

Normalization Assignment

Given Problem:

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

Step 1: Converting to 1 NF, We Get

DocNo	Phone		Doc No.	Name	Address	Department ID	Designation	Charges Per Hour
D1	0333-123		D1	Dr. Nadeem	Abc 123	Neurology	Professor	5000
D1	042-123		D2	Dr. Nadeem	Kb 13	Orthopedic	Professor	5000
D2	0334-124		D4	Dr. Erum	Ak123	ENT/Neurology	Astt. Professor	3000
D2	0300-123		D5	Dr. Hafeez	Nd123	Skin/Orthopedic	Astt. Professor	3000
D4	0321-123							
D5	0321-124							
Doc No	Patient No	Patient Name	CNIC	Phone	Room No.	Room Type	Bed No.	
D1	P1	Kahlid	12345-1	042-1	R2	Normal	B1	
D1	P5	Ahmed	12345-2	042-2	R2	Normal	B1	
D1	P7	Anum	12345-3	042-3	Nill	Nill	Nill	
D2	P4	Mehmood	12345-4	042-4	R2	Normal	B1	
D2	P7	Anum	12345-3	042-3	R4	Two bed	B5	
D2	P9	Khawar	12345-5	042-5	R4	Two bed	B7	
D4	P10	Tanweer	12345-6	042-6	Nill	Nill	Nill	
D4	P1	Khalid	12345-1	042-1	R5	Special	B8	
D5	P12	Sohail	12345-8	042-8	Nill	Nill	Nill	
D5	P13	Ahmed	12345-9	042-9	R6	Special	B9	

A new relation is created for Multi-valued attribute (Phone No.) since it is dependent on Dr No.

Patient is a multi-valued attribute. Thus another relation is created with atomic values.

Step 2: Converting to 2NF, We Get

DocNo	Phone		Doc No.	Name	Address	Department ID	Designation	Charges Per Hour
D1	0333-123		D1	Dr. Nadeem	Abc 123	Neurology	Professor	5000
D1	042-123		D2	Dr. Nadeem	Kb 13	Orthopedic	Professor	5000
D2	0334-124		D4	Dr. Erum	Ak123	ENT/Neurology	Astt. Professor	3000
D2	0300-123		D5	Dr. Hafeez	Nd123	Skin/Orthopedic	Astt. Professor	3000
D4	0321-123							
D5	0321-124							

Doc No	Patient No		Patient No	Patient Name	CNIC	Phone	Room No.	Room Type	Bed No.
D1	P1		P1	Kahlid	12345-1	042-1	R2	Normal	B1
D1	P5		P5	Ahmed	12345-2	042-2	R2	Normal	B1
D1	P7		P7	Anum	12345-3	042-3	Nill	Nill	Nill
D2	P4		P4	Mehmood	12345-4	042-4	R2	Normal	B1
D2	P7		P7	Anum	12345-3	042-3	R4	Two bed	B5
D2	P9		P9	Khawar	12345-5	042-5	R4	Two bed	B7
D4	P10		P10	Tanweer	12345-6	042-6	Nill	Nill	Nill
D4	P1		P1	Khalid	12345-1	042-1	R5	Special	B8
D5	P12		P12	Sohail	12345-8	042-8	Nill	Nill	Nill
D5	P13		P13	Ahmed	12345-9	042-9	R6	Special	B9

Relations having partial dependency are normalized by breaking it down in multiple relations.

Patient is dependent on Doctor. Room is dependent on the Patient & Doctor.

Step 3: Converting to 3NF & then BCNF, We Get

DOC ID	Phone		Doc No.	Name	Address	Department ID	Designation	Charges Per Hour			
D1	0333-123		D1	Dr. Nadeem	Abc123	Neurology	Professor	5000			
D1	042-123		D2	Dr. Nadeem	Kb13	Orthopedic	Professor	5000			
D2	0334-124		D4	Dr. Erum	Ak123	ENT/ Neurology	Astt. Professor	3000			
D2	0300-123		D5	Dr. Hafeez	Nd123	Skin/Orthopedic	Astt. Professor	3000			
D4	0321-123										
D5	0321-124										
DocNo	Patient No.	Room No.	Bed No.		Room No.	Room Type		Patient No.	Patient Name	CNIC	Phone
D1	P1	R2	B1		Nill	ND		P1	Kahlid	12345-1	042-1
D1	P5	R2	B1		R2	Normal		P5	Ahmed	12345-2	042-2
D1	P7	Nill	Nill		R4	Two Bed		P7	Anum	12345-3	042-3
D2	P4	R2	B1		R5	Special		P4	Mehmood	12345-4	042-4
D2	P7	R4	B5		R6	Special		P9	Khawar	12345-6	042-5
D2	P9	R4	B7					P10	Tanweer	12345-7	042-6
D4	P10	Nill	Nill					P12	Sohail	12345-9	042-8
D4	P1	R5	B8					P13	Ahmed	12345-0	042-9
D5	P12	Nill	Nill								
D5	P13	R6	B9								

Decomposing Relations till every non-prime attribute of all relations (tables) is non-transitively dependent on every key of all derived tables and all candidate keys are part of the superkey.