Normalization

CUSTOMER

customer\_ID, first\_name, last\_name, address, gender, phone\_number

1NF: CUSTOMER is not in 1NF because it has the multivalued attribute phone\_number. This should be eliminated by dividing it into the following relations:

CUSTOMER (customer\_ID, last\_name, first\_name, address, gender)

CUSTOMER PHONE (customer\_ID, phone\_number)

2NF: Both relations are in 2NF as both relations are 1NF and CUSTOMER and CUSTOMER PHONE have all non-prime attributes partially depend on the primary key customer\_ID

3NF: Both relations are in 3NF as all nonprime attributes are non transitively dependent on the primary key, customer\_ID.

BCNF: Both relations are in BCNF.

STAFF

staff\_ID, address, D.O.B, salary, last\_name, first\_name, phone\_number, part\_ID\_ordered

1NF: STAFF is not in 1NF because it has the multivalued attributes part\_ID\_ordered and phone\_number. This can be eliminated by dividing it into the following relations:

STAFF (staff\_ID, address, D.O.B, salary, last\_name, first\_name)

STAFF PART (staff\_ID, part\_ID\_ordered)

STAFF PHONE (staff\_ID, phone\_number)

2NF: All relations are in 2NF as all relations are 1NF and all have non-prime attributes partially dependent on the primary key staff\_ID.

3NF: All relations are in 3NF as they are all 2NF and non-prime attributes are non transitively dependant on the primary key staff\_ID

BCNF: All relations are in BCNF.

APPOINTMENT

appointment\_ID, pick\_up\_time, time\_booked, date, car\_ID, work\_to\_do

1NF: APPOINTMENT is not 1NF because it has the multivalued attribute work\_to\_do. This should be eliminated by dividing it into the following relations:

APPOINTMENT (appointment\_ID, pick\_up\_time, time\_booked, date, car\_ID)  
 APPOINTMENT WORK (appointment\_ID, work\_to\_do)

2NF: Both relations are 2NF as they are 1NF and all non-prime attributes are partially dependent on the primary key appointment\_ID.

3NF: Both relations are 3NF as they are 2NF and all non-prime attributes are non transitively dependant on the primary key appointment\_ID.

BCNF: Both relations are BCNF.

ACCOUNT

account\_ID, last\_visit, balance, customer\_ID, customer\_account

1NF: ACCOUNT is 1NF as it does not have any multivalued attributes and each attribute refers to one value.

2NF: ACCOUNT is 2NF as it is 1NF and all non-prime attributes partially dependent on the primary key account\_ID

3NF: ACCOUNT is 3NF as it is 2NF and all non-prime attributes are non transitively dependant on the primary key account\_ID

BCNF: ACCOUNT is BCNF

PARTS

part\_ID, cost, part\_name, description, quantity, staff\_ID

1NF: PARTS is 1NF as it does not have any multivalued attributes and each attribute refers to one value.

2NF: PARTS is 2NF as it is 1NF and all non-prime attributes partially dependent on the primary key part\_ID

3NF: PARTS is 3NF as it is 2NF and all non-prime attributes are non transitively dependant on the primary key part\_ID

BCNF: PARTS is BCNF

CAR

car\_ID, make, model, year, appointment\_ID, customer\_ID

1NF: CAR is 1NF as it does not have any multivalued attributes and each attribute refers to one value.

2NF: CAR is 2NF as it is 1NF and all non-prime attributes are partially dependent on the primary key car\_ID

3NF: CAR is not in 3NF because nonprime attribute model depends on nonprime attribute make. To make CAR 3NF this should be eliminated by the following:

CAR (car\_id, make, year)

CARTYPE (make, model)

BCNF: Both relations are in BCNF.

TRANSACTION

transaction\_number, type, amount, date, E\_account\_ID,

1NF: TRANSACTION is 1NF as it does not have any multivalued attributes and each attribute refers to one value.

2NF: TRANSACTION is 2NF as it is 1NF and all non-prime attributes are partially dependent on the primary key transaction\_number

3NF: TRANSACTION is 3NF as it is 2NF and all non-prime attributes are non transitively dependant on the primary key transaction\_number

BCNF: TRANSACTION is BCNF