

**N&N** Hospital is facing problems in its data organization. As database analyst, you have to normalize following N&N Hospital data up to **4NF**. Elaborate each step you perform with logic and state clearly any other **VALID** assumption that you make.

Doc no.	Name	Address	Phone	Department Id	Designation	Charges Per hour	Patient No.	Patient Name	CNIC	Phone	Room No.	Room Type	Bed No.
D1	Dr.Nadeem	Abc 123	0333-123, 042-123	Neurology	Professor	5000	P1	Kahlid	12345-1	042-1	R2	Normal	B1
							P5	Ahmed	12345-2	042-2			
							P7	Anum	12345-3	042-3	Nil		Nil
D2	Dr.Nadeem	Kb13	0334-124, 0300-123	Orthopedic	Professor	5000	P4	Mehmood	12345-4	042-4	R2	Normal	B1
							P7	Anum	12345-3	042-3	R4	Two bed	B5
							P9	Khawar	12345-6	042-5			B7
D4	Dr.Erum	Ak123	0321-123	ENT/ Neurology	Asth. Professor	3000	P10	Tanweer	12345-7	042-6	Nil		Nil
							P1	Khalid	12345-1	042-1	R5	Special	B8
D5	Dr.Hafeez	Nd123	0321-124	Skin/ Orthopedic	Asth. Professor	3000	P12	Sohail	12345-9	042-8	Nil		Nil
							P13	Ahmed	12346-0	042-9	R6	Special	B9

1NF  $\rightarrow$  Single valued / atomic values.

There are many multivalued values, so create different tables for each multivalued columns.

Doc no.	phone no.	Room no.	Room type
D <sub>1</sub>	0333-123	R <sub>2</sub>	normal
D <sub>1</sub>	042-123	R <sub>4</sub>	two bed
D <sub>2</sub>	0334-124	R <sub>5</sub>	special
D <sub>2</sub>	0300-123	R <sub>6</sub>	special.
D <sub>4</sub>	0321-123	Nil	Nil
D <sub>5</sub>	0321-124		

Rest of the original table remains same, as every value is atomic now.

2NF  $\rightarrow$  There should be no partial dependency -

- prime  $\rightarrow$  non prime is a partial dependency
- > we need prime & non prime attributes now
- > So first find out candidate key.
- > For candidate key, identify functional dependencies first.

So functional dependencies are:-

Docno  $\rightarrow$  address Department ID

Designation  $\rightarrow$  charges per hour

patient\_number  $\rightarrow$  pat-name, CNIC, phone

Bed-no  $\rightarrow$  room-no.

DATE:     

Dec No.    Name    Address    Dept id    Patient charges    patient patient  
 (lets use)    (patient)    for the above  
 D    N    A    De    Des    C    P    PN    CN    ph    R    B

D    N    A    De    Des    C    P    PN    CN    ph    R    B

According to functional dependencies,

So the candidate key now becomes (DN PB)

i.e., Department no, Name, Patient No., Bed No.  
is our candidate key

Now for 2NF, different tables are

D N P B

D A De

$N \rightarrow Des \rightarrow C$

$P \rightarrow PN \rightarrow CN \rightarrow ph$

$B \rightarrow R$

DATE:     

CNIC    phone    Room No.    Room type    Bed no.

DATE:

Now for 3NF, check for  $np \rightarrow np$  functional dependencies.

There is only one, i.e., 
$$\begin{array}{ccc} N \rightarrow Des \rightarrow C \\ p & np & np \end{array}$$

So make two tables  $N \rightarrow Des$   
 $Des \rightarrow C$ .

Now for BCNF, check for  $p/np \rightarrow p$  functional dependencies.

There is not even one functional dependency of this type. So final tables are

DNPB

D A Dc

N Des

Des C

P PN CN Ph

B R

Doctor No. phone No.

Room No. Room type.



# Final tables

DATE:

DNPB.

Doc No	Name	patient no	Bed No.
D <sub>1</sub>	Dr. Nadeem	P <sub>1</sub>	B <sub>1</sub>
D <sub>1</sub>	— 11 —	P <sub>5</sub>	B <sub>1</sub>
D <sub>1</sub>	— 11 —	P <sub>7</sub>	NH
D <sub>2</sub>	Dr. Nadeem	P <sub>4</sub>	B <sub>1</sub>
D <sub>2</sub>	— 11 —	P <sub>7</sub>	B <sub>5</sub>
D <sub>2</sub>	— 11 —	P <sub>9</sub>	B <sub>7</sub>
D <sub>4</sub>	Dr. Erum	P <sub>10</sub>	NH
D <sub>4</sub>	Dr. Erum	P <sub>1</sub>	B <sub>8</sub>
D <sub>5</sub>	Dr. Hafeez	P <sub>12</sub>	NH
D <sub>5</sub>	Dr. Hafeez	P <sub>13</sub>	B <sub>9</sub>

D	A	De
Doc No	Address	Department IP.
D <sub>1</sub>	Abc 123	Neurology
D <sub>2</sub>	Eb 13	Orthopedic
D <sub>4</sub>	AK 123	ENT/Neurology
D <sub>5</sub>	Nd 123	Skin/Orthopedic

N	Des	Des	C
Name	Designation	Designation	charges per
Dr. Nadeem	professor	professor	5000
Dr. Erum	Asst. professor	Asst. professor	3000
Dr. Erum	Asst. professor		

DATE:      

P	Pw	CN	Ph
patient No	patient Name	CNIC	phone
P1	Khalid	12345-1	042-1
P5	Ahmed	12345-2	042-2
P7	Anum	12345-3	042-3
P4	Mehmood	12345-4	042-4
P9	Khawar	12345-6	042-5
P10	Tanweer	12345-7	042-6
P12	Sohail	12345-9	042-8
P13	Ahmed	12346-0	042-9

B → R

Bed No	Room type
B1	Normal
B5	Special Two Bed
B7	Special Two Bed
B8	Special
B9	Special.

Doctor No	phone No	Room No	Room type
D1	0333-123	R2	normal
D1	042-123	R4	two bed
D2	0334-124	R5	Special
D2	0300-123	R6	Special
D4	0321-123	Nil	Nil
D5	0321-124		