Third normal form proof

1.

Branch(BranchID, OpeningDate, Phone, Fax, City, Street, managerID,

IsHeadOffice, province)

(Assumption : one branch has only “main service phone number” and has only one location.)

FD BranchId 🡪 openingDate, BranchId 🡪 OpeningDate, BranchId 🡪 phone, BranchId 🡪 Fax,

BranchId 🡪 City, BranchId 🡪 managerID, BranchId 🡪 isHeadOffice, BranchId 🡪 Provence.

Since for all FD's over branch, the left hand side is BranchID, which is the key of this schema,

Branch schema is in BCNF, thus also in 3NF.

2.

Employee(EmployeeID, Phone, address, StartDate, Wage, BranchID, FirstName, LastName, Email)

(Assumption: one Employee can only has one “working phone number” and has one “current address” also, he may only works for/reside in one Branch, has only one “working email”)

FD EmployeeID🡪 phone, EmployeeID🡪 address, EmployeeID🡪 startDate,

EmployeeID🡪 startDate, EmployeeID🡪 wage, EmployeeID🡪 BranchID, EmployeeID🡪 FirstName, EmployeeID🡪 lastName, EmployeeID🡪 email.

Since for all FD's over Employee, the left hand side is BranchID, which is the key,

Schema Employee is in BCNF, thus also in 3NF.

3.

Schedule(EmployeeID, Date, HourBegin, HourLeft, isHolyday)

FD EmployeeID, Date 🡪 HourBegin, EmployeeID, Date 🡪HourLeft, EmployeeID, Date 🡪 isHolyday

Employee and date makes up the composite key and is the LHS of all the related FD's, therefore

it is in BCNF thus in 3NF.

4

Services(ServicesID, servicesName, ManagerID)

FD's ServicesID🡪 servicesName, ServicesID 🡪 ManagerID

Since all the LHS are the set key, it is in 3NF

5

Client(client\_id, firstName, lastName, city, province, dob, join\_date, standing, email, phone, category, branch\_id)

(Assumption: one client has only one “bank contacting email” and one “bank contacting phone”)

FD client\_id 🡪 firstName, client\_id 🡪 lastName, client\_id 🡪 city, client\_id 🡪 province, client\_id 🡪 dob, client\_id 🡪 join\_date, client\_id 🡪 standing, client\_id 🡪 email, client\_id 🡪 phone, client\_id 🡪 category, client\_id 🡪 branch\_id;

Since the LHS are all key, this schema in BCNF, thus also in 3NF.

6

Account(account\_id, client\_id, account\_type, chargePlan\_id, balance, credit\_limit, interest\_rate, lvl, transactionLeft)

account\_id 🡪 client\_id, account\_id 🡪 account\_type, account\_id 🡪 charegPlan, account\_id 🡪 balance, account\_id 🡪 credit\_limit, account\_id 🡪 interest\_rate, account\_id 🡪 lvl, account\_id 🡪 transactionLeft)

Since the LHS are all key, this schema in BCNF, thus also in 3NF.

7

ChargePlan( chargePlan\_id, option\_name, draw\_limit, charge\_value);

FDs chargePlan\_id 🡪 option\_name, chargePlan\_id 🡪draw\_limit, chargePlan\_id🡪 charge\_value)

Since the LHS are all key, this schema in BCNF, thus also in 3NF.

8

Transaction(tid, account1\_id, account2\_id, amount, dt)

FDs tid 🡪 account1\_id, tid 🡪 account2\_id, tid 🡪\_amount, tid 🡪 dt)

Since the LHS are all key, this schema in BCNF, thus also in 3NF.

9

Bills(bill\_id, amount, account1\_id, account2\_id, recurring)

FDs bill\_id 🡪 amount, bill\_id 🡪 account1\_id, bill\_id 🡪 account2\_id, bill\_id 🡪 recurring

Since the LHS are all key, this schema in BCNF, thus also in 3NF.

10

EmployeeLogin(employee\_id, psw)

Since there are only two attributes in this schema, it must be in BCNF.

11

ClientLOgin(client\_id, psw)

Since there are only two attributes in this schema, it must be in BCNF.