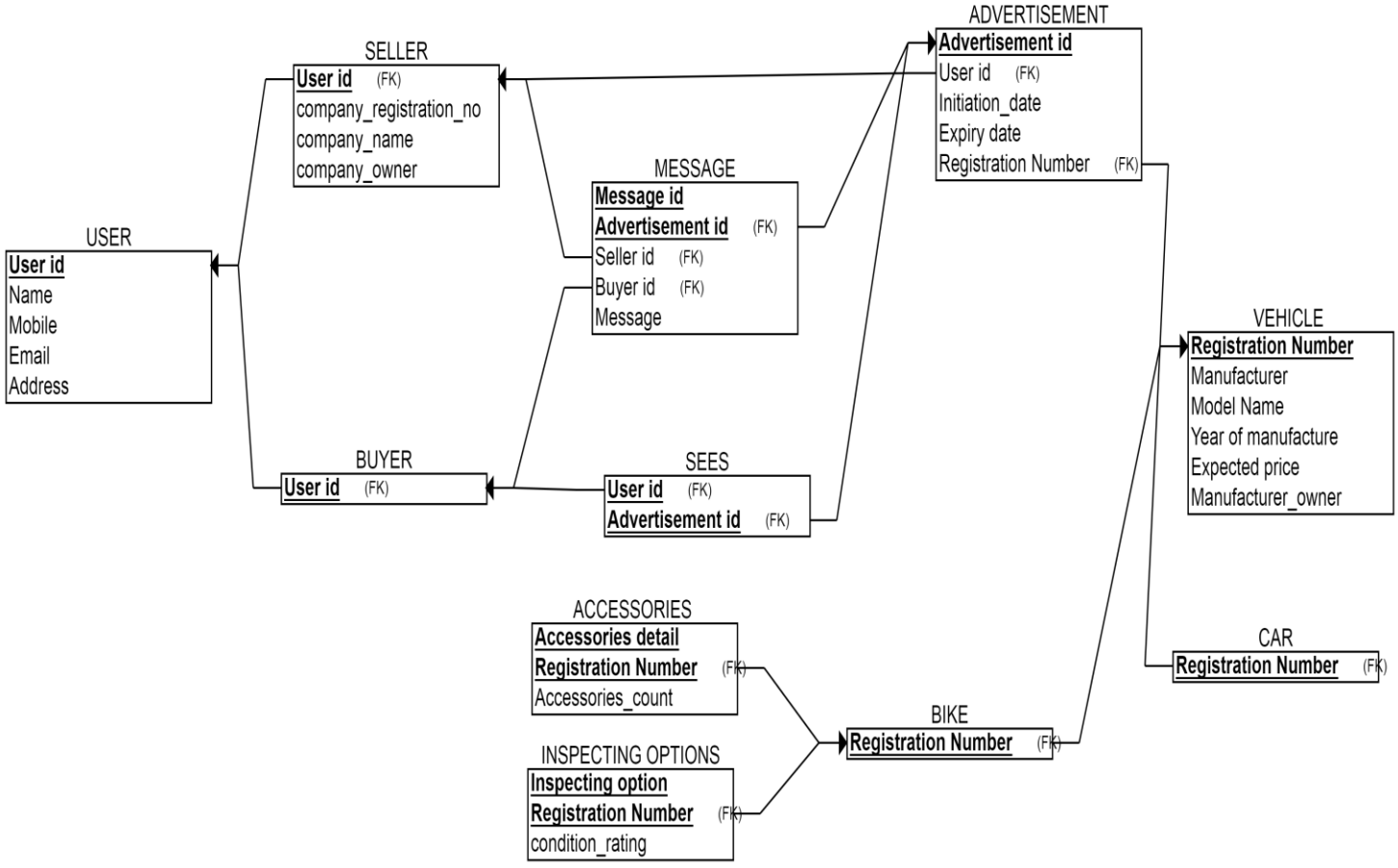
DBMS LAB

EXERCISE 05

1. FIRST NORMAL FORM (1NF):-

A relation is in 1NF if and only if, for every legal value of that relation, every tuple has exactly one value for each attribute.

First normal form deals only with the basic structures of the relation and does not resolve the problem of redundant information and any other anomalies.



Relational schema for 1nf

RELATIONS FOR 1NF

1. USER

user_id	username	email	mobile	address
1	ABC	abc@gmail.com	1234	22. avb, Dhar MP India
2	DEF	def@gmail.com	5678	22. dfg, ujjain MP India
3	GHI	ghi@gmail.com	9101112	1. ggis, Nagpur Mh India
4	JKL	jkl@gmail.com	13141516	333. mani, Pune Mh India
5	MNO	mno@gmail.com	17181920	122. ania,Patna Bihar India
6	PQR	pqr@gmail.com	21222324	11. paas Rajkot Gj India
7	STU	stu@gmail.com	25262728	001. sks Madurai TN India
8	VWX	vwx@gmail.com	10101012	342. ak Puri Orrisa India
9	XYZ	xyz@gmail.com	1012312	92. jia Srinagar JK India
10	YZA	yza@gmail.com	1231233	862. aa Calicut Kerala India
NULL	NULL	NULL	NULL	NULL

2. SELLER

user_id	company_registration_no	company_name	company_owner
2	1001	Movers And Packers	Mr.AAA
4	1002	Indian cars	Mr.BBB
6	1003	Yashwant Cars	Mr.CCC
8	1004	shivam mobiles	Mr.DDD
10	1005	Rajpat mobiles	Mr.EEE
NULL	NULL	NULL	NULL

3. BUYER

user_id
1
3
5
7
9
NULL

4. VEHICLE

registration_no	manufacturer	manufacturer_owner	model_name	year_of_manufacture	expected_price
111	Hyundai	Won hee lee	creata	15-12-2017	1400000
123	BMW	Harald Kruger	BMW 2404	20-01-2018	3000000
212	Tata	Ratan Tata	Citi	10-01-2014	500000
221	Tata	Ratan Tata	Neno	01-01-2016	300000
511	Hero	Pawan Munjal	Splendor	01-01-2013	80000
531	Hero	Pawan Munjal	Delux	11-11-2015	90000
612	TVS	K.N Radhakrishnan	victor	11-03-2014	65000
626	TVS	K.N Radhakrishnan	Apache	11-03-2018	120000
818	Bajaj	Rajiv	Pulsar	11-03-2018	1400000
911	Toyota	Akio Toyoda	fortuner	30-09-2016	4000000
NULL	NULL	NULL	NULL	NULL	NULL

5. ADVERTISEMENT

adv_id	user_id	reg_no	initiation_date	expiry_date
1001	2	111	10-02-2019	31-02-2019
1002	4	123	01-12-2019	21-12-2019
1003	6	511	03-11-2019	23-11-2019
1004	8	612	05-11-2019	25-11-2019
1005	10	911	02-09-2019	22-09-2019
NULL	NULL	NULL	NULL	NULL

6. MESSAGE

message_id	adv_id	seller_id	buyer_id	message
11	1001	2	3	Is any variation available
12	1001	2	1	Does it have open rooftop
13	1003	6	9	Are more colors available
14	1002	4	7	I want your whatsapp number
15	1005	10	3	Is car available now or sold
NULL	NULL	NULL	NULL	NULL

7. SEES

user_id	adv_id
1	1001
3	1002
3	1003
5	1003
7	1004
NULL	NULL

8. CAR

reg_no
111
123
212
221
911
NULL

9. BIKE

reg_no
511
531
612
626
818
NULL

10. ACCESSORIES

accessories_detail	reg_no	accessories_count
colored light	818	5
handlebar hangers	531	2
led strip tail light	626	1
sit holders	612	3
tank pad	511	1
NULL	NULL	NULL

11. INSPECTING_OPTIONS

inspecting_option	reg_no	condition_rating
breaks	626	4
chase	511	5
max speed	531	5
mileage	818	7
tyre condition	612	10
NULL	NULL	NULL

EXPLANATION:-

As we can see in all this given relations values in the domain of each attribute of relation are atomic. In other words, only one value is associated with each attribute and value is not a set of values or list of values. A database is in first normal from if every relation included in database is in 1nf.

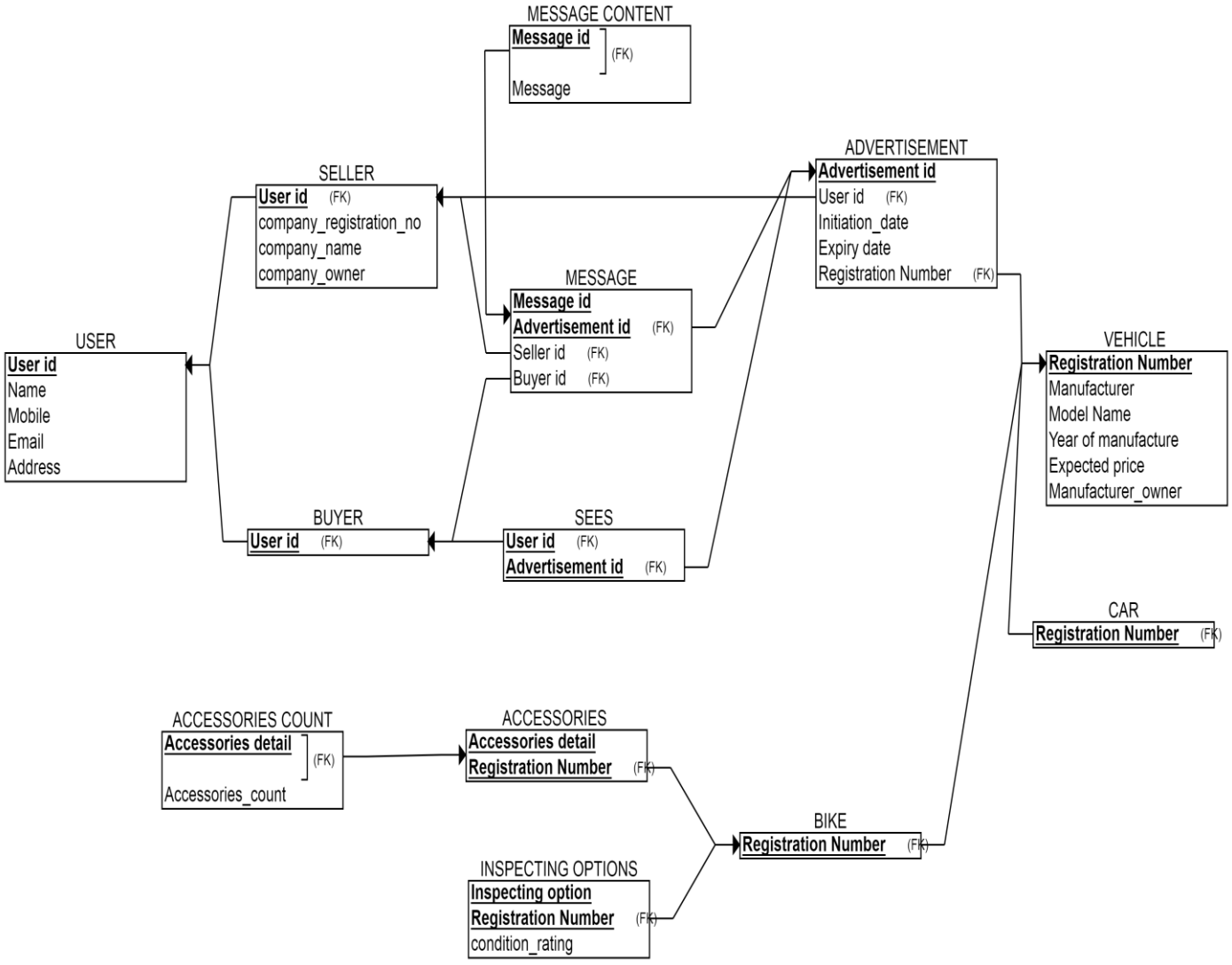
PROBLEM AND ANOMALIES IN 1NF:-

1. **INSERT** :- In ACCESSORIES relation we cannot add an accessory if it's count is not known.
2. **DELETE** :- In INSPECTING_OPTIONS if we delete sole first tuple for a particular inspecting option, we delete not only the rating but also lose other information, such as inspecting_option.
   For eg:- if we delete tuple breaks as we want to delete it's rating .Then while deleting it we even delete break feature from inspecting options.
3. **UPDATE** :- In this form of relation, we have some information repeated many times. If we want to update some information, for this we have to search all the tuples containing that information and then update that tuples.

This anomalies can be resolved by further converting it into 2nf and 3nf.

2. SECOND NORMAL FORM (2NF):-

A relation is in second normal form(2nf), if it is in 1NF and if all non-prime attributes are fully functionally dependent on the primary key.
Non-prime attributes are attributes which are not a part of candidate key.
Partial Dependency occurs when a non-prime attribute is functionally dependent on part of a candidate key.2NF eliminates partial dependency.



Relational schema for 2nf

(MODIFICATION FROM 1NF to 2NF)

CHANGES MADE :-

1. In ACCESSORIES we have considered that bike have a specific count for a fixed type of accessories hence accessories count only depends on count type of accessories and not on registration number. Hence we can make a separate table for this to remove the partial dependency.
2. In MESSAGE relation message is independent of advertisement_id hence again it is partial dependency and to remove this we make a separate table having message_id as primary key and message as non prime attribute.

RELATIONS FOR 2NF

1. USER

user_id	username	email	mobile	address
1	ABC	abc@gmail.com	1234	22. avb, Dhar MP India
2	DEF	def@gmail.com	5678	22. dfg, ujjain MP India
3	GHI	ghi@gmail.com	9101112	1. ggis, Nagpur Mh India
4	JKL	jkl@gmail.com	13141516	333. mani, Pune Mh India
5	MNO	mno@gmail.com	17181920	122. ania,Patna Bihar India
6	PQR	pqr@gmail.com	21222324	11. paas Rajkot Gj India
7	STU	stu@gmail.com	25262728	001. sks Madurai TN India
8	VWX	vwx@gmail.com	10101012	342. ak Puri Orrisa India
9	XYZ	xyz@gmail.com	1012312	92. jia Srinagar JK India
10	YZA	yza@gmail.com	1231233	862. aa Calicut Kerala India
NULL	NULL	NULL	NULL	NULL

2. SELLER

user_id	company_registration_no	company_name	company_owner
2	1001	Movers And Packers	Mr.AAA
4	1002	Indian cars	Mr.BBB
6	1003	Yashwant Cars	Mr.CCC
8	1004	shivam mobiles	Mr.DDD
10	1005	Rajpat mobiles	Mr.EEE
NULL	NULL	NULL	NULL

3. BUYER

user_id
1
3
5
7
9
NULL

4. VEHICLE

registration_no	manufacturer	manufacturer_owner	model_name	year_of_manufacture	expected_price
111	Hyundai	Won hee lee	creata	15-12-2017	1400000
123	BMW	Harald Kruger	BMW 2404	20-01-2018	3000000
212	Tata	Ratan Tata	Citi	10-01-2014	500000
221	Tata	Ratan Tata	Neno	01-01-2016	300000
511	Hero	Pawan Munjal	Splendor	01-01-2013	80000
531	Hero	Pawan Munjal	Delux	11-11-2015	90000
612	TVS	K.N Radhakrishnan	victor	11-03-2014	65000
626	TVS	K.N Radhakrishnan	Apache	11-03-2018	120000
818	Bajaj	Rajiv	Pulsar	11-03-2018	1400000
911	Toyota	Akio Toyoda	fortuner	30-09-2016	4000000
NULL	NULL	NULL	NULL	NULL	NULL

5. ADVERTISEMENT

adv_id	user_id	reg_no	initiation_date	expiry_date
1001	2	111	10-02-2019	31-02-2019
1002	4	123	01-12-2019	21-12-2019
1003	6	511	03-11-2019	23-11-2019
1004	8	612	05-11-2019	25-11-2019
1005	10	911	02-09-2019	22-09-2019
NULL	NULL	NULL	NULL	NULL

6. MESSAGE

message_id	adv_id	seller_id	buyer_id
13	1003	6	9
12	1001	2	1
14	1002	4	7
11	1001	2	3
15	1005	10	3
NULL	NULL	NULL	NULL

7. MESSAGE_CONTENT

message_id	message
13	Are more colors available
12	Does it have open rooftop
14	I want your whatsapp number
11	Is any variation available
15	Is car available now or sold
NULL	NULL

9. SEES

user_id	adv_id
1	1001
3	1002
3	1003
5	1003
7	1004
NULL	NULL

10 . CAR

reg_no
111
123
212
221
911
NULL

11 . BIKE

reg_no
511
531
612
626
818
NULL

12. ACCESSORIES

accessories_detail	reg_no
colored light	818
handlebar hangers	531
led strip tail light	626
sit holders	612
tank pad	511
NULL	NULL

13. ACCESSORIES_COUNT

accessories_detail	accessories_count
colored light	5
handlebar hangers	2
led strip tail light	1
sit holders	3
tank pad	1
NULL	NULL

14. INSPECTING_OPTIONS

inspecting_option	reg_no	condition_rating
breaks	626	4
chase	511	5
max speed	531	5
mileage	818	7
tyre condition	612	10
NULL	NULL	NULL

EXPLANATION:-

The steps involved in transforming the relation from 1NF to 2NF are as follows:-

1. Identify the set of attributes that make up the primary key.
2. Create all subsets of the above set obtained in step1.
3. Designate each of these subsets at the primary key of a relation that contains those attributes which are dependent on these primary keys.

For example:-

Here in ACCESSORIES-1NF primary key was {accessories_detail,reg_no} however as we assume that for all bike accessories count is only dependent on type of accessory. Hence here one attribute depends on part of a primary key and not to whole primary key so this is partial dependence. And to remove partial dependencies we used 2NF.

The advantage of 2NF is that, the problems that we were facing in 1NF are solved in 2NF. These are solved as follows;-

1. **INSERT** :- In MESSAGE we can insert a message even the advertisement_ id is not known for the given message, by simply inserting appropriate tuple in MESSAGE_CONTENT.
2. **DELETE** :- IN ACCESSORIES we can delete a tuple without losing any information of count of accessories by use of ACCESSORIES COUNT table. Example if earlier in 1 NF if we delete bike with reg_no =818 we would have to delete it from accessories and then we would have lost accessories count for bikes. But using 2NF we have solved this anomaly.
3. **UPDATE**:- Let consider a case when so many bikes have same accessory . Now if we want to change accessories_count for that accessory then if it was 1NF then we have to update all accessories with specific value. This cause more searching and time. But as in 2NF we separated count and details. So now if we want to change accessories_count then we would require to make only one change in ACCESSORIES_COUNT table.

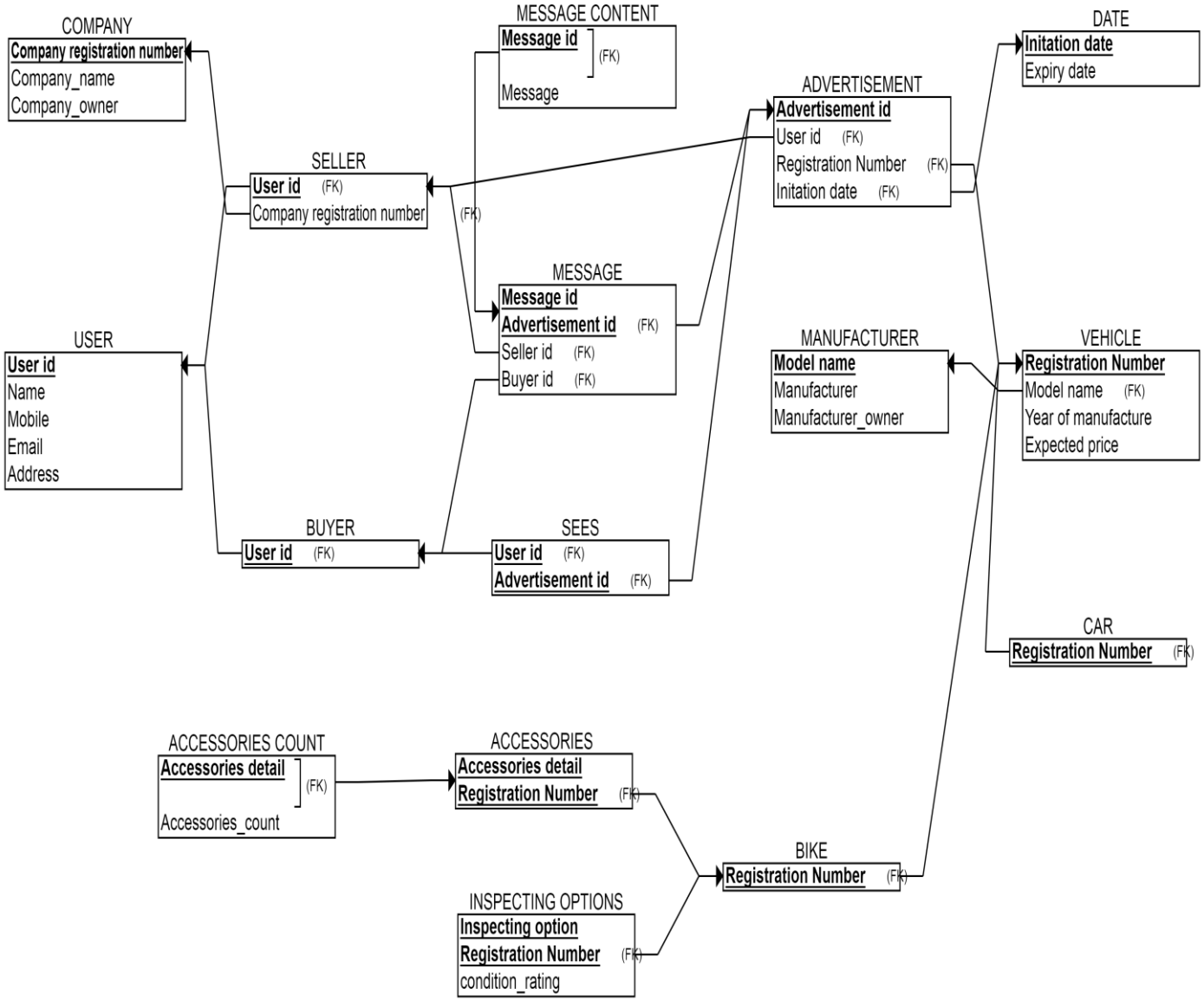
3 . THIRD NORMAL FORM (3NF):-

A relation is in third normal form(3NF) if and only if it is in 2NF and every non-key attribute is non-transitively dependent on primary key.

Transitive functional dependency means that:-

If, x(primary key)-> y and y->z then x->z.

So z is transitively dependent on x.



Relational schema for 3nf

(MODIFICATION FROM 2NF to 3NF)

CHANGES MADE :-

1. In SELLER we see that company name and company owner depends on company_registration_no only which is a non-prime attribute. Hence this is a transitive dependency. So to solve this problem we make a new relation named company.
2. In ADVERTISEMENT expiry date is derived from initiation date which is not a prime attribute. Hence we make a new relation DATE in 3NF.
3. In VEHICLE manufacturer owner and manufacture depends only on model name. So to remove this transitive dependency in 3NF we make a separate relation MANUFACTURER using model name as primary key for new table.

RELATIONS FOR 3NF

1. USER

user_id	username	email	mobile	address
1	ABC	abc@gmail.com	1234	22. avb, Dhar MP India
2	DEF	def@gmail.com	5678	22. dfg, ujjain MP India
3	GHI	ghi@gmail.com	9101112	1. ggis, Nagpur Mh India
4	JKL	jkl@gmail.com	13141516	333. mani, Pune Mh India
5	MNO	mno@gmail.com	17181920	122. ania,Patna Bihar India
6	PQR	pqr@gmail.com	21222324	11. paas Rajkot Gj India
7	STU	stu@gmail.com	25262728	001. sks Madurai TN India
8	VWX	vwx@gmail.com	10101012	342. ak Puri Orrisa India
9	XYZ	xyz@gmail.com	1012312	92. jia Srinagar JK India
10	YZA	yza@gmail.com	1231233	862. aa Calicut Kerala India
NULL	NULL	NULL	NULL	NULL

2.SELLER

user_id	company_registration_no
2	1001
4	1002
6	1003
8	1004
10	1005
NULL	NULL

3.COMPANY

company_registration_no	company_name	company_owner
1001	Movers And Packers	Mr.AAA
1002	Indian cars	Mr.BBB
1003	Yashwant Cars	Mr.CCC
1004	shivam mobiles	Mr.DDD
1005	Rajpat mobiles	Mr.EEE
NULL	NULL	NULL

4. BUYER

user_id
1
3
5
7
9
NULL

5. VEHICLE

registration_no	model_name	year_of_manufacture	expected_price
111	creata	15-12-2017	1400000
123	BMW 2404	20-01-2018	3000000
212	Citi	10-01-2014	500000
221	Neno	01-01-2016	300000
511	Splendor	01-01-2013	80000
531	Delux	11-11-2015	90000
612	victor	11-03-2014	65000
626	Apache	11-03-2018	120000
818	Pulsar	11-03-2018	1400000
911	fortuner	30-09-2016	4000000
NULL	NULL	NULL	NULL

6. MANUFACTURER

model_name	manufacturer	manufacturer_owner
creata	Hyundai	Won hee lee
BMW 2404	BMW	Harald Kruger
Citi	Tata	Ratan Tata
Neno	Tata	Ratan Tata
Splendor	Hero	Pawan Munjal
Delux	Hero	Pawan Munjal
victor	TVS	K.N Radhakrishnan
Apache	TVS	K.N Radhakrishnan
Pulsar	Bajaj	Rajiv
fortuner	Toyota	Akio Toyoda
NULL	NULL	NULL

7. ADVERTISEMENT

adv_id	user_id	reg_no	initiation_date
1001	2	111	10-02-2019
1002	4	123	01-12-2019
1003	6	511	03-11-2019
1004	8	612	05-11-2019
1005	10	911	02-09-2019
NULL	NULL	NULL	NULL

8. DATE

initiation_date	expiry_date
10-02-2019	31-02-2019
01-12-2019	21-12-2019
03-11-2019	23-11-2019
05-11-2019	25-11-2019
02-09-2019	22-09-2019
NULL	NULL

9 . MESSAGE

message_id	adv_id	seller_id	buyer_id
13	1003	6	9
12	1001	2	1
14	1002	4	7
11	1001	2	3
15	1005	10	3
NULL	NULL	NULL	NULL

10. MESSAGE_CONTENT

message_id	message
13	Are more colors available
12	Does it have open rooftop
14	I want your whatsapp number
11	Is any variation available
15	Is car available now or sold
NULL	NULL

11. SEES

user_id	adv_id
1	1001
3	1002
3	1003
5	1003
7	1004
NULL	NULL

12. CAR

reg_no
111
123
212
221
911
NULL

13 . BIKE

reg_no
511
531
612
626
818
NULL

14. ACCESSORIES

accessories_detail	reg_no
colored light	818
handlebar hangers	531
led strip tail light	626
sit holders	612
tank pad	511
NULL	NULL

15. ACCESSORIES_COUNT

accessories_detail	accessories_count
colored light	5
handlebar hangers	2
led strip tail light	1
sit holders	3
tank pad	1
NULL	NULL

16. INSPECTING_OPTIONS

inspecting_option	reg_no	condition_rating
breaks	626	4
chase	511	5
max speed	531	5
mileage	818	7
tyre condition	612	10
NULL	NULL	NULL

EXPLANATION:-

The steps involved in transforming the relation from 2NF to 3NF are as follows:-

1. Determine the non-key attribute that determine some other non-key attribute.
2. Make separate relation taking first one as primary key.