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Homework #4

Problem 1: Consider a relation R(A,B,C,D,E) with the following dependencies:

Closure Set of {AB}+	Functional Dependency used
{A,B}	Trivial
{A,B,C}	AB→C

Due to the fact that majority of the attributes of relation R are not available, this means that the attributes won't be able to be identified. This is while using the AB key. AB is not a designated candidate key for use upon the relation R.

We must now find the candidate key of key ABD. This is done by finding the closure.

Closure Set of {AB}+	Functional Dependency used
{A,B,D}	Trivial
{A,B,C,D}	AB→C
{A,B,C,D,E}	CD→E

As we can see from the chart above, the relation R has the attributes that are necessary for identifying the ABD key. Because of this, we come to see that ABD is a candidate key for the relation R.

Problem 2: Consider the universal relation R = {A, B, C, D, E, F, G, H, I} and the set of functional dependencies

The key, is a set of attributes who has an R which hold every single attribute included. As we can see, we have a closure from {A, B}. Therefore, {A, B}+ = R. That means that for R,one key is {A, B.

We must first turn 2NF from the R. Once completing that, we can then change It into 3NF

We must look at the dependencies that disrupt the 2NF. We take the closures of {A}+ and {B}+. These are used to help identify the partially dependent attributes. We come to see that:

{A}+ = {A, D, E, I, J}. Therefore, {A} -> {D, E, I, J} ({A} -> {A} is a trivial dependency)

{B}+ = {B, F, G, H}. Therefore, {A} -> {F, G, H} ({B} -> {B} is a trivial dependency)

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To change the R into the 2NF, we must take the attributes, and have them removed. These are the ones that depend on A and B. When doing so, we are placing A and B onto their own relations, which are labeled as R1 and R2.

R1 = {A, D, E, I, J},

R2 = {B, F, G, H}

R3 = {A, B, C}

Following this, we must now look at the transitive dependencies. With this, we see that:

The relation R1 has the transitive dependency {A} ->
{D} -> {I, J}

Because of this dependency, we take out {I, J} from R1. We then set them within relation R11. Afterwards, we duplicate the attribute D. These are the attributes that are dependent on R11. The leftover attributes are left within relation R12. Because of this, R1 is left to mix into R11 and R12. This will show as:

R11 = {D, I, J}
R12 = {A, D, E}

For relation R2 it creates the same decomposition for R21 and R22 just like R1. However, it derived on the transitive
dependency of {B} -> {F} -> {G, H}:

R2 = {F, G, H}, R2 = {B, F}

With these findings, the relations for 3NF are {R11, R12, R21, R22, R3}