Assignment by Shlok Agarwal

First Normal Form

Condition - Every attribute must be single - valued attribute

Given table is not in first normal form as it is violating the above mentioned condition.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Doc No. | Name | Address | Phone | Department Id | Designation | Charges per hour | Patient No. | Patient Name | CNIC | Phone | Room No. | Room Type | Bed No. |
| D1 | Dr. Nadeem | Abc 123 | 0333-123 | Neurology | Professor | 5000 | P1 | Kahid | 12345-1 | 042-1 | R2 | Normal | B1 |
| D1 | Dr. Nadeem | Abc 123 | 0333-123 | Neurology | Professor | 5000 | P5 | Ahmed | 12345-2 | 042-2 | R2 | Normal | B1 |
| D1 | Dr. Nadeem | Abc 123 | 0333-123 | Neurology | Professor | 5000 | P7 | Anum | 12345-3 | 042-3 | Nil |  | Nil |
| D1 | Dr. Nadeem | Abc 123 | 042-123 | Neurology | Professor | 5000 | P1 | Kahid | 12345-1 | 042-1 | R2 | Normal | B1 |
| D1 | Dr. Nadeem | Abc 123 | 042-123 | Neurology | Professor | 5000 | P5 | Ahmed | 12345-2 | 042-2 | R2 | Normal | B1 |
| D1 | Dr. Nadeem | Abc 123 | 042-123 | Neurology | Professor | 5000 | P7 | Anum | 12345-3 | 042-3 | Nil |  | Nil |
| D2 | Dr. Nadeem | Kb13 | 0334-124 | Orthopedic | Professor | 5000 | P4 | Mehmood | 12345-4 | 042-4 | R2 | Normal | B1 |
| D2 | Dr. Nadeem | Kb13 | 0334-124 | Orthopedic | Professor | 5000 | P7 | Anum | 12345-3 | 042-3 | R4 | Two Bed | B5 |
| D2 | Dr. Nadeem | Kb13 | 0334-124 | Orthopedic | Professor | 5000 | P9 | Khawar | 12345-6 | 042-5 | R4 | Two Bed | B7 |
| D2 | Dr. Nadeem | Kb13 | 0300-123 | Orthopedic | Professor | 5000 | P4 | Mehmood | 12345-4 | 042-4 | R2 | Normal | B1 |
| D2 | Dr. Nadeem | Kb13 | 0300-123 | Orthopedic | Professor | 5000 | P7 | Anum | 12345-3 | 042-3 | R4 | Two Bed | B5 |
| D2 | Dr. Nadeem | Kb13 | 0300-123 | Orthopedic | Professor | 5000 | P9 | Khawar | 12345-6 | 042-5 | R4 | Two Bed | B7 |
| D4 | Dr. Erum | Ak123 | 0321-123 | ENT | Astt. Professor | 3000 | P1 | Kahid | 12345-1 | 042-1 | R5 | Special | B8 |
| D4 | Dr. Erum | Ak123 | 0321-123 | ENT | Astt. Professor | 3000 | P10 | Tanweer | 12345-7 | 042-6 | Nill |  | Nill |
| D4 | Dr. Erum | Ak123 | 0321-123 | Neurology | Astt. Professor | 3000 | P1 | Kahid | 12345-1 | 042-1 | R5 | Special | B8 |
| D4 | Dr. Erum | Ak123 | 0321-123 | Neurology | Astt. Professor | 3000 | P10 | Tanweer | 12345-7 | 042-6 | Nill |  | Nill |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Skin | Astt. Professor | 3000 | P12 | Sohail | 12345-9 | 042-8 | Nill |  | Nill |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Skin | Astt. Professor | 3000 | P13 | Ahmed | 12346-0 | 042-9 | R6 | Special | B9 |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Orthopedic | Astt. Professor | 3000 | P12 | Sohail | 12345-9 | 042-8 | Nill |  | Nill |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Orthopedic | Astt. Professor | 3000 | P13 | Ahmed | 12346-0 | 042-9 | R6 | Special | B9 |

In the above table every attribute is a single - valued attribute. So now we have converted the given table into the first normal form.

Second Normal Form

Condition - 1) table should be in first normal form

2) 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.

When the table is in first normal form, there exists partial functional dependency in it as a single attribute

is not enough to uniquely identify each record in the table.

So for the table to be in second normal form, we need to remove this partial functional dependency.

For this purpose we divide the table into two, Doctor and Patient table respectively.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Doc No. | Name | Address | Phone | Department Id | Designation | Charges per hour |
| D1 | Dr. Nadeem | Abc 123 | 0333-123 | Neurology | Professor | 5000 |
| D1 | Dr. Nadeem | Abc 123 | 042-123 | Neurology | Professor | 5000 |
| D2 | Dr. Nadeem | Kb13 | 0334-124 | Orthopedic | Professor | 5000 |
| D2 | Dr. Nadeem | Kb13 | 0300-123 | Orthopedic | Professor | 5000 |
| D4 | Dr. Erum | Ak123 | 0321-123 | ENT | Astt. Professor | 3000 |
| D4 | Dr. Erum | Ak123 | 0321-123 | Neurology | Astt. Professor | 3000 |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Skin | Astt. Professor | 3000 |
| D5 | Dr. Hafeez | Nd123 | 0321-124 | Orthopedic | Astt. Professor | 3000 |

**Doctor**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Patient No. | Patient Name | CNIC | Phone | Room No. | Room Type | Bed No. | Doc No. |
| P1 | Kahid | 12345-1 | 042-1 | R2 | Normal | B1 | D1 |
| P1 | Kahid | 12345-1 | 042-1 | R5 | Special | B8 | D4 |
| P5 | Ahmed | 12345-2 | 042-2 | R2 | Normal | B1 | D1 |
| P4 | Mehmood | 12345-4 | 042-4 | R2 | Normal | B1 | D2 |
| P7 | Anum | 12345-3 | 042-3 | Nil |  | Nil | D1 |
| P7 | Anum | 12345-3 | 042-3 | R4 | Two Bed | B5 | D2 |
| P9 | Khawar | 12345-6 | 042-5 | R4 | Two Bed | B7 | D2 |
| P10 | Tanweer | 12345-7 | 042-6 | Nill |  | Nill | D4 |
| P12 | Sohail | 12345-9 | 042-8 | Nill |  | Nill | D5 |
| P13 | Ahmed | 12346-0 | 042-9 | R6 | Special | B9 | D5 |

**Patient**

Third Normal Form

Condition - 1) table should be in second normal form

2) No transitive dependency for non-prime attributes

When the table is in second normal form, there could be some transitive dependency such that non-key attribute from some non-key attribute could be determined by a key-attribute.

So for the table to be in third normal form, we need to remove this transitive dependency.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Doc No. | Name | Address | Designation | Charges per hour |
| D1 | Dr. Nadeem | Abc 123 | Professor | 5000 |
| D2 | Dr. Nadeem | Kb13 | Professor | 5000 |
| D4 | Dr. Erum | Ak123 | Astt. Professor | 3000 |
| D5 | Dr. Hafeez | Nd123 | Astt. Professor | 3000 |

**Doctor**

|  |  |
| --- | --- |
| Doc No. | Phone No. |
| D1 | 0333-123 |
| D1 | 042-123 |
| D2 | 0334-124 |
| D2 | 0300-123 |
| D4 | 0321-123 |
| D5 | 0321-124 |

**Phone**

|  |  |
| --- | --- |
| Doc No. | Department Name |
| D1 | Neurology |
| D2 | Orthopedic |
| D4 | Neurology |
| D4 | ENT |
| D5 | Orthopedic |
| D5 | Skin |

**Department**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Patient No. | Patient Name | CNIC | Phone | Doc No. |
| P1 | Kahid | 12345-1 | 042-1 | D1 |
| P1 | Kahid | 12345-1 | 042-1 | D4 |
| P5 | Ahmed | 12345-2 | 042-2 | D1 |
| P4 | Mehmood | 12345-4 | 042-4 | D2 |
| P7 | Anum | 12345-3 | 042-3 | D1 |
| P7 | Anum | 12345-3 | 042-3 | D2 |
| P9 | Khawar | 12345-6 | 042-5 | D2 |
| P10 | Tanweer | 12345-7 | 042-6 | D4 |
| P12 | Sohail | 12345-9 | 042-8 | D5 |
| P13 | Ahmed | 12346-0 | 042-9 | D5 |

**Patient**

|  |  |
| --- | --- |
| Patient No. | Room No. |
| P1 | R2 |
| P1 | R5 |
| P4 | R2 |
| P5 | R2 |
| P7 | R4 |
| P9 | R4 |
| P13 | R6 |

**Room No.**

|  |  |
| --- | --- |
| Patient No. | Room Type |
| P1 | Normal |
| P1 | Special |
| P4 | Normal |
| P5 | Normal |
| P7 | Two Bed |
| P9 | Two Bed |
| P13 | Special |

**Room Type**

|  |  |
| --- | --- |
| Patient No. | Bed No. |
| P1 | B1 |
| P1 | B8 |
| P4 | B1 |
| P5 | B1 |
| P7 | B5 |
| P9 | B7 |
| P13 | B9 |

**Bed**

BCNF

Condition - 1) table should be in third normal form

2) table is in BCNF if every determinant is a candidate key

We can see that in the above tables, determinant of each is a candidate key.