**Normalized Logical Schema (Version 1.0)**

**Based on Logical Schema Version 1.2.**

**Employee**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EmpID | Name | Street | City | Zip | State |

**Candidate Keys:** EmpID is the only candidate key. No other combination of attributes can guarantee uniqueness.

**Functional Dependencies:**

EmpID -> Name

EmpID -> Street

EmpID -> City

EmpD -> Zip

EmpID -> State

**1NF:** Employee is in first normal form already, there are no composite attributes and all non-key attributes depend on key-attributes.

**2NF:** Employee is already in second normal form; all non-key attributes are determined by a candidate key.

**3ND:** Employee is already in third normal form; all non-key attributes are determined by candidate keys and no non-key attributes determine other non-key attributes

**BCNF:** Employee is already in Boyce-Codd normal form. All key and non-key attributes are only determined by a candidate key.

**Department**

|  |  |
| --- | --- |
| Name | Manager |

**Candidate Keys:** Name is the only candidate key as it is the only reliable way to identify a department.

**Functional Dependencies:**

Name -> Manager

**1NF:** Department is already in first normal form already, there are no composite attributes and al non-key attributes depend on key-attributes.

**2NF:** Department is already in second normal form; all non-key attributes are determined by candidate keys.

**3ND:** Department is in third normal form; all non-key attributes are only determined by candidate keys.

**BCNF:** Department s already inBoyce-Codd normal form, all key and non-key attributes are determined by only a candidate key.

**Inventory**

|  |  |  |
| --- | --- | --- |
| ItemName | VendorName | Price |

**Candidate Keys:** ItemName is the only viable candidate key. VendorName is unreliable in the event more than one product can be purchased from a vendor and a price can be shared between multiple items.

**Functional Dependencies:**

ItemName -> VendorName

ItemName -> Price

**1NF:** Inventory is already in first normal form already, there are no composite attributes and all non-key attributes depend on key-attributes.

**2NF:** Inventory is already in second normal form, there are no partial dependencies, all non-key attributes are determined by a complete candidate key.

**3ND:** Inventory is already in third normal form, there are no non-key attributes that rely on other non-key attributes.

**BCNF:** Inventory is in Boyce-Codd normal form. There are no key-attributes that rely on other key attributes.

**Vendor**

|  |  |
| --- | --- |
| Name | Phone |

**Candidate Keys:** Both Name and Phone are candidate keys as both can be unique.

**Functional Dependencies:**

Name -> Phone

Phone -> Name

**1NF:** Vendor is already in first normal form already, there are no composite attributes and all non-key attributes depend on key-attributes.

**2NF:** Vendor is in second normal form, there are no partial dependencies.

**3ND:** Vendor is in third normal form; no non-key attributes rely on other non-key attributes.

**BCNF:** The Vendor table is already in Boyce-Codd normal form. No key-attributes are determined by other key-attributes, both Phone and Name are unique values.

**Order**

|  |  |  |  |
| --- | --- | --- | --- |
| OrderID | Manager | OrderDate | State |

**Candidate Keys:** EmpID is the only candidate key. No other combination of attributes can guarantee uniqueness.

**Functional Dependencies:**

OrderID -> Manager

OrderID -> OrderDate

OrderID -> State

**1NF:** The order table is already in First normal form, there are no multi-value attributes or composite attributes and all non-key attributes are already determined by a candidate key.

**2NF:** The order table is already in second normal form, there are no partial dependencies and all non-key attributes are determined by a complete candidate key.

**3ND:** The order table is already in third normal form, all non-key attributes are only determined by candidate keys, no non-key attributes determine other non-key attributes.

**BCNF:** The order table is already in Boyce-Codd normal form, OrderID is the only candidate key, so no key attributes rely on other key attribute.

**OrderDetail**

|  |  |  |  |
| --- | --- | --- | --- |
| OrderID | ItemName | Quantity | Price |

**Candidate Keys:** The combination of OrderID and ItemName is the only candidate key, as the combination of the two is the only way to determine uniqueness.

**Functional Dependencies:**

(OrderID, ItemName) -> Quantity

(OrderID, ItemName) -> Price

**1NF:** The OrderDetail table is already in first normal form, there are no multi-value attributes and there are no composite attributes. All non-key attributes are determined by a candidate key.

**2NF:** The OrderDetail table is already in second normal form as there are no partial dependencies and all non-key attributes are determined by candidate keys.

**3ND:** The OrderDetail table is already in third normal form as no non-key attributes rely on other non-key attributes.

**BCNF:** The OrderDetail table is already in Boyce-Codd normal form as no key-attributes rely on other key-attributes.

**Normalized Logical Schema**

Employee(EmplID, Name\*, Street, City, Zip, State, Department\*)

Department references Dempatment.Name

Department(Name, Manager\*)

Manager references Employee.EmpID

Order(OrderID, Manager\*, OrderDate\*, Vendor\*)

Vendor references Vendor.Name

OrderDetail(OrderID, ItemName, Quantity\*, TotalPrice\*)

OrderID references Order.OrderID

ItemName references Inventory.ItemName

Inventory(ItemName, VendorName, Price\*)

VendorName references Vendor.Name

Vendor(Name, Phone\*)