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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**19CSE202 - DATABASE MANAGEMENT SYSTEM**

**NORMALIZATION- SAMPLE DOCUMENT**

**CAR RENTAL SYSTEM**

**MASTER TABLE:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| customer \_id | customer \_name | Phone No | Aadhaar | Email |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gender | DOB | Street | city | Zipcode | car- id |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| car model | location | milage | Seating space | availability status |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reg. No | Booking \_Id | caution deposit | booking status | From date | to-date |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| billing id | discount | date of billing | return - date | late fee | Total amount |

|  |  |
| --- | --- |
| payment method | Payment status |

**Functional Dependencies Identified From Master Table:**

1. (Customer\_ID)àcustomer\_name, phone no , email, gender, DOB, Street, city, Zipcode, aadhar.
2. (Aadhar )àcustomer\_name, gender, DOB.
3. (Car\_ID,Customer\_id)àCar Model, Location, Milage, Seating \_space, Availability\_Status
4. (Reg\_no)àCar Model, Milage, Seating Capacity.
5. (Booking\_ID,Car\_ID)à Caution\_deposit , booking status, from\_date,to\_date, Car\_model
6. (Billing\_Id, Booking \_Id)à discount, date of billing
7. ( Billing)àreturn \_date, late \_fee, Total amount, Payment status, payment method.

**We assumed attributes as alphabets and numbers:**

|  |  |
| --- | --- |
| customer \_Id | A |
| car \_Id | B |
| Booking \_Id | C |
| Billing \_Id | D |
| Aadhaar | E |
| Reg\_ No | F |

|  |  |
| --- | --- |
| Customer name | 1 |
| Phone Number | 2 |
| Email | 3 |
| Gender | 4 |
| DOB | 5 |
| Street | 6 |
| City | 7 |
| Zipcode | 8 |

|  |  |
| --- | --- |
| Car Model | 9 |
| Location | 10 |
| Milage | 11 |
| Seating \_space | 12 |
| Availability\_Status | 13 |
| Caution\_deposit | 14 |
| Booking status | 15 |
| From\_date | 16 |

|  |  |
| --- | --- |
| To\_date | 17 |
| discount | 18 |
| Date of billing | 19 |
| return \_date | 20 |
| late \_fee | 21 |
| Total amount | 22 |
| Payment status | 23 |
| payment method | 24 |

**Functional Dependencies :**

1. A à 1, 2, 3, 4, 5, 6, 7, 8, E
2. E à 1,4,5
3. AB à 9, 10, 11, 12, 13, F
4. F→ 9,11,12
5. BC à 14, 15, 16, 17,9
6. CD à 18, 19
7. D à 20,21,22,23,24.

**Candidate Key For The Master table:**

(Candidate Key) = **(ABCD)**

(ABCD)+ = {R}

**1NF:**

As per the rule of first normal form, an attribute (column) of a table cannot hold multiple values. It should hold only atomic values.

Hence the MASTER TABLE is in **1NF.**

**2NF:**

* In the 2NF, relational must be in 1NF.
* In the second normal form, all non-key attributes are fully functional dependent on the primary key

(Candidate Key) = **(ABCD)**

1st FD, A is part of CK .So it should be in new table.

* **R1 = {A, 1, 2, 3, 4, 5, 6, 7, 8, E}**

3rd F.D, AB is Part of CK , So new table

* **R2 ={AB, 9, 10, 11, 12, 13,F}**

5th F.D, BC is Part of CK , So new table

* **R3 = {BC, 14, 15, 16, 17,9}**

6th F.D, CD is Part of CK , So new table

* **R4 ={CD,18,19}**

7th F.D, D is Part of CK , So new table

* **R5 ={D, 20, 21, 22, 23, 24}**

**Third Normal Form (3NF) :**

* A relation will be in 3NF if it is in 2NF and not contain any transitive partial dependency.
* 3NF is used to reduce the data duplication. It is also used to achieve the data integrity.
* If there is no transitive dependency for non-prime attributes, then the relation must be in third normal form.

**Convertion:**

R1 = {A, 1, 2, 3, 4, 5, 6, 7, 8, 9, E }

There is a transitive dependency as E à 1,4,5 decomposes this to the table.

* So, **R1 ={ A, 2, 3, 6,7,8, 9,E }.**
* **R11 ={E 1,4,5}**
* **R2 = {AB, 9, 10, 11, 12, 13, F}.**

» There is a Transitive dependency as F 9, 11,12

* **R2 ={ AB, 10, 13, F} .**
* **R21= {F, 9, 11, 12}**
* **R3 = { BC, 9, 14, 15, 16, 17}**

R3 is in 3NF

* **R4 = {CD, 18, 19}**

R4 is in 3NF

* **R5 = {D, 20, 21, 22, 23, 24}**

R5 is also in 3NF

And,

Hence the decomposed tables are:

**{R1,R11,R2,R21,R3,R4,R5}**

**i.e.,**

**R1 ={ A, 2, 3, 6,7,8, ,E }.**

{customer \_Id,phone number,email,street,city,zipcode.Aadhaar}

**R11 ={E 1,4,5}**

{Aadhaar,Name,Gender,DOB}

**R2 ={ AB, 10, 13, F} .**

{customer\_id,car\_id,location,availability\_status,RegNo}

**R21= {F, 9, 11, 12}**

{RegNo,Milage,model,seating\_space}

**R3 = { BC, 9, 14, 15, 16, 17}**

{car\_id,booking\_id,caution\_deposit,booking status,from date,to date,model}

**R4 = {CD, 18, 19}**

{booking\_id,billing\_id,discount,date of billing}

**R5 = {D, 20, 21, 22, 23, 24}**

{billing\_id,return date,late fee,total amount,payment status, payment method}

**Group Members:**

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* **-----------------------------------THANK YOU-----------------------------------**