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Summer 1 2021 – CIDM 6350

Assignment 3

Task 1: [15 points] (1NF)

a) Based on the given FDs, what are the possible Keys of the XyzPropertyInspection relation and what is the type of each key (i.e. Primary or candidate key)

Start with XYZPropertyInspection = R and PropNo = A, Propaddress = B, InspDate = C, InspTime = D, InspNo = E, InspName = F, InspCar = G , InspNotes = H.

Relation = R(A, B, C, D, E, F, G, H)

FD = {AC -> DEHFG, A -> B, E -> F, EC -> G, GCD -> ABHEF, ECD -> ABH}

Candidate keys: Attribute "C" is not present in the right side of any of the given functional dependencies so attribute "C" must be present in every candidate key as the candidate key has the ability to derive all the attributes of the relation.

Primary key: (AC)

Candidate keys: (GCD) and (ECD)

b) State why the relation XyzPropertyInspection is not in the 1NF.

The relation is not in 1NF because non atomic values exist in this relation. There are multivalued and complex attributes present in the relation. The multivalued attributes are InspDate, InspTime, InspNo, InspName, InspCar and the complex attribute is InspNotes.

c) Show the 1NF (1st normal Form) for the relation using the report example data and the relation schema. Show the Primary key(s) of the 1NF table(s).

To covert this relation to 1NF PropNo and InspDate can be selected as a composite key for the relation and each column should store only the atomic values.

ProsNo	InspDate	PropAddress	InspTime	InspNo	InspName	InspCar	InspNotes
5	03/02/15	123 Broadway st, LA	10:00am	Xyz-16	John Doe	6TRJ224	Roof damage
5	04/11/16	123 Broadway st, LA	10:00am	Xyx-12	Tracy C.	3STR341	Replace front door
5	01/01/18	123 Broadway st, LA	2:00pm	Xyz-12	Tracy C.	7NNY123	All Good
26	04/11/16	5 maple st, LA	8:00am	Xyz-12	Tracy C.	3STR341	Fence repair needed
26	11/22/16	5 maple st, LA	1:00pm	Xyz-16	John Doe	7NNY123	All good

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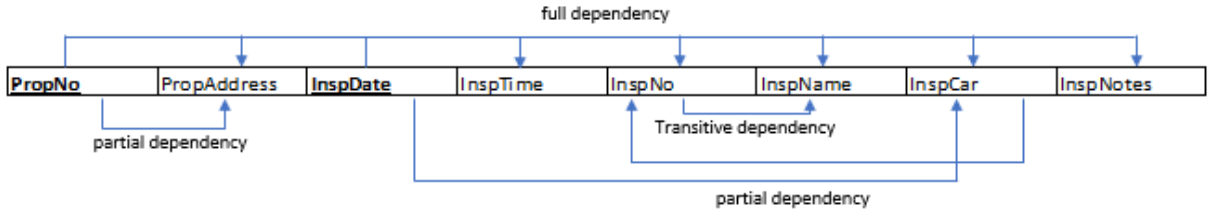
Task 2: [20 points] (FDD)

Draw FDD (Functional Dependency Diagram) of the relation XyzPropertyInspection showing the type of each FD (Partial, Full, Transitive).



Task 3: [25 points] (2NF)

a) Show why each relation resulted from task 1 (1NF) is (or is not) in 2NF, then apply the normalization process to transform it into 2NF if it is not already in the 2NF.

b) Explain your steps using relation notations and FDs only (data examples are not required).

c) Show the primary key of each relation by underline or adding (PK) to the key attribute(s).

For a relation to be in 2NF, there should be no partial dependency (PropNo -> PropAddress) in the relation. To convert it to 2NF we can divide the relation above to 2 new relations.

Relation R1

PropNo	**InspDate**	InspTime	InspNo	InspName	InspCar	InspNotes

PropNo, InspDate → InspTime, InspNo, InspNotes, InspName, InspCar
InspNo → InspName
InspNo, InspDate → InspCar
InspCar, InspDate, InspTime → PropNo, PropAddress, InspNotes, InspNo, InspName
InspNo, InspDate, InspTime → PropNo, PropAddress, InspNotes

Relation R2

PropNo	PropAddress

PropNo → PropAddress

Task 4: [25 points] (3NF)

a) Show why each relation resulted from the previous task (task 3) is (or is not) in 3NF, then apply the normalization process to transform it into 3NF if it is not already in the 3NF.

b) Explain your steps, and show the Functional Dependencies in each of the 2NF relations first (based on the original FDs and the attributes in each 2NF relation).

c) Show the primary key of each relation.

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For a relation to be in 3NF there should be no transitive dependency (InspNo->InspName) in the relation. To convert relation R1 to 3NF it should be decomposed as shown below:

Relation R1-1

PropNo	**InspDate**	InspTime	InspNo	InspCar	InspNotes

PropNo, InspDate → InspTime, InspNo, InspNotes, InspName, InspCar
InspNo, InspDate → InspCar
InspCar, InspDate, InspTime → PropNo, PropAddress, InspNotes, InspNo, InspName
InspNo, InspDate, InspTime → PropNo, PropAddress, InspNotes

Relation R1-2

InspNo	InspName

InspNo → InspName

Relation R2

PropNo	PropAddress

PropNo → PropAddress

Task 5: [15 points] (SQL-SELECT)

Write SQL SLECT Query to reconstruct the original Relation (1NF) from the Normalized 3NF relation.

Select R1-1.PropNo, R1-1.InspDate, R2.PropAddress, R1-1.InspTime, R1-1.InspNo, R1-2.InspName,R1-1.InspCar, R1-1.InspNotes

from R1-1,R1-2,R2 **where** R1-1.InspNo = R1-2.InspNo And R1-1.PropNo = R2.PropNo

Optional Task 6: [10 points Extra credit] (BCNF)

Transform the relations (if required) resulted from task 4 (3NF) into BCNF.

a) Show the FDs of each relation first, then

b) check if the relation satisfies BCNF or not.

c) If not in BCNF, then transform it into BCNF

XYZPropertyInspection = R and PropNo = A, Propaddress = B, InspDate = C, InspTime = D, InspNo = E, InspName = F, InspCar = G , InspNotes = H.

Relation = R(A, B, C, D, E, F, G, H)

FD = {AC -> DEHFG, A -> B, E -> F, EC -> G, GCD -> ABHEF, ECD -> ABH}

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Write all LHS, copy FDs above, apply reflexivity and then transitivity. Compute F+

A → AB

B → B trivial

AC → ACDEHFG not trivial, needs work. A is not a super key.

C → C trivial

D → D trivial

E→ EF E is not a super key

EC → ECGF

F → F trivial

G → G trivial

GCD →ABHEF

H → H trivial

ECD →ABHF

R(A, B, C, D, E, F, G, H) break on A

Becomes R1(A,C,D,E,F,G,H) and R2(A, B)

Break R1 on E.

Becomes R1-1(A,C,D,E,G,H) and R1-2(E,F)

Since C, D, G and H are trivial, does not violate BCNF.

R(A, B, C, D, E, F, G, H) becomes AB // EF // ACDEGH