Assignment 2

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Ans 1

First Normal Form

Definition of 1st Normal Form: This normal form disallows multi-valued attributes, composite attributes and their combinations. This normal form states that the domain of an attribute must include only atomic (simple, indivisible) values and that the value of any attribute in a tuple must be a single value from the domain of that attribute. 1NF disallows relations within relations or relations as attribute values within tuples. Solution of 1st Normal Form: Form new relations for each multi-valued attribute or nested relation.

Second Normal Form

Definition of 2nd Normal Form: A relation schema R is in 2NF if every non-prime attribute A in R is fully functionally dependent on the primary key of R. The test for 2NF involves testing for functional dependencies whose left-hand side attributes are part of the primary key.
Solution of 2nd Normal Form: Decompose and set up a new relation for each partial key with its dependent attribute(s). Make sure to keep a relation with the original primary key and any attributes that are fully functionally dependent on it.

Third Normal Form

Definition of 3rd Normal Form: A relation schema R is in 3NF if it satisfies 2NF and no non-prime attribute of R is transitively dependent on the primary key.
Solutions of 3rd Normal Form: Decompose and set up a relation that includes the non-key attribute(s) that functionally determine(s) other non-key attribute(s).

Ans 2

Given Table is :

Here we have the following dependencies :

1. Project ID -> Project Name
2. Guide ID -> Guide Name
3. {Project ID, Place ID}->Place Name

4. {Project ID, Place ID}->Hourly salary per place(in Rs) 5. {Project ID , Guide ID}->Place ID
6. {Project ID , Guide ID}->Hourly salary per place(in Rs) 7. {Project ID , Guide ID}->Place Name

Project ID	Project name	Guide ID	Guide name	Place ID	Place name	Hourly salary per Place (in Rs.)
23	Bangalore City tour	10, 11, 12	Rajeev, Manoj, Anil	25, 23, 20	Lalbagh Garden, Innovative Film City, Bangalore Palace	550, 400, 800
56	Mysore City tour	1, 2	Prem, Kapil	28, 23	Vrindavan Garden, Mysore Palace	700, 800

8. {Guide ID,Place ID}->Place Name

9. {Guide ID,Place ID}->Guide Name
10. {Guide ID,Place ID}->Hourly Salary per place

Ans 3

In the given table, there are multi-valued attribute in a single relation (Guide ID, Guide Name, Place ID, Place Name, Hourly Salary per place) so we can say that it is not 1NF.

We can express the given relation as

TOUR(Project ID,Project Name,{GUIDE_DETAILS(Guide ID,Guide Name), {PLACE_DETAILS(Place ID,Place Name, Hourly salary per place)}})

To convert this to 1NF, we create a new connection with the nested relation attributes removed and the primary key propagated into it. The new relation's primary key will combine the partial key with the original relation's primary key. The key is made up of the underlined attribute names. The following is the 1NF table, which is created by deleting multi-valued attributes. :-

Project ID	Project Name
23	Bangalore City Tour
56	Mysore City Tour

Project ID	Guide ID	Guide Name
23	10	Rajeev
23	11	Manoj
23	12	Anil
56	1	Prem
56	2	Kapil

Project ID	Guide ID	Place ID	Place Name	Hourly Salary per place in Rs
23	10	25	Lalbagh Garden	550
23	11	23	Innovative film city	400
23	12	20	Bangalore Palace	800
56	1	28	Vrindavan Garden	700
56	2	23	Mysore Palace	800

For 2NF let us look at the 2nd table above.

Because the functional dependency Project ID,Guide ID -> Guide Name in the second table has a partial reliance (based on the assumption that all Guide ID are unique), we may uniquely derive Guide Name from Guide ID alone. As a result, the Project ID property will need to be removed from that database.

Similarly in the 3rd table there is a partial dependency between {Project ID, Guide ID, Place ID}->Place Name and Hourly Salary which can be uniquely determined by {Project ID , Place ID}.Therefore we have the following tables :-

Project ID	Project Name
23	Bangalore City Tour
56	Mysore City Tour

Guide ID	Guide Name
10	Rajeev
11	Manoj
12	Anil
1	Prem

2	Kapil

Project ID	Place ID	Place Name	Hourly Salary per place in Rs
23	25	Lalbagh Garden	550
23	23	Innovative film city	400
23	20	Bangalore Palace	800
56	28	Vrindavan Garden	700
56	23	Mysore Palace	800

We check the first two tables from 2NF for 3NF. We can now declare that it is already in 3NF because there are no transitive dependencies. However, in the last table, Project ID and Place ID are used. The following is what we notice:-

1. {Project ID,Place ID}-> Place Name
2. {Project ID,Place ID}-> Hourly Salary per place 3. Place Name -> Hourly Salary per place

This highlights the transitive dependency and hence the table is not in 3NF. Resolving this we have the following tables finally (4 tables):-

Project ID	Project Name
23	Bangalore City Tour
56	Mysore City Tour

Guide ID	Guide Name
10	Rajeev
11	Manoj
12	Anil

1	Prem
2	Kapil

Project ID	Place ID	Place Name
23	25	Lalbagh Garden
23	23	Innovative film city
23	20	Bangalore Palace
56	28	Vrindavan Garden
56	23	Mysore Palace