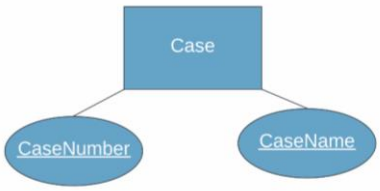
Department

DepartmentNo	‣ Department Name	location



Case

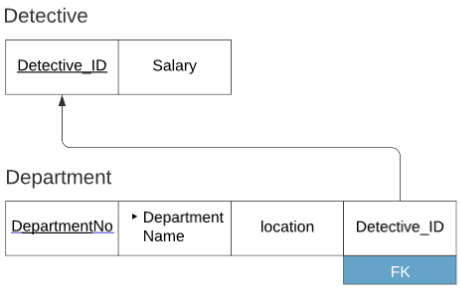
CaseNumber	CaseName



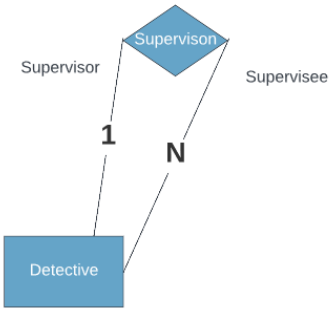
3.2 Mapping of Weak Entity Types

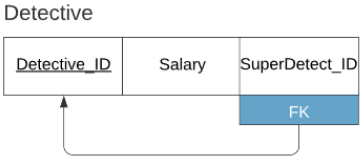
The system dose not have weak entity types.

3.3 Mapping of binary 1-1 relationship types



3.4 Mapping of binary 1-N relationship types





Detective

Detective_ID	Salary	SuperDetect_ID	DepartmentNo
FK		FK	FK

Department

DepartmentNo	‣ Department Name	location	Detective_ID
			FK

Department

DepartmentNo	‣ Department Name	location	Detective_ID
			FK

Case

CaseNumber	CaseName	DepartmentNo
		FK

Case

CaseNumber	CaseName	DepartmentNo	Clerk_ID
		FK	FK

Clerk

Clerk_ID	Salary

Detective

Detective_ID	Salary	SuperDetect_ID	DepartmentNo
PK		FK	FK

Case

CaseNumber	CaseName	DepartmentNo	Clerk_ID	Detective_ID
		FK	FK	FK

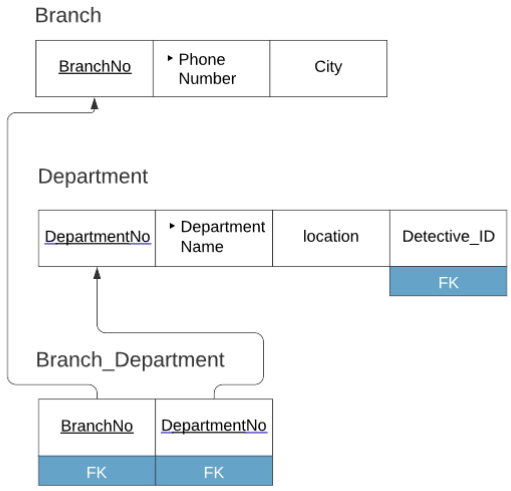
Defend

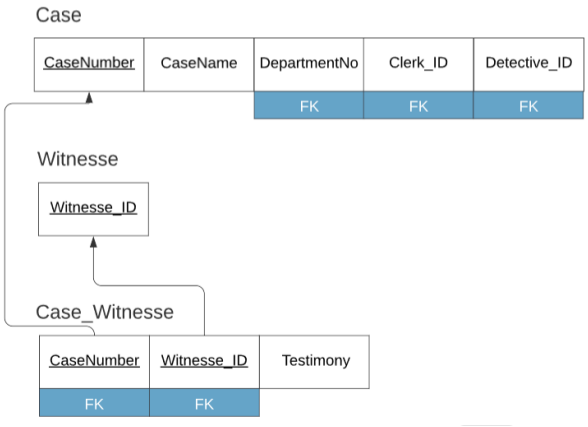
Defend_ID	Lawyer_ID
	FK

Lawyer

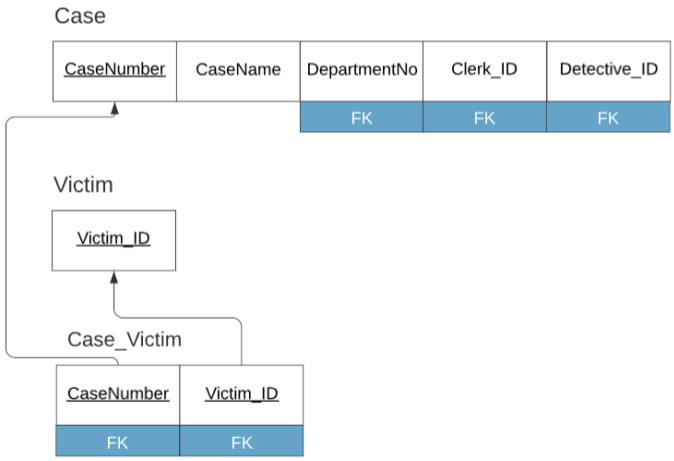
Lawyer_ID	Specialization

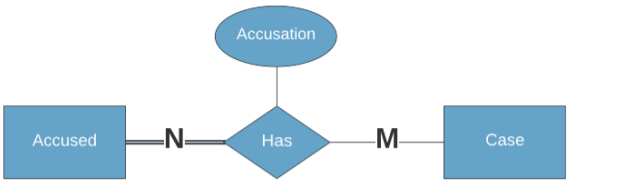
3.5 Mapping of binary M-N relationship types

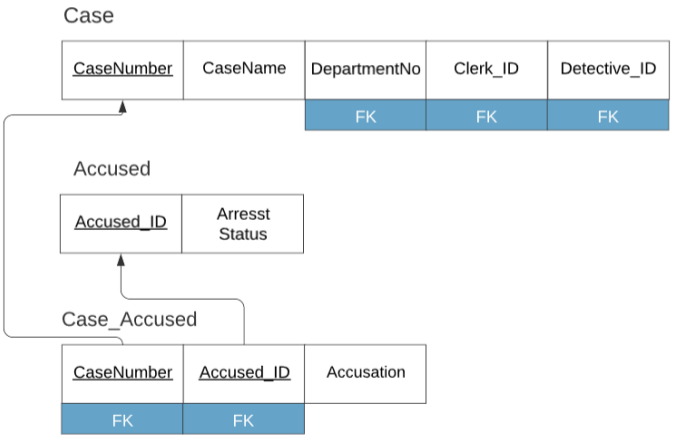


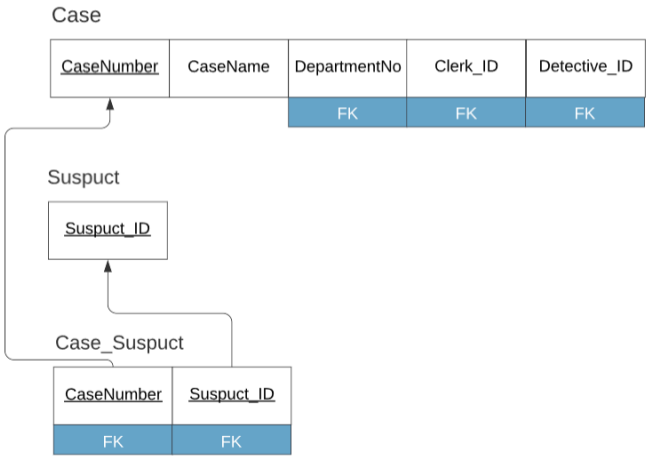



Victim
N
Has
M
Case

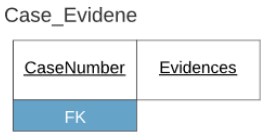

Case
CaseNumber
CaseName
DepartmentNo
Clerk_ID
Detective_ID
FK
FK
FK
Victim
Victim_ID
Case_Victim
CaseNumber
Victim_ID
FK
FK

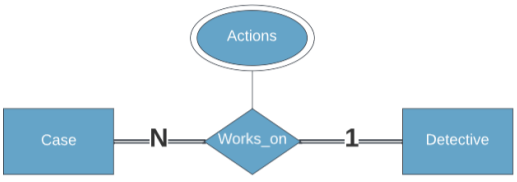

Accusation
Accused
N
Has
M
Case

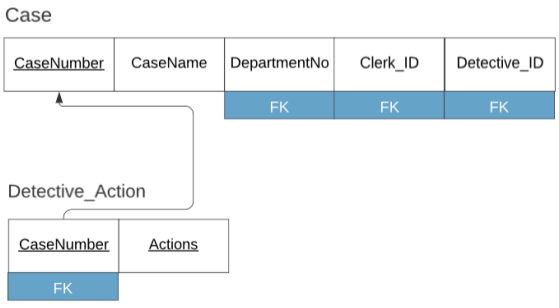

Case
CaseNumber
CaseName
DepartmentNo
Clerk_ID
Detective_ID
FK
FK
FK
Accused
Accused_ID
Arresst Status
Case_Accused
CaseNumber
Accused_ID
Accusation
FK
FK

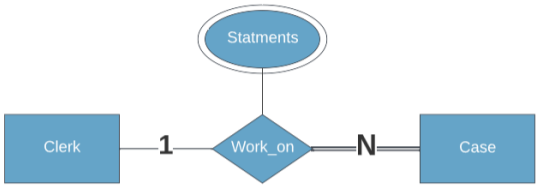


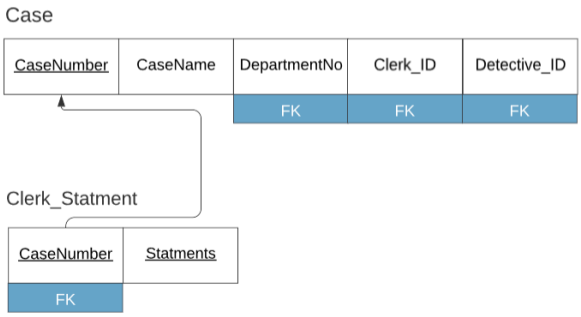
3.6 Mapping of multivalued attributes

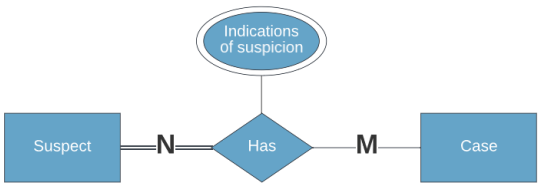


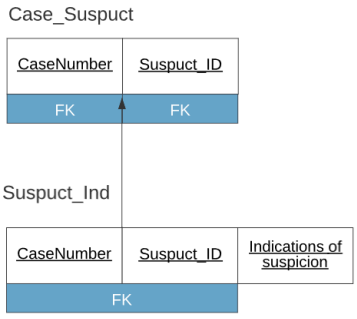








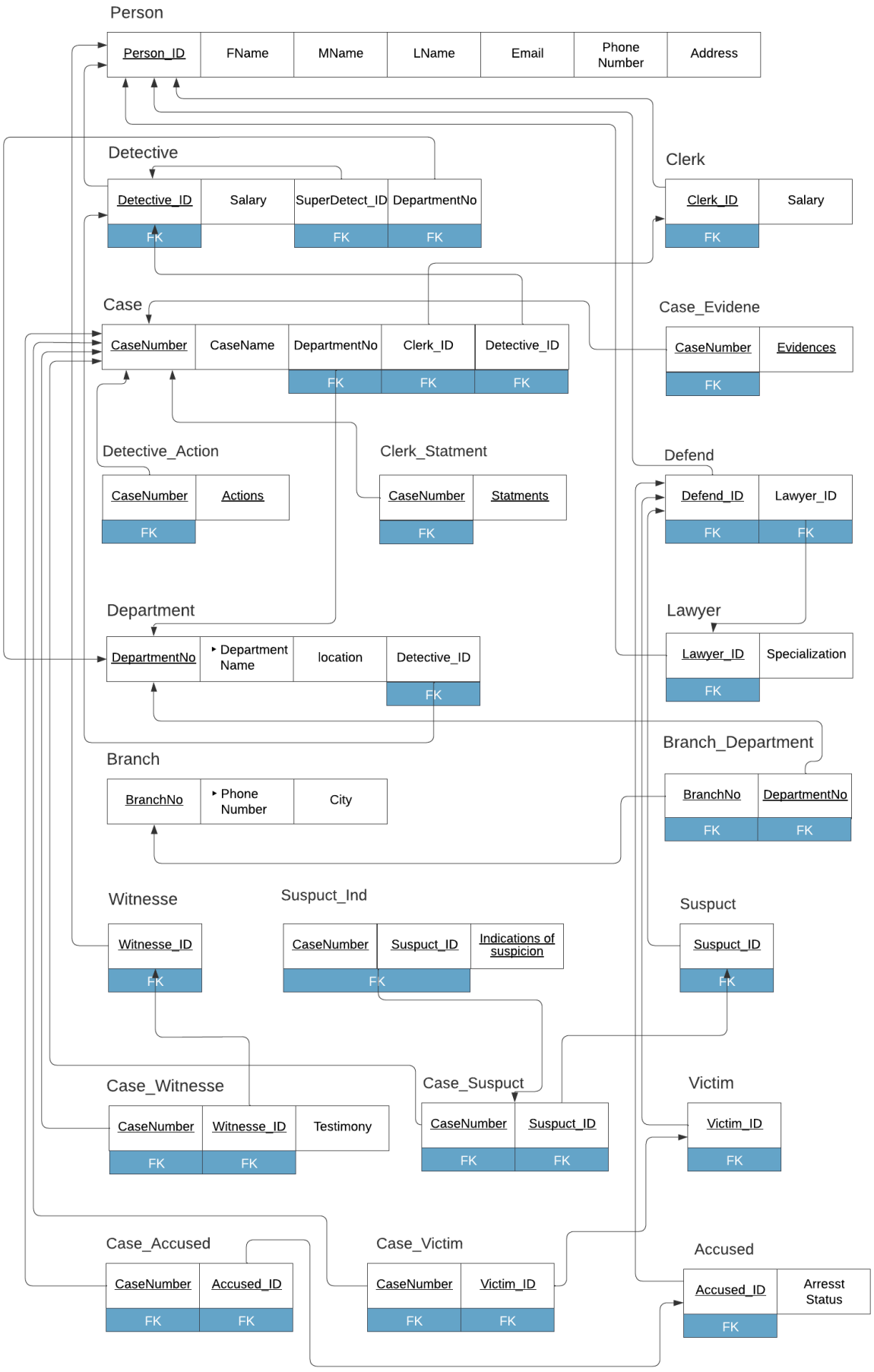




3.7 Mapping of n-ary relationship types

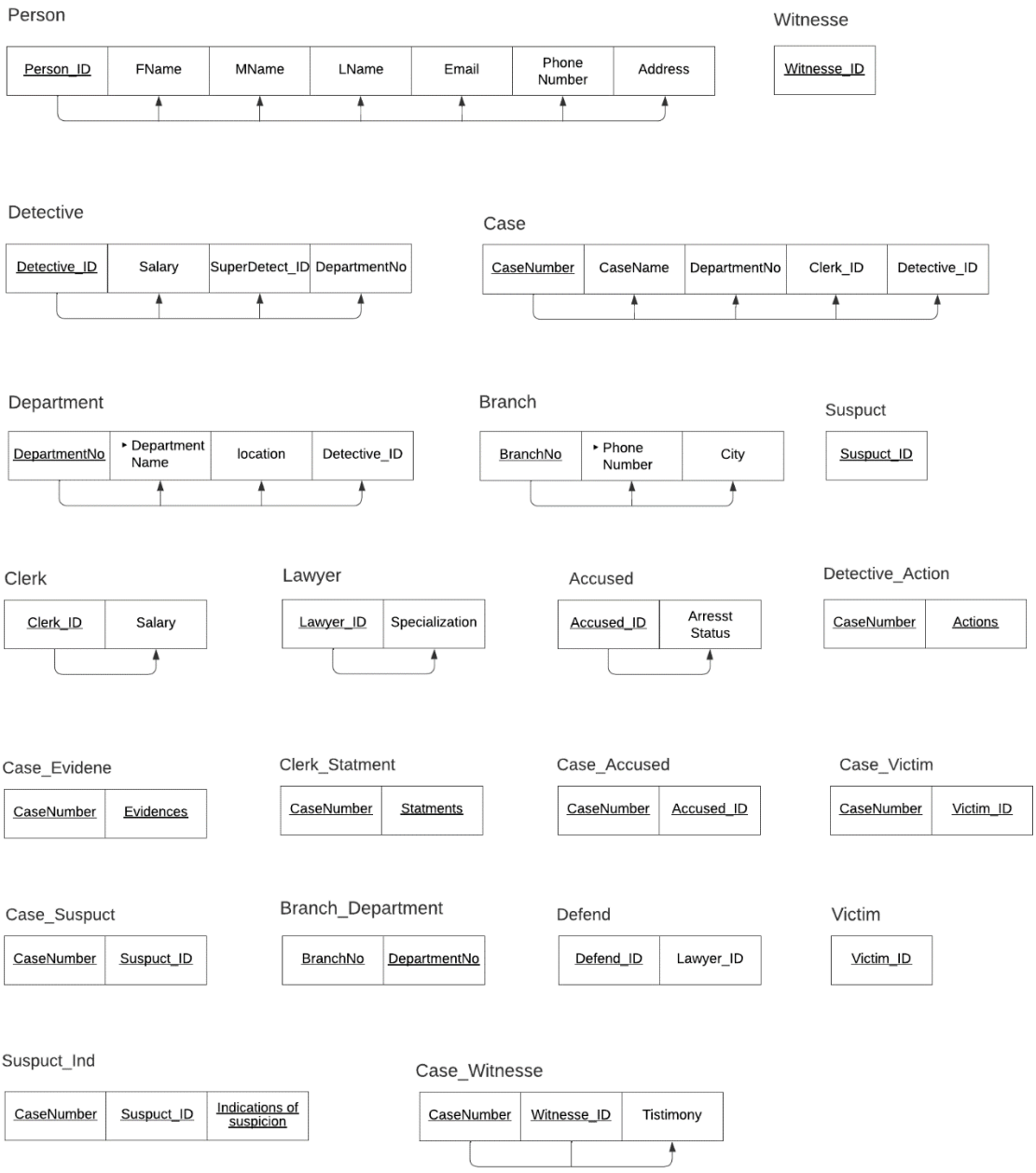
The system does not have n-ary relationship types.

3.8 Schema Diagram



4 Normalization

Functional dependence



4.1 First Normal Form

Person

Person_ID	FName	MName	LName	Email	Phone Number	Address

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Detective

Detective_ID	Salary	SuperDetect_ID	DepartmentNo

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Case

CaseNumber	CaseName	DepartmentNo	Clerk_ID	Detective_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Department

DepartmentNo	▸ Department Name	location	Detective_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Branch

BranchNo	▸ Phone Number	City

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Witnesse

Witnesse_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Clerk

Clerk_ID	Salary

Table on first normal form

Reason: Because there are no multivalued attribute nested relation .

Lawyer

Lawyer_ID	Specialization

Table on first normal form

Reason: Because there are no multivalued attribute nested relation.

Defend

Defend_ID	Lawyer_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Accused

Accused_ID	Arresst Status

Table on first normal form

Reason: Because there are no multivalued attribute nested relation .

Victim

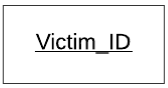


Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Suspuct

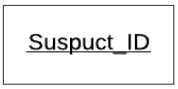


Table on first normal form

Reason: Because there is no multivalued attribute nested relation**.**

Case_Evidene

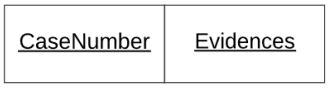


Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Clerk_Statment

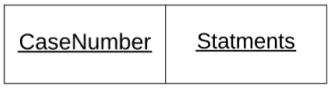


Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Detective_Action

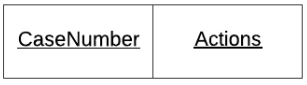


Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Branch_Department

BranchNo	DepartmentNo

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Suspuct_Ind

CaseNumber	Suspuct_ID	Indications of suspicion

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Case_Witnesse

CaseNumber	Witnesse_ID	Testimony

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Case_Accused

CaseNumber	Accused_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Case_Victim

CaseNumber	Victim_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

Case_Suspuct

CaseNumber	Susuct_ID

Table on first normal form

Reason: Because there is no multivalued attribute nested relation.

4.2 Second Normal Form

Person

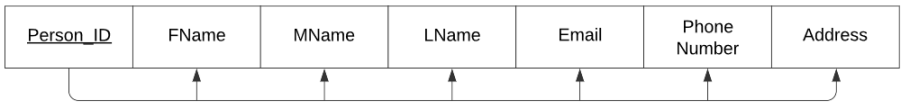


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Case

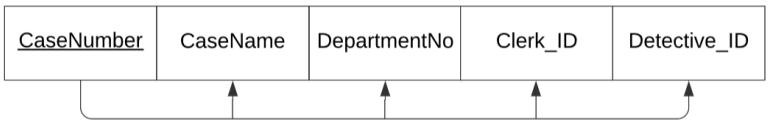


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Detective

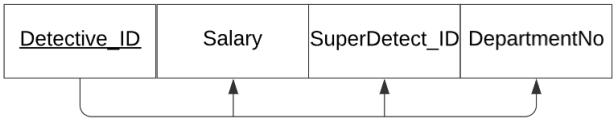


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Detective_Action

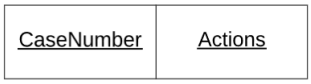


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Clerk_Statment

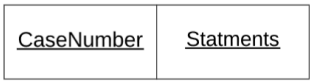


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Department

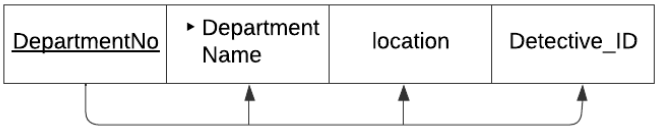


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Branch

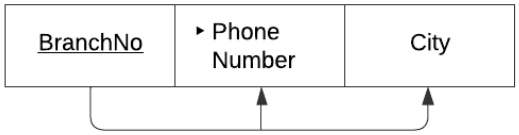


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Witnesse

Witnesse_ID

Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Suspuct_Ind

CaseNumber	Suspuct_ID	Indications of suspicion

Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Case_Witnesse

CaseNumber	Witnesse_ID	Tistimony

Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK

Case_Suspuct

CaseNumber	Suspuct_ID

Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Case_Accused

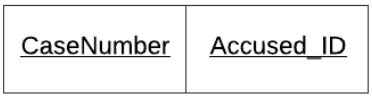


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Case_Victim

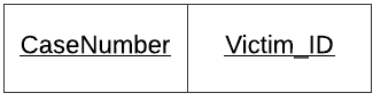


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Clerk

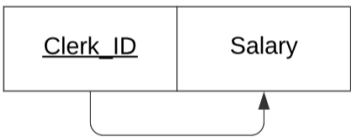


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Case_Evidene

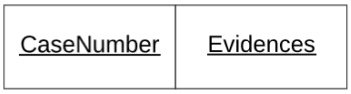


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Defend

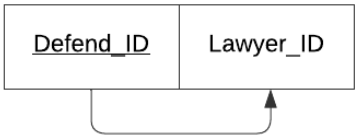


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Lawyer

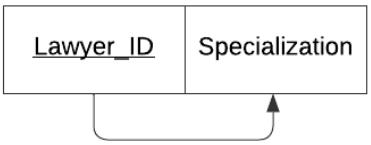


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Branch_Department

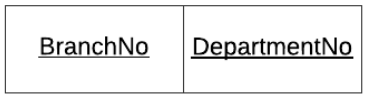


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

Suspuct

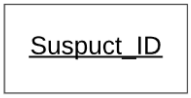


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

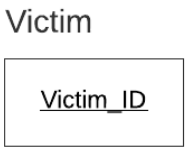


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

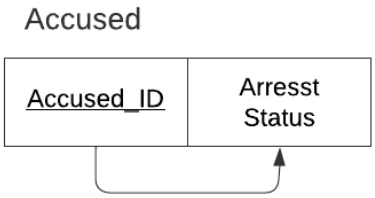


Table on second normal form

Reason: because functional dependence have not a partial functional dependency on PK .

4.3 Third Normal Form

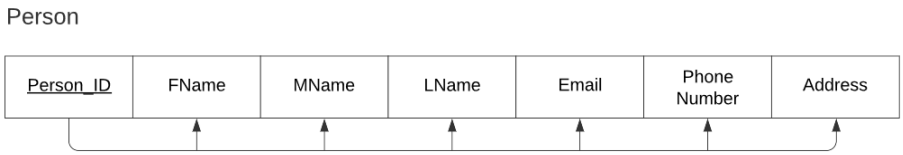


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

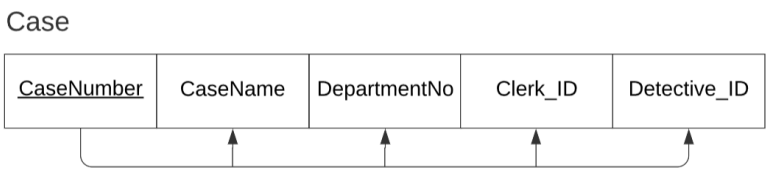


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Detective

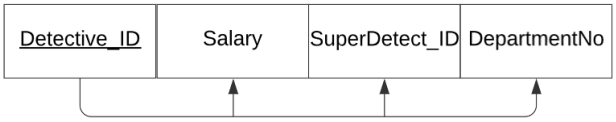


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Detective_Action

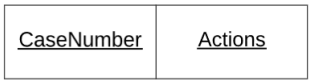


Table on third normal form

Reason: because no functional dependence on PK .

Clerk_Statment

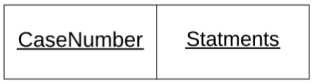


Table on third normal form

Reason: because no functional dependence on PK .

Department

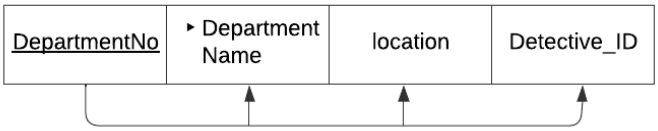


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Branch

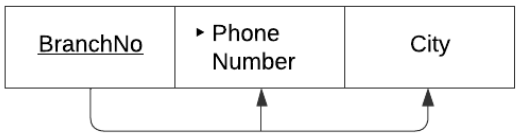


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Witnesse

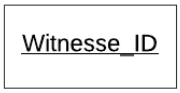


Table on third normal form

Reason: because no functional dependence on PK .

Suspuct_Ind

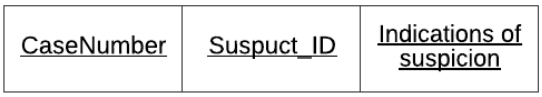


Table on third normal form

Reason: because no functional dependence on PK .

Case_Witnesse

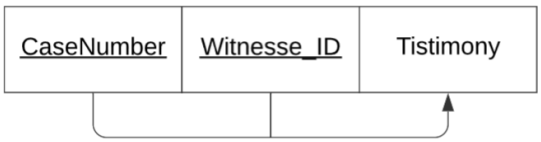


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK.

Case_Suspuct

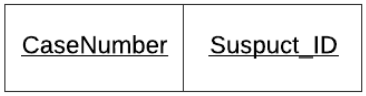


Table on third normal form

Reason: because no functional dependence on PK .

Case_Accused

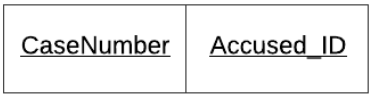


Table on third normal form

Reason: because no functional dependence on PK .

Case_Victim

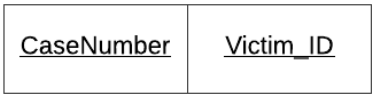


Table on third normal form

Reason: because no functional dependence on PK .

Clerk

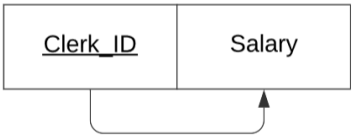


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Case_Evidene

CaseNumber	Evidences

Table on third normal form

Reason: because no functional dependence on PK .

Defend

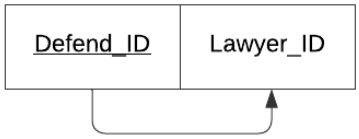


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Lawyer

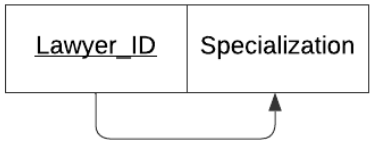


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

Branch_Department

BranchNo	DepartmentNo

Table on third normal form

Reason: because no functional dependence on PK .

Suspuct

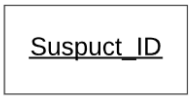


Table on third normal form

Reason: because no functional dependence on PK .

Victim

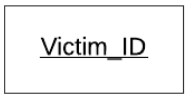


Table on third normal form

Reason: because no functional dependence on PK .

Accused

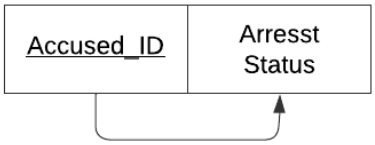
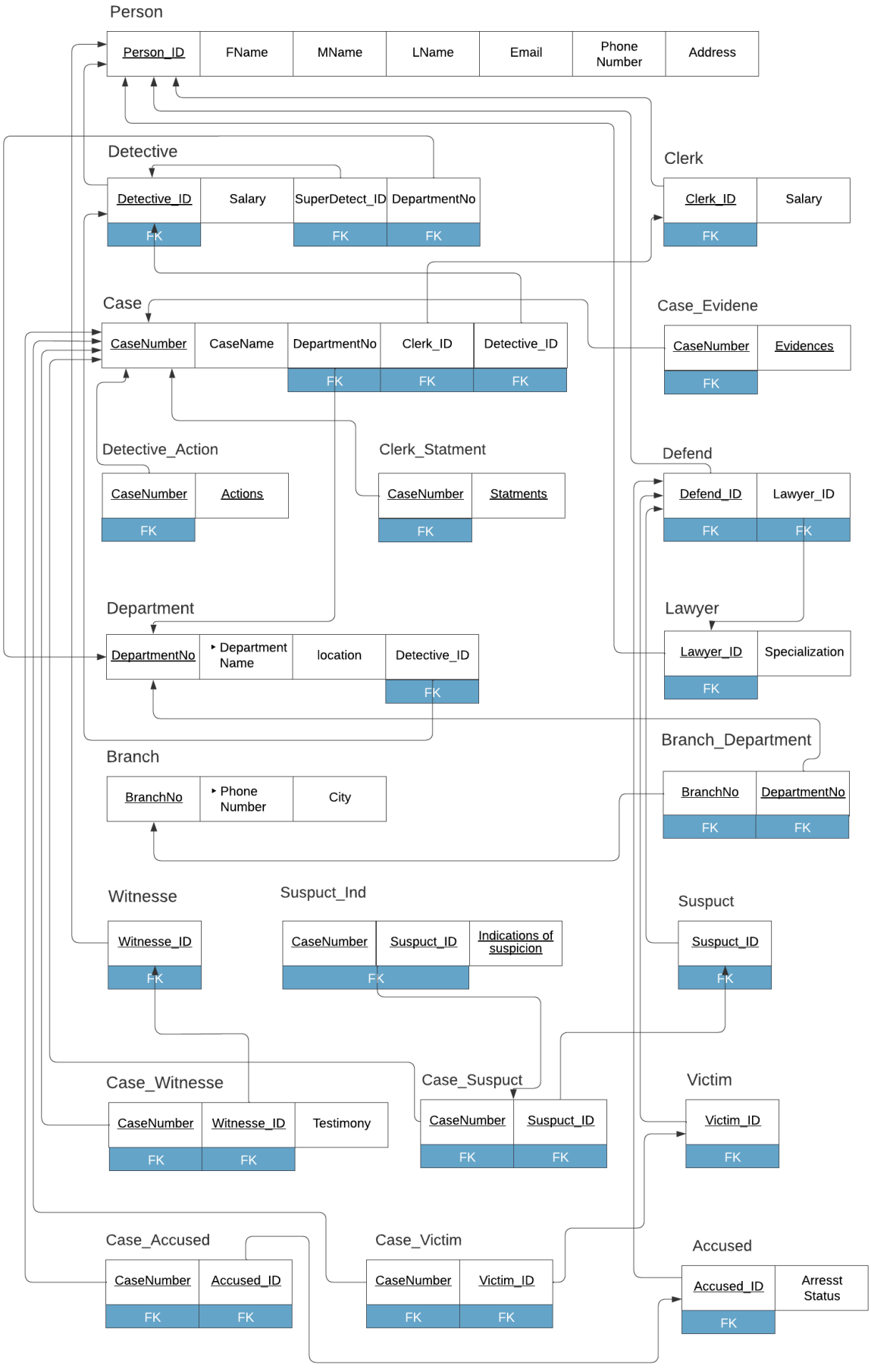


Table on third normal form

Reason: because functional dependence have not transitive functional dependency on PK .

5 Final DB Schema Diagram



PART III: IMPLEMENTATION

6 Table Creation Script

6.1 Person Table

```
Create table Person( Person_ID number(30) ,FName varchar2(255) not null,
MName varchar2(255)not null,
Lname varchar2(255) not null,Gender varchar2(255) not null,Address
varchar2(255) not null,
PhoneNumber number(20)not null,Email varchar2(255) not null,
constraint PK_Person PRIMARY KEY(Person_ID));
```

6.2 Case Table

```
Create table case(CaseNumber number(30)  ,CaseName varchar2(255),
DepartmentNo number(30)not null ,Clerk_id number(30)not null,detective_id
number(30)not null,
constraint PK_Case  primary key (CaseNumber),
constraint FK_6_2_1 foreign key (DepartmentNo) references
Department(DepartmentNo)ON DELETE CASCADE,
constraint FK_6_2_2  foreign key (Clerk_id) references Clerk(Clerk_id)ON
DELETE CASCADE,
constraint FK_6_2_3 foreign key (detective_id ) references detective
(detective_id) ON DELETE CASCADE);
```

6.3 Detective Table

```
Create table Detective(Detective_ID number(30), Salary number(30),
SuperDetective number(30), DepartmentNo Number (30),
constraint PK_Detective primary key(Detective_ID),
constraint FK_6_3_1 foreign key(Detective_ID) references Person(Person_ID)
ON DELETE CASCADE,
constraint FK_6_3_2 foreign key(SuperDetective) references
Detective(Detective_ID) ON DELETE CASCADE,
constraint FK_6_3_3 foreign key(DepartmentNo) references
Department(DepartmentNo) ON DELETE CASCADE);
```

6.4 Department Table

```
create Table Department (DepartmentNo number (30), DepartmentName
varchar2(255) not null, Location Varchar2(255),DetectiveID Number (30));

Alter Table Department Add Constraint PK_Department  primary key
(DepartmentNo);

Alter Table Department Add Constraint FK_6_4_1 foreign Key(DetectiveID)
references Detective(Detective_ID) ON DELETE CASCADE;
```

6.5 Branch Table

```
create Table Branch ( BranchNum Number(30) ,phonNumber Number(30) not null,
city Varchar2(255) ,constraint FK_Branch primary key (BranchNum));
```

6.6 Suspect Table

```
create table Suspect(Suspect_ID number(30),
constraint PK_Suspect primary key(Suspect_ID),
constraint FK_6_6_1 foreign key(Suspect_ID)references Defend(Defend_ID)ON
DELETE CASCADE);
```

6.7 Clerk Table

```
create Table Clerk( Clerk_ID number(30) ,Salary number (30),
Constraint Pk_Clerk primary key(Clerk_ID),
Constraint Fk_6_7_1 foreign key(Clerk_ID)references Person(Person_ID) ON
DELETE CASCADE);
```

6.8 Victim Table

```
Create table Victim(Victim_ID number(30),
constraint PK_Victim primary key(Victim_ID),
constraint FK_6_8_1 foreign key(Victim_ID)references Defend(Defend_ID) ON
DELETE CASCADE);
```

6.9 Lawyer Table

```
create table Lawyer(Lawyer_ID number(30) , Specialization varchar2(255) not
null,
constraint PK_Lawyer primary key(Lawyer_ID),
constraint FK_6_9_1 foreign key(Lawyer_ID)references Person(Person_ID)  ON
DELETE CASCADE);
```

6.10 Accused Table

```
Create table Accused (Accused_ID number(10) not null, Arresst_Status
varchar2(255),
constraint PK_Accused primary key(Accused_ID),
constraint FK_6_10_1  foreign key (Accused_ID) references Defend
(Defend_ID)ON DELETE CASCADE);
```

6.11 Witness Table

```
create table Witnesse(Witnesse_ID number(30),Tistimony varchar2(255) not
null,
constraint PK_Witnesse  primary key(Witnesse_ID),
constraint FK_6_11_1 foreign key(Witnesse_ID)references Person(Person_ID)
ON DELETE CASCADE);
```

6.12 Defend Table

```
create table Defend( Defend_ID number(30) ,Lawyer_ID number(10) not null,
constraint PK_Defend primary key(Defend_ID),
constraint FK_6_12_1 foreign key(Defend_ID) references Person(Person_ID)
ON DELETE CASCADE,
constraint FK_6_12_2 foreign key(Lawyer_ID) references Lawyer(Lawyer_ID) ON
DELETE CASCADE);
```

6.13 Detective_Action Table

```
Create table Detective_Action(CaseNumber number(30), Actions varchar2(255),
constraint PK_Detective_Action primary key(CaseNumber, Actions),
constraint FK_6_13_1 foreign key(CaseNumber) references Case(CaseNumber) ON
DELETE CASCADE);
```

6.14 Case_Evidence Table

```
Create table Case_Evidence(CaseNumber number(30), Evidence varchar2(255),
constraint PK_Case_Evidence primary key(CaseNumber,Evidence),
constraint FK_6_14_1 foreign key(CaseNumber) references Case(CaseNumber) ON
DELETE CASCADE);
```

6.15 Clerk_Statement Table

```
create table Clerk_Statment (CaseNumber Number(30),Statment varchar2(255),
Constraint  PkClerk_Statment primary key (CaseNumber,Statment),
Constraint FK_Clerk_Statment foreign key (CaseNumber)references
case(CaseNumber)On Delete CasCade);
```

6.16 Case_Accused Table

```
Create table case_Accused(CaseNumber number(10) not null, Accused_ID
number(10) not null,
constraint PK_Case_Accused primary key(Accused_ID, CaseNumber),
constraint FK_6_16_1 foreign key (Accused_ID) references Accused
(Accused_ID)ON DELETE CASCADE,
constraint FK_6_16_2 foreign key (CaseNumber) references case
(CaseNumber)ON DELETE CASCADE);
```

6.17 Case_Victim Table

```
create table Case_Victim(CaseNumber number(10) not null, Victim_ID
number(10) not null,
constraint PK_Case_Victim primary key(Victim_ID, CaseNumber),
constraint FK_6_17_1 foreign key(Victim_ID ) references Victim(Victim_ID)
ON DELETE CASCADE,
constraint FK_6_17_2 foreign key(CaseNumber ) references case(CaseNumber)ON
DELETE CASCADE);
```

6.18 Case_Suspect Table

```
Create table Case_Suspect(CaseNumber number(10) not null , Suspect_ID
number(10),
constraint FKPK_Case_Suspuct  primary key(Suspect_ID, CaseNumber),
constraint FK_6_18_1 foreign key(CaseNumber) references case(CaseNumber)ON
DELETE CASCADE,
constraint FK_6_18_2  foreign key(Suspect_ID) references
Suspect(Suspect_ID) ON DELETE CASCADE);
```

6.19 Branch_Department Table

```
create Table Branch_Department (DepartmentNo Number (30),BranchNumber
Number (30));

Alter Table Branch_Department Add Constraint PK_Branch_Department primary
key (DepartmentNo,BranchNumber);

Alter Table Branch_Department Add Constraint FK_6_19_1 foreign Key
(DepartmentNo)references  Department (DepartmentNo) ON delete CasCade;

Alter Table Branch_Department Add Constraint FK_6_19_2 foreign Key
(BranchNumber)references  Branch(BranchNum) ON delete CasCade;
```

6.20 Suspect_Ind Table

```
Create table Suspect_Ind(CaseNumber number(30), Suspect_ID number(30),
IndicationOfSuspicion varchar2(255),
constraint PK_Suspect_Ind primary key(CaseNumber, Suspect_ID,
IndicationOfSuspicion),
constraint FK_6_20_1 foreign key(CaseNumber, Suspect_ID) references
Case_Suspect (CaseNumber, Suspect_ID) ON DELETE CASCADE);
```

6.21 Case_Witnesse Table

```
Create table Case_Witnesse(CaseNumber number(10) not null, Witnesse_ID
number(10) not null,
testimony varchar2(255),
```

```
constraint FKPK_Case_Witnesse  primary key(Witnesse_ID,CaseNumber),
constraint FK_6_21_1 foreign key (Witnesse_ID) references Witnesse
(Witnesse_ID)ON DELETE CASCADE,
constraint FK_6_21_2 foreign key (CaseNumber) references case(CaseNumber)ON
DELETE CASCADE);
```

7 Constraints Script

Business Rule	SQL Script	Table
Each person must have a specialization.	Alter table person add constraint PK_Person PRIMARY KEY(Person_ID); Alter Table Clerk Add Constraint Fk_6_7_1 foreign key(Clerk_ID)references Person(Person_ID) ON DELETE CASCADE; Alter Table Detective Add constraint FK_6_3_1 foreign key(Detective_ID) references Person(Person_ID) ON DELETE CASCADE; Alter Table Lawyer Add constraint FK_6_9_1 foreign key(Lawyer_ID)references Person(Person_ID) ON DELETE CASCADE; Alter Table Defend Add constraint FK_6_12_1 foreign key(Defend_ID) references Person(Person_ID) ON DELETE CASCADE; Alter Table Witnesse Add constraint FK_6_11_1 foreign key(Witnesse_ID)references Person(Person_ID) ON DELETE CASCADE;	1-Person 2- Clerk 3- Detective 4-Lawyer 5- Defend 6- Witnesse
Each supervisor supervises many	Alter table Detective add constraint FK_6_3_2 foreign	1- Detective

supervisee in the detective office.	key(SuperDetective) references Detective(Detective_ID) ON DELETE CASCADE;	
Each department control many cases.	Alter Table Department Add Constraint PK_Department primary key (DepartmentNo); Alter table Case add constraint FK_6_2_1 foreign key (DepartmentNo) references Department(DepartmentNo)ON DELETE CASCADE;	1- Department 2-case
Each defendants must have lawyer.	Alter table Lawyer add constraint PK_Lawyer PRIMARY KEY (Lawyer_ID); ALTER TABLE DEFEND ADD CONSTRAINT FK_6_12_2 Foreign Key references Lawyer(Lawyer_ID);	1-Lawyer 2- DEFEND
A detective work in one department.	Alter table Department Add Constraint PK_Department primary key (DepartmentNo); Alter table Detective add constraint FK_6_3_3 foreign key(DepartmentNo) references Department(DepartmentNo) ON DELETE CASCADE;	1- Department 2- Detective
A detective must work for many case.	Alter table Detective add constraint PK_Detective primary key(Detective_ID); Alter table Case add constraint FK_6_2_3 foreign key (detective_id) references detective (detective_id) ON DELETE CASCADE);	1- Detective 2- Case

Each clerk work on at least one case.	Alter Table Clerk Add Constraint Pk_ Clerk primary key (Clerk_ID); Alter Table Case Add constraint FK_6_2_2 foreign key (Clerk_id) references Clerk(Clerk_id)ON DELETE CASCADE);	1- Clerk 2- Case
Each case can have more than one witness.	Alter table Case add constraint PK_ Case primary key (CaseNumber); Alter table Witnesse add constraint PK_Witnesse primary key(Witnesse_ID); Alter table Case_Witnesse add constraint FK_6_21_1 foreign key (Witnesse_ID) references Witnesse (Witnesse_ID)ON DELETE CASCADE ; Alter table Case_Witnesse add constraint FK_6_21_2 foreign key (CaseNumber) references case (CaseNumber)ON DELETE CASCADE;	1- Case 2- Witnesse 3- Case_Witnesse
Each branch contains more than one department.	Alter Table Department Add Constraint PK_Department primary key (DepartmentNo); Alter Table Branch Add Constraint PK_ Branch primary key (BranchNumber); Alter Table Branch_Department Add Constraint PK_Branch_Department primary key (DepartmentNo,BranchNumber)); Alter Table Branch_Department Add Constraint FK_6_19_1 foreign Key (DepartmentNo)references Department (DepartmentNo) ON delete CasCade);	1- Department 2- Branch 3- Branch_Department

	Alter Table Branch_Department Add Constraint FK_6_19_2 foreign Key (BranchNumber)references Branch (BranchNumber) ON delete CasCade);	
Each defend must have a specialization.	Alter table Defend Add Constraint PK_Defend primary key(Defend_ID); Alter Table Defend Add Constraint FK_6_12_1 foreign key(Defend_ID) references Person(Person_ID) ON DELETE CASCADE; Alter Table Defend Add constraint FK_6_12_2 foreign key(Lawyer_ID) references Lawyer(Lawyer_ID) ON DELETE CASCADE;	1- Defend 2- Person 3- Lawyer
Each case can have more than one accused.	Alter table Case add constraint PK_ Case primary key (CaseNumber); Alter table accused add constraint PK_Accused primary key(Accused_ID); Alter table Case_ accused add constraint FK_6_16_1 foreign key (Accused_ID) references Accused (Accused_ID)ON DELETE CASCADE; Alter table Case_ accused add constraint FK_6_17_1 foreign key(CaseNumber) references case(CaseNumber)ON DELETE CASCADE**;**	1- Case 2- accused. 3- Case_ accused
Each case can have more than one suspect.	Alter table Case add constraint PK_ Case primary key (CaseNumber);	1- Case 2- suspect 3- Case_suspect

	Alter table suspect add constarint PK_Suspect primary key(Suspect_ID); Alter table Case_suspect add constraint FK_6_18_2 foreign key(Suspuct_ID) references Suspuct(Suspuct_ID) ON DELETE CASCADE; Alter table Case_suspect add constraint FK_6_17_1 foreign key(CaseNumber) references case(CaseNumber)ON DELETE CASCADE;	
Each case can have more than one victim.	Alter table Case add constraint PK_ Case primary key (CaseNumber); Alter table Victim add constraint PK_Victim primary key(Victim_ID); Alter table Case_Victim add constraint FK_6_17_1 foreign key(Victim_ID) references Victim(Victim_ID) ON DELETE CASCADE; Alter table Case_Victim add constraint FK_6_17_1 foreign key(CaseNumber) references case(CaseNumber)ON DELETE CASCADE;	1- Case 2- Case_Victim 3- Victim

8 Queries

8.1 *Cases with maximum number of witnesses*

Query in natural language (ENGLISH)

List the cases with maximum number of witnesses.

SQL script

```
SELECT CaseNumber AS Case_Number, count(*) AS Number_Of_Witnesses FROM
Case_Witnesse
GROUP BY CaseNumber HAVING count(*) IN (SELECT MAX (mycount) FROM (SELECT
COUNT(*) mycount FROM Case_Witnesse  GROUP BY CaseNumber));
```

Caption of the first five rows of the output

CASE_NUMBER	NUMBER_OF_WITNESSES
1	2

8.2 *Responsible detectives of cases with the highest number of witnesses*

Query in natural language (ENGLISH)

List the detectives who are responsible of cases with the highest number of witnesses.

SQL script

```
SELECT * from detective where Detective_ID IN (select Detective_ID from
Case where CaseNumber IN(select CaseNumber from Case_Witnesse group by
CaseNumber having count(*) IN(select Max(mycount)from(select count(*)
mycount from Case_Witnesse group by CaseNumber))));
```

Caption of the first five rows of the output

DETECTIVE_ID	SALARY	SUPERDETECTIVE	DEPARTMENTNO
2015	31000	2003	5005

8.3 *Number of victims, accused, suspects in the system*

Query in natural language (ENGLISH)

List number of victims, accused, suspects in the system.

SQL script

```
select  sum(count(V.Victim_ID)) as Victim,sum(count(A.Accused_ID)) as
Accused ,sum(count(S.Suspect_ID)) as Suspect
from Defend D Join Suspect S on d.Defend_ID =S.Suspect_ID join Accused A on
d.Defend_ID= A.Accused_ID join Victim V on d.Defend_ID=V.Victim_ID
group by V.Victim_ID,S.Suspect_ID ,A.Accused_ID;
```

Caption of the first five rows of the output

VICTIM	ACCUSED	SUSPECT
7	7	7

8.4 *Department with the highest number of detectives*

Query in natural language (ENGLISH)

List the department with the highest number of detectives.

SQL script

```
SELECT DEPARTMENTNO,DEPARTMENTNAME FROM Department
WHERE  DEPARTMENTNO IN (SELECT DEPARTMENTNO FROM Detective  GROUP BY
DEPARTMENTNO
HAVING count(*) IN (SELECT MAX (mycount) FROM (SELECT COUNT(*) mycount FROM
Detective  GROUP BY DEPARTMENTNO))) ;
```

Caption of the first five rows of the output

DEPARTMENTNO	DEPARTMENTNAME
5000	Guns and Drugs Section

8.5 *Cases that have at least 3 evidences*

Query in natural language (ENGLISH)

List the cases that have at least 3 evidences.

SQL script

```
Select count(*) as Number_of_Evidence ,CASENUMBER from Case_Evidence
Group BY (CASENUMBER)
having count(CASENUMBER) >=3 ;
```

Caption of the first five rows of the output

NUMBER_OF_EVIDENCE	CASENUMBER
3	2
4	4
3	14

APPENDIX

Person Table

SQL Script:

```
Select * from person;
```

Caption of the result:

PERSON_ID	FNAME	MNAME	LNAME	GENDER	ADDRESS	PHONENUMBER	EMAIL
2000	Rana	Khaled	Basodan	Female	1661,Quise Bin Obadh Street	578437576	Rana_3524@gamil.com
2003	Omar	Salem	Motairi	Male	1551,Alhamra Street	566779676	OmarSlem787@gmail.com
2006	Emad	Talal	Soidi	Male	1543,Alrawdah Street	543560998	Emad_Soidi70@gmail.com
2009	Yosra	Omar	Remmi	Female	7712,Laban Street	510214674	YomarRemmi_0@gmail.com
2012	Anode	Rakan	Omari	Female	1435,Ba Kashab Street	55432109	AnodeRakan657@gmail.com
2015	Osamh	Abdullah	Almotairi	Male	4423,Sharafiah	512438953	Osama_676@randatmail.com
2018	Khaled	Rami	Adani	Male	1667,Alkaldiah	5709325400	KH_Adani@gmail.com
2021	Shuog	Salama	Jezani	Female	3435,Alanode	552160091	Shaoge_Jezani@hotmail.com
2024	Reema	Adel	Khaldi	Female	1467,Alwahaa	512542896	Reema_901@gmail.com
2027	Saad	Mohamed	Sofiani	Male	4548,Alwrood	528699086	SaadM4490@gmail..com
2030	Rami	Abdul	Farrell	Female	2365,Alnakheel Street	598981076	RamiAB1998@gmail.com
2033	Wedad	Mohamed	Altobaiti	Female	3425,Alsafa	552615701	Wedad_aLOT_0@gmail.com

2036	Sami	Mohamed	Alotaibi	Male	1223,Al-Rawnaq	544231080	SAmiM_987@gmail.com
2039	Renad	Thamer	Almalki	Female	1667,Alkal	504312098	Renad_Thamer@gmail.com
2042	Amjad	Ali	Al-khidadi	Female	1989,Kaldia	534354545	Amjad0908@hotmail.com
2045	Ahmed	Salem	Al-solami	Male	1090,Barq Arhagama	500909086	Ahmed_SAle-@gmail.com
2048	Talal	Anas	Alzahrani	Male	1989,Kaldia	575689043	Talal.Anas9@hotmail.com
100	Asayel	Mashhour	Alamoudi	Female	4615,quis Street	555439098	asayel@gmail.com
101	Ahmed	Mohammed	Salesh	Male	1323,Alsafa	55543934	Ahmed@gmail.com
102	Mohammed	Salem	Salesh	Male	3413,Om Alarad	65543564	Mohammed@gmail.com
103	Dareen	Salem	Ahmed	Female	1232,Alkhaldia	565523564	Dareen@gmail.com
104	Hana	Salem	Ahmed	Female	9898,Safwa	565513564	Hana@gmail.com
105	Ruba	Ahmed	Saleh	Female	1213,Alanode	5784675222	Ruba@randatmail.com
106	Adel	Sadeq	Hawsawi	Male	1879,Alrane	578467576	AdelH88@gmail.com
107	Selena	Thomas	Farrell	Female	1557,King Majed	578467576	m.robinson@randatmail.com
108	Salem	Ahmed	Mohammed	Male	2343,Sari street	5784675878	m.robinson@randatmail.com
109	Khaled	Talal	Ahmed	Male	1565,Daren	578455576	Khaled@gmail.com
110	Reem	Saleh	Ahmed	Female	1243,Alshafa	57845666	Reem@gmail.com
111	Wed	Ahmed	Saleh	Female	1989,al-seteen street	57665666	Wed@gmail.com
112	Musab	Ahmed	Saleem	Male	1121,Alajaweed	57345666	Musab@gmail.com
3000	Rami	Mashhour	Alqahtani	Male	4615,King Khaled Street	554889098	Rami_66@gmail.com
3002	Ahmed	Emad	Alotaibi	Male	1323,Alsafa	587310931	Ahmed@gmail.com
3004	Mohammed	Salem	Alamri	Male	3413,Ali Street	56768961	Mohammed@gmail.com
3006	Hani	Salem	Aldahri	Male	9898,Safwa	523109345	Hani@gmail.com
3008	Raed	Khaled	Saleh	Male	1213,Alanode	574509123	Raead443@randatmail.com
3010	Adel	Khaled	Hawsawi	Male	1879,Alrane	554120911	Adel0098@gmail.com
700	Sara	Mustafa	Alshaikh	Female	AL-tyseer	559879059	saraqw1233@gmail.com
701	Salman	Mohammed	Alshaikh	Male	AL-ajwad	538749044	salaman@gmail.com
702	Araw	Khaled	Algamdi	Female	Al-samer	559879051	Araw123@gmail.com
703	Layan	abdullmoen	Alshaikh	Female	Al-samer	559879052	layan@gmail.com
704	Jana	Salem	Ahmed	Female	-Alsameim	559879054	Janaa@gmail.com
705	Joury	Ahmed	Saleh	Female	-Alsameah	55987939	JOURYa@randatmail.com
706	Lana	Thomas	Farrell	Female	Al-samer1	559976059	Lana.robinson@randatmail.com
707	Reman	Thomas	Farrell	Female	AL-tyseerm	559878987	Reman.obinson@randatmail.com
708	Esra	Talal	Alshaikh	Female	AL-tyseer	559879058	Esra@gmail.com
709	Ghala	Saleh	Ahmed	Female	AL-hamra	55987909	Ghalam@gmail.com
710	Asayal	Ahmed	Saleh	Femal	AL-tyseer-1444	559876459	ASALALf@gmail.com
711	Merah	Ahmed	Saleh	Female	Al-naseem	556759787	Wed@gmail.com
712	Fasial	Ahmed	Saleem	Male	Al-naseeah	559870009	FASIALab@gmail.com
713	Maha	Mashhour	Alamoudi	Female	AL-tyseer-1444		

Case Table

SQL Script:

```
Select * from Case;
```

Caption of the result:

CASENUMBER	CASENAME	DEPARTMENTNO	CLERK_ID	DETECTIVE_ID
1	Violence	5005	3002	2015
2	Killing	5000	3002	2039
3	Drugs Promotion	5000	3000	2003
4	Hooliganism	5002	3008	2000
5	Take Drugs	5000	3016	2024
6	Stealing	5004	3000	2006
7	Division of inheritance	5005	3018	2015
8	Stealing	5004	3004	2027
9	Vandalism of public property	5002	3020	2000
10	Hooliganism on the street	5001	3004	2045
11	Violence	5005	3014	2042
12	Rape	5002	3002	2000
13	Illicit drugs use	5000	3020	2003
14	Terrorism	5001	3008	2021
15	Take Drugs	5000	3012	2024
16	Use of an unauthorized weapon	5000	3004	2030
17	Division of inheritance	5005	3020	2048
18	Stealing	5004	3014	2018
19	Vandalism of public property	5001	3020	2009
20	Hooliganism on the street	5001	3010	2012

Detective Table

SQL Script:

```
select * from Detective;
```

Caption of the result:

DETECTIVE_ID	SALARY	SUPERDETECTIVE	DEPARTMENTNO
2000	70000	-	5002
2003	39000	-	5000
2006	37000	-	5004
2009	50000	2000	5001
2012	33000	2009	5001
2015	31000	2003	5005
2018	40000	2003	5004
2021	49000	2009	5001
2024	47000	2000	5000
2027	50000	2000	5004
2030	37000	2009	5000
2033	32000	2000	5000
2036	50000	2000	5005
2039	50000	2003	5000
2042	39000	2036	5005
2045	43000	2009	5001
2048	33000	2036	5005

Department Table

SQL Script:

```
Select * from Department;
```

Caption of the result:

DEPARTMENTNO	DEPARTMENTNAME	LOCATION	DETECTIVEID
5000	Guns and Drugs Section	Jeddah	2000
5001	Organized Crime Section	Makkah	2003
5002	General Investigation Section	Jeddah	2006
5003	Major Crime Section	Jeddah	2009
5004	Criminal Investigation Section	Makkah	2012
5005	Major Crime Section	Makkah	2015

Branch Table

SQL Script:

```
Select * from Branch;
```

Caption of the result:

BRANCHNUM	PHONNUMBER	CITY
1	129244311	Makkah
2	128724109	Jeddah

Suspect Table

SQL Script:

```
Select * from suspect;
```

Caption of the result:

SUSPECT_ID
100
101
102
103
104
105
106

Clerk Table

SQL Script:

```
Select * from Clerk;
```

Caption of the result:

CLERK_ID	SALARY
3000	20000
3002	25000
3004	22500
3006	39000
3008	50000
3010	20000
3012	30000
3014	10000
3016	9000
3018	10000
3020	10000

Victim Table

SQL Script:

```
Select * from victim;
```

Caption of the result:

VICTIM_ID
100
101
102
103
104
105
106

Lawyer Table

SQL Script:

```
Select * from Lawyer;
```

Caption of the result:

LAWYER_ID	SPECIALIZATION
700	Civil Specialty
701	General Specialty
702	Criminal Specialty
703	Consultant specialty
704	General Specialty
705	Consultant specialty
706	Criminal Specialty
707	Consultant specialty
708	General Specialty
709	Consultant specialty
710	General Specialty
711	Criminal Specialty
712	Consultant specialty
713	Civil Specialty

Accused Table

SQL Script:

```
Select * from Accused;
```

Caption of the result:

ACCUSED_ID	ARRESST_STATUS
100	Under Arrest
101	Under investigation
102	Realease
103	The Accused has not been arrested
104	Under investigation
105	Under Arrest
106	Under Arrest
107	Realease
108	The Accused has not been arrested
109	Under investigation
110	Realease
111	Under Arrest
112	Under investigation
113	Realease
114	The Accused has not been arrested
115	Under investigation
116	Under investigation

Witness Table

SQL Script:

```
Select * from Witnesse;
```

Caption of the result:

WITNESSE_ID
1
2
3
4
5

Defend Table

SQL Script:

```
Select * from Defend;
```

Caption of the result:

DEFEND_ID	LAWYER_ID
100	700
101	704
102	710
104	705
105	701
107	712
108	711
109	713
112	707
113	711
115	710
116	703
117	708
119	711
103	710
106	711
110	702
114	703
118	705
111	700
120	700
121	700
122	700
123	700

Detective_Action Table

SQL Script:

```
Select * from Detective_Action;
```

Caption of the result:

CASENUMBER	ACTIONS
1	Primary Hearing
2	Searching
3	Surveillance of Mail Correspondence
4	Search of Persons
5	conducting Inquiries
6	Detention Warrant
7	Closing of the Case
8	Surveillance of Mail Correspondence
9	Placing in Custody
10	Closing of the Case
11	Release Order
12	Request for Scrutiny
13	Statement Taking
14	Release Order
15	Primary Hearing
16	Closing of the Case
17	Release Order
18	Statement Taking
19	Inspection
20	Closing of the Case

Case_Evidence Table

SQL Script:

```
Select * from Case_Evidence;
```

Caption of the result:

CASENUMBER	EVIDENCE
1	Victim"s complaint
2	The presence of fingerprints on the weapon
2	Vedio recordings
2	Victim"s complaint
3	Presence of drugs in the possession of the accused
3	drug test
4	Being at the crime scene
4	Damage to public property
4	Having a witness to the case
4	Vedio recording
5	drug test
6	Presence of fingerprints
7	The heirs"complaint
8	Presence of fingerprints
9	Being at the crime scene
10	Being at the crime scene
11	Victim"s complaint
12	Victim"s complaint, DNA Test
13	Being at the crime scene
13	drug test
14	Audio recordings
14	Being at the crime scene
14	Having a witness to the case
15	drug test
16	The weapon is in his possession
17	The heirs"complaint
18	Presence of fingerprints,Victim"s complaint
18	Vedio recordings
19	Being at the crime scene,Vedio recordings

Clerk_Statement Table

SQL Script:

```
Select * from Clerk_Statment;
```

Caption of the result:

CASENUMBER	STATMENT
10	I was with a group of guys in the street and they told me if I vandalized they would reward me, I was foolish and sorry for what I did
15	Yes, I was taking Drugs
18	You ask me if we closed that boy in. Yes that's right. You ask me if it is rigt that I had my hand in his coat pocket and took 500 Euros. Yes that is right. I saw no keys. I took 5 Euros

Case_Accused Table

SQL Script:

```
Select * from Case_Accused;
```

Caption of the result:

CASENUMBER	ACCUSED_ID
9	100
11	100
3	101
5	102
2	103
14	103
6	104
4	105
15	106
1	107
13	107
16	107
17	107
12	108
18	109
7	110
5	111
10	112
9	113
5	114
8	115
20	115
19	116

Case_Victim Table

SQL Script:

```
Select * from Case_VICTIM;
```

Caption of the result:

CASENUMBER	VICTIM_ID
1	100
2	101
3	102
4	103
5	104
6	105
7	106

Case_Suspect Table

SQL Script:

```
Select * from Case_Suspect;
```

Caption of the result:

CASENUMBER	SUSPECT_ID
1	100
2	101
3	102
4	103
5	104
6	105
7	106

Branch_Department Table

SQL Script:

```
Select * from Branch_Department;
```

Caption of the result:

DEPARTMENTNO	BRANCHNUMBER
5000	2
5001	1
5002	2
5003	1
5004	2
5005	1

Suspect_Ind Table

SQL Script:

```
Select * from Suspect_Ind;
```

Caption of the result:

CASENUMBER	SUSPECT_ID	INDICATIONOFSUSPICION
1	100	Aggression
1	100	Marks of beatings
2	101	Aggression
3	102	Close to the site of the accident
3	102	Suspicious behavior
4	103	Consanguinity with persons involved in the case
5	104	Weird behavior
6	105	Close to the site of the accident
7	106	Seizure of funds of unknown source

Case_Witness Table

SQL Script:

```
Select * from Case_Witnesse;
```

Caption of the result:

CASENUMBER	WITNESSE_ID	TESTIMONY
1	1	the person was acting as though she were drunk.
2	2	I observed a black truck approach a red light and continue driving through it without stopping.
3	3	the car was driving too fast also the person was acting as though she were drunk.
6	4	Audio and 3 images
12	5	I observed a blue truck approach a red light and continue driving through it without stopping and the person inside car was acting as though she were drunk
1	2	I saw him doing it