

Assignment 4 (Databases and Datawarehouse).

Q.1). Definitions

a) Trivial Functional Dependency:-

The dependency of an attribute on a set of attributes is known as trivial functional dependency if the set of attributes includes that attribute.

i.e. $A \rightarrow B$ is trivially dependent if B is subset of A .

eg Consider a table having columns — studentid and studentname
 $\{ \text{studentid}, \text{studentname} \} \rightarrow \text{studentid}$ is a trivial functional dependency.

b) Nontrivial functional dependency:-

If a functional dependency $x \rightarrow y$ holds true where y is not a subset of x then, this dependency is known as non-trivial.

i.e. Table has attributes — empid, empname, empaddress.

F.D. $\text{empid} \rightarrow \text{empname}$.

$\text{empid} \rightarrow \text{empaddress}$.

c) Transitive functional dependency:-

when an indirect relationship causes functional dependency, it is known as transitive functional dependency.

i.e. $P \rightarrow Q$ & $Q \rightarrow R$ is true then $P \rightarrow R$ is transitive functional dep.

F.D. Consider table

movieid, listingid, listingtype.

$\rightarrow \text{movieid} \rightarrow \text{listingid}$.

$\text{listingid} \rightarrow \text{listingtype}$.

so $\text{movieid} \rightarrow \text{listingtype} \Rightarrow$ This is transitive dependency.

d) 1NF:-

If the attributes of table are atomic and not multivalued and each cell has only one value then table is said to be in 1NF

R_1 (not in 1NF).

RollNo	Name	mobile.
1	Neha	9920763595
		9920735678
2	Nikita	9920123456
		9920578913
3	Dakshita	9820132478
		982083437

\rightarrow

R_1 (in 1NF)

RollNo	Name	mobile.
1	Neha	9920763595
1	Meha	9920735678
2	Nikita	9920123456
2	Nikita	9920578913
3	Dakshita	9820132478
3	Dakshita	982083437

e) 2NF:- If all the N-prime attributes are fully functional dependent on the candidate key as a whole and there is no partial functional dependency then R is said to be in 2NF.

R	R_1			In 2NF	R_1		R_L
	custid	state.	city		custid	state/city	
Not in 2NF	1	maharashtra	Mumbai	\Rightarrow	1	Mumbai	9
	2	Gujrat	Surat		2	Surat	
	3	maharashtra	Thane		3	Thane	
	4	Gujrat	Baroda		4	Baroda	
2NF							

⑧ 3NF :- If a table is in 2NF & also none of the prime attributes refer to the other non prime attributes, then the table is in 3NF.

eg. $R \rightarrow R_1, R_2$

R	custId	state	city
	1	Guj	Surat
	2	Maha	Mumbai
	3	Guj	Surat
	4	Maha	Mumbai

R ₁	custId	state
	1	Guj
	2	Maha
	3	Guj
	4	Maha

R ₂	state	city
	Guj	Surat
	Maha	Mumbai
	Maha	

⑨ BCNF :- If a table is in 3NF & in the functional dependency, all the entries on the LHS are superkey, then the Relation is in BCNF.

eg. $CR \rightarrow \{SSN, adhar\}$

FD $\rightarrow \{SSN \rightarrow empname, adhar \rightarrow age, adhar \rightarrow SSN, SSN \rightarrow adhar\}$

Q.2 $R = \{P, Q, R, S, T, U, V, W, X, Y, Z\}$

FD = $\{\{P\} \rightarrow \{S\}, \{P\} \rightarrow \{T\}, \{R\} \rightarrow \{U\}, \{U\} \rightarrow \{V, W\}, \{S\} \rightarrow \{X, Y\}, \{U\} \rightarrow \{Z\}\}$

PR UVWZRPQSTXY

PK = $\{PR\}$

PR is the key of R.

$P \rightarrow \{ST\}$ $R \rightarrow \{U\}$

$P^+ = PSTXY$ $R^+ = RUZVW$ $PR^+ = PQR$
 R_1 R_2 R_3

the Relation R can be broken down into.

$R_1 \rightarrow PSTXY$ $R_2 \rightarrow RUZVW$ $R_3 \rightarrow PQR$ } In 2NF

For $R_1 \rightarrow PSTXY$, FD = $\{P \rightarrow ST\}, \{S \rightarrow XY\}$, CK $\{P\}$, PA = $\{P\}$, NPA = $\{S, T, X, Y\}$

$R_1' \Rightarrow PST$ where $P \rightarrow ST \Rightarrow$ PA $\{P\}$, CK = $\{P\}$, NPA = $\{S, T\}$

$R_1'' = SXY$ where $S \rightarrow XY$, CK = $\{S\}$, PA = $\{S\}$, NPA = $\{X, Y\}$

$R_2 = RUZVW$, FD = $\{U \rightarrow VW\}, \{R \rightarrow U\}, \{U \rightarrow Z\}$

CK = $\{R\}$, PA = $\{R\}$, NPA = $\{U, V, W, Z\}$

R_2 can be broken down to

$R_2' = RU$

where $R \rightarrow U$

PA = $\{R\}$

CK = $\{R\}$

NPA = $\{U\}$

$R_2'' = UVWZ$

where $U \rightarrow VW, U \rightarrow Z$

PA = $\{U\}$

CK = $\{U\}$

NPA = $\{V, W, Z\}$

The table R can be broken down into 5 tables in 3NF
Research Thinking.

$R_3 = PQR$
 $R_1' = PST \quad R_1'' = SXY$
 $R_2' = RU \quad R_2'' = UVWZ$

3NF.

All the tables follow BCNF as well
∴ no further decomposition possible.

$R_3 = PQR$
 $R_1' = PST$
 $R_1'' = SXY, R_2' = RU$
 $R_2'' = UVWZ$

BCNF.

Q.3

R_1 Bus (Reg. No, model No)
 R_2 Model (model No, capacity)
 R_3 Technician (Name, adhar, address, PNo, salary)
 R_4 Expertise (adhar, model No)
 R_5 Test (TNo, TName, maxScore)
 R_6 Testing (Reg No, adhar, TNo, date, No of hrs, Score)
 R_7 Union (Adhar, UmemNo)

FDs.

R_1 RegNo \rightarrow model No. Key Reg.No.
 R_2 Key: ModelNo., Model no \rightarrow capacity.
 R_3 Key: adhar no., FD is adhar \rightarrow Name, address, PNo, salary.
 R_4 Key: adhar, model No.
 R_5 Key TNo. & TName.
 FD. \rightarrow
 $TNo \rightarrow$ maxScore.
 $TName \rightarrow$ TNo
 $TNo \rightarrow$ TName
 $TName \rightarrow$ maxScore.

To make it in BCNF

TestNo (TNo, maxScore).
 TestName (TName, maxScore).

R_6 Key: RegNo + TNo + Date + adhar = A
 F.D $A \rightarrow$ No. of hrs.
 $A \rightarrow$ Score.

in BCNF:

R_7 Key: Adhar, UmemNo.
 $adhar \rightarrow$ UmemNo.
 $UmemNo \rightarrow$ adhar.