**Q1**

**Normalize the following schema, with given constraints, to BCNF. (2 Point)**

**books(accessionn, isbn, title, author, publisher)**

**users(userid, name, deptid, deptname)**

**accessionno isbn**

**isbn title**

**isbn publisher**

**isbn author**

**userid name**

**userid deptid**

**deptid deptname**

***Answer***

**1NF :**

**Select primary key for each relation**

**books(accessionno, isbn, title, author, publisher)**

**users(userid, name, deptid, deptname)**

 **2NF:**

**All relations are in 2NF because the primary key is single attribute**

**books(accessionno, isbn, title, author, publisher)**

**users(userid, name, deptid, deptname)**

**3NF**

**Prevent any transitively dependent in the 2NF relations**

**Also all relations are in BCNF**

***book*(*isbn, title, publisher,author*)
*accession*(*accessionno, isbn*)
*user*(*userid, name, deptid*)
*department*(*deptid,deptname*)**

**Q2**

**Consider the relational database given below, where the primary keys are underlined. Give an expression in Tuple Relational Calculus and Domain Relational Calculus for each of the following queries: (0.5+0.5 = 1 Point)**

**a. Find all employees who work directly for “STC”**

**b. Find all cities of residence of all employees who work directly for “STC”**



**a.**

***Tuple Relational Calculus*{t | ∃ m ∈ manages (t[person name] = m[person name] ∧ m[manager name] = "STC")}**

***Domain Relational Calculus***

{*<p>* | *< p,m>* ∈**manages** ∧*m="STC” }*

**b.**

***Tuple Relational Calculus***

**{t | ∃ m ∈ manages ∃e ∈ employee(e[person name] = m[person name]
 ∧ m[manager name] = "STC" ∧ t[city] = e[city])}**

***Domain Relational Calculus***

{*<c>* | ∃**p,s** *(<p,s,c*> ∈*person* ∧∃**m** (<p,*m>* ∈**manages** ∧*m* = "STC" ))}

**Q3**

 **Consider the following database: (0.5+0.5+1= 2 Points)**

***person* (*driver\_id*, *name*, *address*)**

***car* (*license*, *model*, *year*)**

***accident* (*report\_number*, *date*, *location*)**

***owns* (*driver\_id*, *license*)**

***participated* (*report\_number*, *license*, *driver\_id*, *damage\_amount*)**

1. **Write SQL DDL corresponding to the following schema. Make any reasonable assumptions about data types, and be sure to declare primary and foreign keys.**
2. **Find the number of accidents in which the cars belonging to “John Smith” were involved.**
3. **Update the damage amount for the car with license number “AABB2000” in the accident with report number “AR2197” to $3000.**

**a-**

***create table person***

**(**

***driver\_id char(10) primary key*,**

***name varchar(40) not null*,**

***address varchar(60)***

**)**

***create table car***

**(**

***license* *char(10) primary key*,**

***model varchar(20) not null,***

***year int***

**)**

***create table accident***

**(**

***report\_number char(10) primary key*,**

***date* varchar(20),**

***location varchar(40),***

**)**

***create table owns* (**

***driver\_id* *char(10) references driver*,**

***license char(10) references car,***

***primary key(driver\_id, license)***

**)**

***create table participated* (**

***report\_number char(10) primary key*,**

***license char(10) references car,***

***driver\_id* *char(10) references driver*,**

***damage\_amount dec(6,2),***

**)**

**b-**

select count (distinct **accident.report\_number**) Accidents
from **person, accident, participated**
where **participated .report\_number= accident.report\_number**
and **participated.driver\_id** = **person. driver\_id**

and **person.name** ="**John Smith"**

c-

**update participated
set damage\_amount = 3000
where report\_number ="AR2197"**

**and license = "AABB2000"**