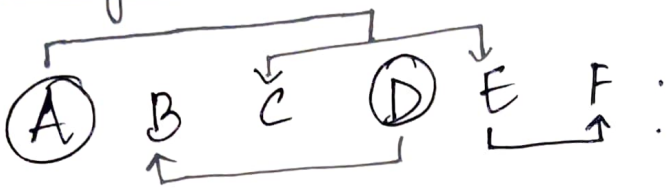
HW8 NIHAR MUNIRAJU.

1) Given a relation R(A, B, C, D, E, F) in 1NF and its functional depedency set F = {A → CE, E → F, D → B}. (1).

i) Find Candidate key of R.

ii) Decompose R into 3NF.

Soln Edge Diagram:-



i) Find the Candidate key of R.

A → CE.

E → F

D → B

⇒ AD is the Candidate Key for R because A → CE & D → B and rest of other attributes which are not to be present on the righthand side on the Candidate key. The attributes that are functionally depedent on all other attributes to meet this Criteria.

→ ... relational R ... with ... functional dependencies

ii) Decompose R into 3NF.

⇒ the transitive depedency is A→CE, Thus we need to decompose R into two relations $R_1(A,B,C,D)$ & $R_2(A,E,F)$. (2)

⇒ we can check R_1 & R_2 are in 3NF we can see that $R_1(A\,B\,C\,D)$ is in 3NF since there are no transitive depedencies.

For R_2 we can see that the only transitive depedency A→E.

Thus, we decompose R_2 into two relations $R_3(A,E)$ and $R_4(A,F)$

⇒ we can see that R_3 & R_4 are in 3NF, R_3 is in 3NF as there are no transitive depedencies. For $R_4(A,F)$ we can see that the only transitive depedency A→F, thus we decompose $R_5(A,F)$ & $R_6(A)$

⇒ We can see both $R_5(A,F)$ & $R_6(A)$ both are having no transitive depedences so they are 3NF.

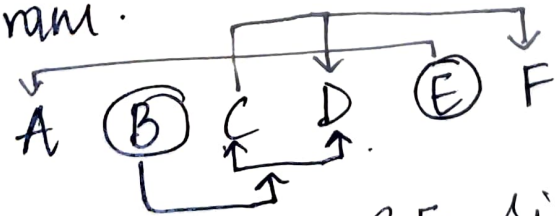
Thus the decomposition 3NF is $R_1(A,B,C,D)$ $R_3(A,E)$, $R_5(A,F)$ & R.

Q2

Give a relation R(A, B, C, D, E, F) in 1NF and its functional depedency set F={ B→CD, E→A, C→DF }.

i) Find Candidate key of R.

Edge Diagram.



B→CD.
E→A.
C→DF.

The Candidate key are B & E since the rest of the other attributes which are not to be present are on the right hand side. The attributes BE are not functionally dependent on any of the other attributes to meet this Criteria.

(ii) The decomposition of R into BCNF is. (3)

$R_1(B, C, D, F)$.

$R_2(E, A)$

$R_3(C, D, F)$.

The functional depedependencies in each decomposed relation

R_1: $B \to CD$, $C \to DF$.

R_2: $E \to A$.

R_3: $C \to DF$.

⇒ R were to decompose we to find the subset of attributes that contains a candidate key and all the depedent functionalite

⇒ Since B, C, D and F are Subset, which contains key B, this gives us first decomposed relation R_1 [$B \to CD$, $C \to DF$].

⇒ we can take attributes E & A which are in form that contains the candidate key of all functional depedencies ($E \to A$) gives.

thes Seeond decomposed relation R_2.

⇒ Finally taking attribute C and its functional depedency $C \to DF$, which gives us the third decomposed relation R_3.

The decomposed R into BCNF is.

$R_1(B, C, DF)$

$R_2(E, A)$

$R_3(C, D, F)$.

3] Given a relational R with a function dependency
$F = X \rightarrow Y$.

(1) If X is nonprime attribute and Y is prime attribute, select the right answer.

a. R is not in 2NF.
b. R is in 2NF, but not 3NF
c. R is in 3NF, but not BNCF
d. R is in BCNF

Soln (a) R is not in 2NF.

⇒ From the given functional depedency of R does not sasitsfy the conditions for the inclusion in 3NF and in 2NF since the given depedency $X \rightarrow Y$ do not comply with the requirement that all non-prime attributes be functionally determined by the Candidate key. The functional depedency b/w the attributes which are not tend to be prime attribute (x) and the prime attribute (Y), which leads to the voilation of the second normalization form, hence R is not in 2NF.

(2) If X is a subset of Candidate key and Y is non-prime attribute, select the right answer.

a. R is not in 2NF
b. R is in 2NF, but not in 3NF
c. R is in 3NF, but not in BCNF.
d. R is in BCNF

Soln (b) R is in 2NF, but not in 3NF.

⇒ The Depedency $X \rightarrow Y$ which voilates the constraint that all non-prime attributes must be functionally determined by the Candidate key. The functional depedency between the attributes that are not prime attributes voilates the third normalization form.

the right answer. prime attribute and Y is non prime attribute, select

a. R is not in 2NF
b. R is in 2NF, but not in 3NF.
c. R is in 3NF, but not BCNF.
d. R is in BCNF.

(5)

Soln (a) R is not in 2NF

⇒ The Functional depedency F=X→Y fails to meet the requirement of every non prime attribute must be functionally determined by the entire Candidate key, which indicates it does not implement factors relating to the third normalization factor either on the attributes. So the depedency which is contrary to the second normalization form of the given attribute set.

4] If X is Candidate key attribute and Y is prime attribute, select the right answer.

a. R is not in 2NF.
b. R is in 2NF, but not in 3NF.
c. R is in 3NF, but not BCNF.
d. R is in BCNF.

Soln (b) R is in 2NF, but not in 3NF

⇒ The functional attributes of a Candidate key and the prime attributes share a reliant on the primary key of the relation is entirely functionally on the primary key which qualifies a relation to be 2NF. The relation in a way is non transitive for 3NF. where X→Y breaks the Constraint that all non-prime attributes must be functionally depedent on the Candidate Key