



Bhartiya Vidya Bhavan's
Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

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SUBJECT	DBMS (Database Management System)
EXPERIMENT NO :	Experiment 10
DATE OF PERFORMANCE	25/11/22
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AIM:	To check for the normal forms of tables i.e., 1NF, 2NF and 3NF and decompose the tables accordingly.
THEORY:	<p>Normalization is the process of minimizing redundancy from a relation or set of relations. Redundancy in relation may cause insertion, deletion, and update anomalies.</p> <p>1. First Normal Form – If a relation contain composite or multi-valued attribute, it violates first normal form or a relation is in first normal form if it does not contain any composite or multi-valued attribute. A relation is in first normal form if every attribute in that relation is singled valued attribute.</p> <p>2. Second Normal Form – To be in second normal form, a relation must be in first normal form and relation must not contain any partial dependency. A relation is in 2NF if it has No Partial Dependency, i.e., no non-prime attribute (attributes which are not part of any candidate key) is dependent on any proper subset of any candidate key of the table.</p>



3. Third Normal Form –

A relation is in third normal form, if there is no transitive dependency for non-prime attributes as well as it is in second normal form.

A relation is in 3NF if at least one of the following condition holds in every non-trivial function dependency $X \rightarrow Y$

X is a super key.

Y is a prime attribute (each element of Y is part of some candidate key).

4. Boyce-Codd Normal Form (BCNF) –

A relation R is in BCNF if R is in Third Normal Form and for every FD, LHS is super key. A relation is in BCNF iff in every non-trivial functional dependency $X \rightarrow Y$, X is a super key.

SQL QUERIES/ COMMANDS:

First Normal Form(1NF):

It is already satisfied. All the tables have single value attributes only. A single cell cannot hold multiple values. If a table contains a composite or multi-valued attribute, it violates the First Normal Form.

S_NAME	S_ID	ADDRESS	CONTACT_NO	field_NO	Field_name
DEEP	2001	JAMMU	700606****	1	Engineering Student
DEEPAK	2002	LUDHIANA	990628****	1	Engineering Student
TARAK	2003	GUJRAT	98761****	1	Engineering Student
DHARA	2004	WESTBENGAL	700606****	1	Engineering Student
ANKITA	2005	AMRITSAR	785426****	2	Medical Student
VASUDHA	2006	RAIGARH	659823****	2	Medical Student
TOMPER	2007	MUMBAI	983467****	1	Engineering Student
VINEET	2008	KOLABA	981167****	1	Engineering Student
JUSTIN	2009	AMSTERDAM	663467****	1	Engineering Student

9 rows in set (0.01 sec)

Second Normal Form(2NF):

All the tables are in 2NF because all the non-prime attributes are completely



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dependent on the candidate key and hence no further decomposition of table.

For Example:

In this table, all the non-prime attributes are fully functional dependent on candidate key, Course_code.

Course_Code	Total_Seats	Course_Name	StartDate	Fee
1011	60	JEE	1042	150000
1012	60	JEE ADVANCED	1242	180000
1013	70	NEET	842	130000
1014	70	NEET PG	1042	170000
1015	120	GATE	472	100000
1016	32	CET	8900	125000
1017	56	GCET	4340	189000
1018	23	CAT	7890	250000

8 rows in set (0.00 sec)

Modified tables:

```
mysql> select * from courses;
```

Course_Code	Total_Seats	Course_Name	StartDate	Fee
1011	60	JEE	1042	150000
1012	60	JEE ADVANCED	1242	150000
1013	70	NEET	842	320000
1014	70	NEET PG	1042	320000
1015	120	GATE	472	400000

5 rows in set (0.00 sec)

```
mysql> select * from student;
```

S_NAME	S_ID	City	CONTACT_NO	state
DEEP	2001	Amritsar	700606****	Jammu
DEEPAK	2002	Mohali	990628****	Punjab
TARAK	2003	Mumbai	98761****	Maharashtra
DHARA	2004	Kolkata	700606****	West Bengal
ANKITA	2005	Gandhinagar	785426****	Gujrat
DEEPAK	2006	Mumbai	659823****	Punjab
TOMPER	2007	Delhi	983467****	Maharashtra
VINEET	2008	Amritsar	981167****	Jammu
JUSTIN	2009	Kolkata	663467****	Assam

9 rows in set (0.00 sec)



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F_id	F_name	SubID	Subject	age
1	GAJENDRA	111	MATHEMATICS	50
2	AMAN AGGARWAL	112	Physics	35
3	RONAK	111	Mathematics	35
4	Neha	113	Chemistry	30
5	Alakh	114	Biology	36
6	Sakshi	115	Statistics	29
7	Poonam	112	Physics	29
8	Ankit	115	Statistics	48
9	Pooja	113	Chemistry	41
10	Sakshi	114	Biology	58

10 rows in set (0.00 sec)

Let us take a table showing which student has enrolled in which course.

```
mysql> select * from enroll;
```

s_id	s_name	course_code	course_name	fee
2001	DEEP	1011	JEE	150000
2002	DEEPAK	1012	JEE ADVANCED	150000
2001	DEEP	1014	NEET ADVANCED	320000
2004	DHARA	1013	NEET	320000
2004	DHARA	1011	JEE	150000
2005	ANKITA	1015	GATE	400000

Candidate key: {s_id, course_code}

Functional dependencies: {course_code -> fee, s_id -> fee}

Non-prime attribute FEE is dependent on a proper subset of the candidate key i.e course_code , which is a partial dependency and so this relation is not in 2NF.

To convert the above relation to 2NF, we need to split the table into two tables such as :

Table 1: S_ID,S_NAME, COURSE_CODE

Table 2: COURSE_CODE, COURSE_NAME, FEE



COURSE_CODE	COURSE_NAME	FEE
1011	JEE	150000
1012	JEE ADVANCE	150000
1013	NEET	320000
1014	NEET PG	320000
1015	GATE	400000

COURSE_CODE	S_ID	S_NAME
1011	2001	DEEP
1011	2004	DHARA
1012	2002	DEEPAK
1013	2004	DHARA
1014	2001	DEEP
1015	2005	ANKITA

Third Normal Form(3NF):

Considering the modified student table, we have candidate key as S_id.

Here, S_id determines State and State determines City of the student.

That implies a non-prime attribute CITY is derived by another non-prime attribute STATE. Hence, a transitive dependency exist and the table is not in 3NF.

To convert the above relation to 3NF, we need to split the table into two tables such as :



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(SET-1)

Table 1: S_ID,S_NAME, CONT_NO,CITY

Table 2: CITY,STATE

S_NAME	S_ID	CONT_NO	CITY
DEEP	2001	700606****	Amritsar
DEEPAK	2002	990628****	Mohali
TARAK	2003	98761****	Mumbai
DHARA	2004	700606****	Kolkata
ANKITA	2005	785426****	Gandhinagar
DEEPAK	2006	659823****	Mumbai
TOMPER	2007	983467****	Delhi
VINEET	2008	981167****	Amritsar
JUSTIN	2009	663467****	Kolkata

CITY	STATE
Amritsar	Jammu
Mohali	Punjab
Mumbai	Maharashtra
Kolkata	West Bengal
Gandhinagar	Gujrat
Mumbai	Punjab
Delhi	Maharashtra
Kolkata	Assam



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(SET-2)

Table 1: F_ID,F_NAME, SubID, age

Table 2: SubID, Subject

F_ID	F_NAME	SubID	age
1	GAJENDRA	111	50
2	AMAN AGGARWAL	112	35
3	RONAK	111	35
4	NEHA	113	30
5	ALAKH	114	36
6	SAKSHI	115	29
7	POONAM	112	29
8	ANKIT	115	48
9	POOJA	113	41
10	SAKSHI	114	50

SubID	Subject
111	MATHEMATICS
112	Physics
113	Chemistry
114	Biology
115	Statistics



Table

F_ID	F_NAME	SubID	age
1	GAJENDRA	111	50
2	AMAN AGGARWAL	112	35
3	RONAK	111	50
4	NEHA	113	30
5	ALAKH	114	36
6	SAKSHI	115	29
7	POONAM	112	35
8	ANKIT	115	29
9	POOJA	113	30
10	SAKSHI	114	36

BCNF

Table 1: F_ID,F_NAME, SubID

Table 2: SubID, age

F_ID	F_NAME	SubID
1	GAJENDRA	111
2	AMAN AGGARWAL	112
3	RONAK	111
4	NEHA	113
5	ALAKH	114
6	SAKSHI	115
7	POONAM	112
8	ANKIT	115
9	POOJA	113



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10	SAKSHI	114
SubID	age	
111	50	
112	35	
113	30	
114	36	
115	29	
CONCLUSION:		All normal forms have been understood and incorporated in the database.