Normal forms on Primary keys

10/8

Assume:

inputs
- set of relations
- each relation has a primary key
- set of functional dependencies

Nomalization:

- given inputs
- achieve:
  1) minimize redundancy
  2) minimize insertion, deletion, and update anomalies

Normal form: highest normal form condition that the relation meets

Super key : relation $R = \{A_1, \cdots, A_n\}$

set of attributes $S \subseteq R$

s.t. t_1, t_2 on relational state of R

$t_1[S] = t_2[S] \Rightarrow t_1 = t_2$

Key : K is a superkey w/ prop

remove any attribute from K

then it is no longer a key

e.g. minimal

E.g EMPLOYEES(Ename, Bdate, ..., Ssn, ..., favorite_color)

{Ssn, favorite_color} ∈ Super key

{Ssn} ∈ key

candidate key: set of keys for a relation

primary key: (same def)

secondary keys: Candidate keys that are not primary

prime attribute: attribute that is a member of a candidate key

non-prime attrib: not a prime attrib

1NF

All attributes must be atomic values

DEPARTMENT

Dname	Dnumber	Dmgr_ssn	Dlocations
Research	5	333445555	{Bellaire, Sugarland, Houston}
Administration	4	987654321	{Stafford}
Headquarters	1	888665555	{Houston}

Solutions!

1. Add relation

DEPARTMENT

Dname	Dnumber	Dmgr_ssn
Research	5	333445555
Administration	4	987654321
Headquarters	1	888665555

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

2. Add tuples

DEPARTMENT

Dname	Dnumber	Dmgr_ssn	Dlocation
Research	5	333445555	Bellaire
Research	5	333445555	Sugarland
Research	5	333445555	Houston
Administration	4	987654321	Stafford
Headquarters	1	888665555	Houston

3. Use Mar nam

DEPARTMENT

Dname	Dnumber	Dmgr_ssn
Research	5	333445555
Administration	4	987654321
Headquarters	1	888665555

Loc1	Loc2	Loc3
Bellaire	Sugarland	Houston
Stafford	NULL	NULL
Houston	NULL	NULL

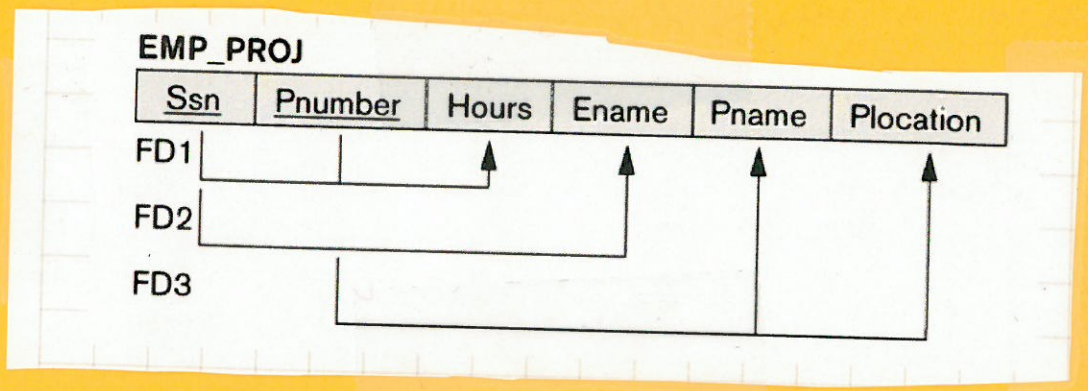
2NF

Full functional dependency:

F.D. $X \rightarrow Y$ is a full FD if removing an attribute from X cause the FD to no longer hold

Partial F.D.: can remove attributes from X

Eg.



{Ssn, Pnumber} → Hours is full functional dependency

{SSn, Pnumber} → Ename is partial

extra

known from FD2

def 2NF:

a relation R is 2NF if every nonprime attribute is fully funtionally dependent on the primary key of R

Q// Is 2NF?