Esme Gonzalez
CIS 3400 Database Management Systems
Homework #2
Normalization
T (d, e, f, g, h, i)   Key: d, e
FD1: d, e → f, g, h, i
FD2: e → f, g
FD3: h → i
1) Consider the relation T, with key and functional dependencies shown below.
I. What Normal form is T in right now? Why?
1NF ? Yes, it is given that it is a relation.
II. What actions would you take to normalize T to the next higher normal form (describe the steps)?
To figure out 2NF we would have to split this relation into two new relations. Since e is only part of the key and it determines a non-key attribute of (f,g)
III. Follow those steps you mentioned in the prior question to normalize T to the next higher normal form. Be sure to show all the work.
Relation T: (d,e,h,i) Key: d,e
FD1: d,e →h,i
FD2: h → I
Is this relation in 1NF? Yes, because f and g was split from relation T
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the key

Relation: B (e,f,g)   Key: e
FD1: e → f,g
Is this relation in 1NF? Yes, because A was split from relation T
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the keys.

IV. Once you have normalized T, what normal forms are each the two new relations in? Why?
d,e→h,i
h→ i
The h is the reason why it does not work.
Solution: Split T into two new relations. Copy "h" and remove attribute "i"
Relation T: Relation T: (d,e,h,i)
Key: d,e
FD1: d,e →h
Is this relation in 1NF? Yes, it is given it is a relation
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the key.
Is this relation in 3NF? Yes, because there are no transitive dependencies
Relation A
Relation A: (h, i) Key: h
FD1: h → i
Is this relation in 1NF? Yes, it is split from relation T
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the keys.
Is this relation in 3NF? Yes, because there are no transitive dependencies.

Relation: B (e,f,g) Key: e
FD1: e → f,g
Is this relation in 1NF? Yes, because A was split from relation T
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the keys.
Is this relation in 3NF? Yes, because there are no transitive dependencies.
V. If any of the remaining relations are not in 3NF, normalize them to 3NF. Be sure to show all the work.

2) Given the Customer relation below with sample data, write down the Key and Functional Dependencies. Then normalize the relation to 3NF. Be sure to follow all steps and show your work

Customers (CustID (Key), FirstName, LastName, Street, City, State, ZipCode, PropertyID (Key), PropertyName, Rent)

Sample Data:

CustID	FirstName	LastName	Street	City	State	ZipCode	PropertyID	PropertyName	Rent
C101	Edison	Fawcett	89 Smith	Garfield	NJ	07026	P52	Dandelion	$6,150
C102	Ishwarya	Roberts	89 Smith	Garfield	NJ	07026	P50	Crescent	$9,450
C103	Joseph	Smith	12 Grand	Cliffside	NJ	07010	P51	Blue Pearl	$6,300
C103	Joseph	Smith	12 Grand	Cliffside	NJ	07010	P50	Crescent	$9,450
C104	Joseph	Smith	152 Main	Garfield	NJ	07026	P51	Blue Pearl	$6,300
C105	Dheeraj	Alexander	667 22nd	Bergenfield	NJ	07621	P52	Dandelion	$6,300
C106	Dheeraj	Davis	420 Bird	Springfield	NY	11413	P51	Blue Pearl	$6,300
C111	Meena	Alexander	PO Box 15	Fair Lawn	NJ	07410	P53	Crescent	$9,500
C115	Mary	Collins	35 Lincoln	Springfield	NJ	07081	P51	Blue Pearl	$6,300
C116	Irene	Laughton	6 Sun St	Wappinger	NY	12590	P55	Dandelion	$6,150
C116	Irene	Laughton	6 Sun St	Wappinger	NY	12590	P51	Blue Pearl	$6,300
C117	Prem	Walken	152 Main	Wappinger	NY	12590	P50	Crescent	$9,500

Customers Relation
Key: CustID, PropertyID   (Composite)
Non-Key attributes:FirstName, LastName, Street, City, State, ZipCode, PropertyName, Rent
FD1: CustID, PropertyID→FirstName, LastName, Street, City, State, ZipCode, PropertyName, Rent
FD2: CustID → FirstName, LastName, Street, City, State, ZipCode
FD3: ZipCode → City, State
FD4: PropertyID → PropertyName, Rent

Is this relation in 1NF? Yes, because it meets all of the criteria to be considered to be a relation
Is this relation in 2NF? No, this relation is not in 2NF because in CustID is only part of the key and it determines non-key attributes: FirstName, LastName, Street, City, State, ZipCode
Solution is to split up the CustID and PropertyID into new relations using FD2 as a guide. Copy CustID and remove all the attributes. Copy Property ID and remove all the attributes.

Customer Relation X:
FD1: CustID → FirstName, LastName, Street, City, State, ZipCode
FD2: ZipCode → City, State
Is this relation in 1NF? Yes, because it is split from a relation

Is this relation in 2NF? Yes, because all of the non-key attributes are dependent upon all of the key.
Is this relation in 3NF? No, it is not free of transitive dependencies.
Solution: Split up the relation one more time.

Relation Customer X:
FD1: CustID → FirstName, LastName, Street
Is this relation in 1NF? Yes, it is from customer relations.
Is this relation in 2NF? All of the non-key attributes are dependent upon all of the key
Is this relation in 3NF? It is free of transitive dependencies.

Relation Customer Y:
Key: ZipCode   Non key: State, City
FD1: ZipCode → State, City
Is this relation in 1NF? Yes, because it is from customer relation
Is this relation in 2NF? Yes, all of the non key attributes are dependent upon all of the key
Is this relation in 3NF? Yes, it is free of transitive dependencies
Solution: Split up the relation another time

Relation Customer Z:
Key: PropertyID   Non-Key: PropertyName, Rent
FD1: PropertyID → PropertyName, Rent
Is this relation in 1NF? Yes, because Y was split from X relation
Is this relation in 2NF? Yes, because all non-key attributes are dependent upon all of the keys
Is this relation in 3NF? Yes, because it is free of transitive dependencies