

Normalisation

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A1) The table is not in 1NF, because the attribute Courses contains more than 1 values for eg: IO-1 Courses \rightarrow "OS, DBMS". So as it is not in 1NF, it can't be in 2NF & 3NF.

Converted table :-

IO	Name	Age	Location	Courses
1	Sachin	22	Delhi	OS
1	Sachin	22	Delhi	DBMS
2	Ram	22	Jamshedpur	DAA
2	Ram	22	Jamshedpur	DBMS
3	Mike	23	Chennai	ML
3	Mike	23	Chennai	OS
4	Sameer	21	Bangalore	DAA
4	Sameer	21	Bangalore	ML
5	Vijay	22	Mumbai	ML
5	Vijay	22	Mumbai	DBMS

The above table is in 1NF.

Prime attributes \rightarrow IO & Name

Non-Prime \rightarrow Age, Location, Courses

* The second table mentioned in the question is in 1NF.

2)

a) This is not in 2nd NF, because it is not fully functionally independent as

EmpID \rightarrow Name, Age.

EmpID, DutyShift-ID \rightarrow Duty-Shift

- * Primary keys \rightarrow EmpID
- * Candidate \rightarrow Emp-ID, Name, Age
- * Prime \rightarrow Emp-ID, Name, Age
- * Non-Prime \rightarrow Duty-Shift-ID, Duty-Shift.

Converted table:-

i.

Emp-ID	Name	Age
101	Arun	26
102	Bobby	28
103	Suresh	32
104	Sita	24

ii.

Emp-ID	Duty-Shift-ID	Duty-Shift
101	1	Morning
102	2	Afternoon
103	3	Night
104	1	Morning.

b) This table is not in 2NF because it is not fully functionally independent as

Emp-ID \rightarrow Name

Emp-ID, Project-ID \rightarrow Project-Name,
Proj-Name, no-of-houses

- * Primary key \rightarrow Emp-ID
- * Candidate key \rightarrow Emp-ID, Project-ID
- * Prime attributes \rightarrow Emp-ID, Project-ID.
- * Non-Prime \rightarrow name, Proj-name, No-of-houses

Converted table:

Emp-ID	Name
123	Ajay
321	Charu
546	Rajesh
765	Abhishek

Emp-ID	Project-ID	Proj-Name	No-of-houses
123	Proj-21	Speech System	10
321	Proj-45	HR System	15
546	Proj-24	Automate tickets	23
765	Proj-11	NLR	16

3) a) Not in 3NF, there exists transitive dependency between {Cust-address} & {Cust-loc} on a non-Primary key which is {Cust-Postcode}

3NF would be

Cust-ID	Cust-Name	Cust-Postcode
25	Dell	560037
45	lenovo	560046
89	acer	210067
90	SamSung	4500078

{Cust-10} → Primary key

Cust - Postcode	Cust - Address	Cust - loc
560037	Whitefield	Bangalore
560046	Marathahalli	Bangalore
210067	Bandra	Mumbai
4500078	Oelhi Central	Delhi

{Cust-Postcode} → Primary key

b) Here, there exists transitive dependency.
So, it is not in 3NF

{Contractor} → Fee

There should be no transitive dependency in 3NF

{Building} → Primary key

{Contractor, Builder, Fee} → Non-prime attributes

3NF would be

Building	Contractor	Builder
B-2156	Taylor	Prestige
B-8765	Sandeep	Hiranandani
B-4567	Vishaka	Tata

Primary key → {Contractor, Fee}

Contractor	Fee
Taylor	2567891
Sandeep	3567356
Vishaka	4567990