PASSVAULT - Multi-Pass Digital Wallet

PROJECT REPORT
for
21CSC205P – DATABASE MANAGEMENT SYSTEMS

Submitted by

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In partial fulfilment of the requirements for the degree of

BACHELOR OF TECHNOLOGY
in
COMPUTER SCIENCE ENGINEERING
WITH SPECIALIZATION IN SOFTWARE ENGINEERING

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Project Report: PassVault - Multi-Pass Digital Wallet : (4B Component)

Normalization of Tables:

1. **Backup-Recovery Table :**

BackUp_Id	User_Id	BackUp_Date	Recovery_Status	BackUp_Location
1	1	2025-03-01 00:00:00	Completed	Cloud Storage
2	2	2025-03-02 00:00:00	Pending	Local Backup
4	4	2025-03-04 00:00:00	Pending	External HDD
5	5	2025-03-05 00:00:00	Completed	Local Backup
6	6	2025-03-06 00:00:00	Completed	Cloud Storage
7	7	2025-03-07 00:00:00	Pending	USB Drive
8	8	2025-03-08 00:00:00	Completed	Cloud Storage
9	9	2025-03-09 00:00:00	Completed	External HDD
10	10	2025-03-10 00:00:00	Pending	Local Backup
11	11	2025-03-11 00:00:00	Completed	Cloud Storage
12	2	2025-04-01 07:54:38	Pending	Cloud Storage

Full Function Dependency : **Backup_Id** → User_Id, Backup_Date, Recovery_Status, Backup_Location
Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

2. Bank Table :

Bank_Id	User_Id	BankName	Card_No	Card_Type	Expiry_Date
1	1	HDFC Bank	1234567812345678	Credit	2027-12-01
2	2	SBI Bank	2345678923456789	Debit	2026-09-15
3	3	ICICI Bank	3456789034567890	Credit	2028-06-20
4	4	Axis Bank	4567890145678901	Debit	2025-11-30
5	5	Kotak Bank	5678901256789012	Credit	2029-05-10
6	6	PNB	6789012367890123	Debit	2024-08-21
7	7	Union Bank	7890123478901234	Credit	2027-01-15
8	8	Canara Bank	8901234589012345	Debit	2026-04-05
9	9	Bank of Baroda	9012345690123456	Credit	2028-03-18
10	10	IndusInd Bank	0123456701234567	Debit	2025-10-27
11	11	Yes Bank	1111222233334444	Credit	2027-07-13
12	2	Federal Bank	9999888877776666	Credit	2029-12-31

Full Function Dependency : **Bank_Id** → User_Id, BankName, Card_No, Card_Type, Expiry_Date
Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ YES Bank_Id → Card_No → BankName
Bank_Id → Card_No → Card_Type,
Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Failed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Failed**

- Handles cases where **candidate keys as** (Super Key) cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections

After Normalization

split into 2 tables: CardDetails & UserCard

CardDetails Table:

Card_No	BankName	Card_Type	Expiry_Date
0123456701234567	IndusInd Bank	Debit	2025-10-27
1111222233334444	Yes Bank	Credit	2027-07-13
1234567812345678	HDFC Bank	Credit	2027-12-01
2345678923456789	SBI Bank	Debit	2026-09-15
3456789034567890	ICICI Bank	Credit	2028-06-20
4567890145678901	Axis Bank	Debit	2025-11-30
5678901256789012	Kotak Bank	Credit	2029-05-10
6789012367890123	PNB	Debit	2024-08-21
7890123478901234	Union Bank	Credit	2027-01-15
8901234589012345	Canara Bank	Debit	2026-04-05
9012345690123456	Bank of Baroda	Credit	2028-03-18
9999888877776666	Federal Bank	Credit	2029-12-31

UserCard Table:

Bank_Id	User_Id	Card_No	
1	1	1234567812345678	
2	2	2345678923456789	
3	3	3456789034567890	
4	4	4567890145678901	
5	5	5678901256789012	
6	6	6789012367890123	
7	7	7890123478901234	
8	8	8901234589012345	
9	9	9012345690123456	
10	10	0123456701234567	
11	11	1111222233334444	
12	2	9999888877776666	

All determinants are superkeys:

- In CardDetails, Card_No is the PK and determines all.
- In UserCard, Bank_Id is the PK and no non-superkey determines anything.

→ No transitive or partial dependencies remain.
→ BCNF achieved.

3. DashBoard Table:

Dashboard_Id	User_Id	Last_Login
1	1	2025-04-07 19:40:22
2	2	Null
4	4	Null
5	5	2025-04-02 11:57:02
6	6	Null
7	7	Null
8	8	Null
9	9	Null
10	10	Null
11	11	Null

Full Function Dependency : **DashBoard_Id** → User_Id,
Last_Login Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

4. ExpirationAlerts Table:

Alert_Id	Pass_Id	User_Id	Expiration_Date	Status
1	1	1	2024-07-20	Active
2	2	2	2025-03-15	Expired
4	4	4	2025-07-20	Expired
5	5	5	2025-08-11	Active
6	6	6	2025-09-05	Expired
7	7	7	2025-10-01	Active
8	8	8	2025-11-12	Expired
9	9	9	2025-12-25	Active
10	10	10	2026-01-30	Expired
11	11	11	2026-02-15	Active
14	12	12	2023-02-20	Expired
15	20	2	2025-04-10	Expired
16	20	2	2025-04-10	Expired
20	20	2	2023-04-10	Expired
22	22	4	2025-04-05	Active
23	25	5	2024-03-22	Expired

Full Function Dependency : **Alert_Id** → Pass_Id, User_Id, Expiration_Date, Status
Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).

- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

5. Features Table:

Feature_Id	Feature_Name
1	QR Sharing
2	Pass Sharing
3	Multi-Device Access
4	Transaction History
5	Expiration Alerts
6	AI-Based Recommendations
7	Pass Sync
8	Data Backup & Recovery
9	Two-Factor Authentication
10	Personalized Offers
11	Analytics Dashboard

Full Function Dependency : **Feature_Id** →
Feature_Name Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

6. MutlideviceAccess Table:

Access_Id	Device_Id	Last_IP	Connected_Devices
1	Device001	192.168.1.10	Laptop, Mobile
2	Device002	192.168.1.20	Mobile
3	Device003	192.168.1.30	Tablet, Mobile
4	Device004	192.168.1.40	Laptop, Tablet
5	Device005	192.168.1.50	Smartwatch, Mobile
6	Device006	192.168.1.60	Mobile, Smart TV
7	Device007	192.168.1.70	Laptop, Mobile, Tablet
8	Device008	192.168.1.80	Workstation, Mobile
9	Device009	192.168.1.90	Laptop, Home Assistant
10	Device010	192.168.2.10	Smartphone, Wearable
11	Device011	192.168.2.20	Laptop, Smart Display

Full Function Dependency : **Access_Id** → Device_Id, Last_IP, Connected_Devices
Atomic Attributes ⇒ NO
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ YES

> 1NF - First Normal Form : **Failed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Failed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Failed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

After Normalization

- Connected_Devices violates **1NF** because it stores **multiple values** in one field.

Recreating the Main table:

```
CREATE TABLE MultiDeviceAccess (
    Access_Id INT PRIMARY KEY
    AUTO_INCREMENT, Device_Id VARCHAR(255)
    UNIQUE NOT NULL, Last_IP VARCHAR(50)
    NOT NULL
);
```

Creation of the New Table: ConnectedDevices

```
CREATE TABLE
    ConnectedDevices (
    Access_Id INT NOT
    NULL,
    Device_Type VARCHAR(100) NOT NULL,
    FOREIGN KEY (Access_Id) REFERENCES MultiDeviceAccess(Access_Id)
);
```

Multidevice Table (After Normalisation):

Access_Id	Device_Id	Last_IP
1	Device001	192.168.1.10
2	Device002	192.168.1.20
3	Device003	192.168.1.30
4	Device004	192.168.1.40
5	Device005	192.168.1.50
6	Device006	192.168.1.60
7	Device007	192.168.1.70
8	Device008	192.168.1.80
9	Device009	192.168.1.90
10	Device010	192.168.2.10
11	Device011	192.168.2.20

ConnectedDevice Table:

Access_Id	Device_Type	
1	Laptop	
1	Mobile	
2	Mobile	
3	Tablet	
3	Mobile	
4	Laptop	
4	Tablet	
5	Smartwatch	
5	Mobile	
6	Mobile	
6	Smart TV	
7	Laptop	
7	Mobile	
7	Tablet	
8	Workstation	
8	Mobile	
9	Laptop	
9	Home Assistant	
10	Smartphone	
10	Wearable	

11	Laptop
11	Smart Display

After the **Normalization** process,

1NF – Passed (Atomic attributes Now done),
4NF – Passed (Multivalued Dependencies removed) &
5NF – Passed (No Loss Decomposition).

7. PassSharing Table :

Share_Id	SenderUser_Id	ReciverUser_Id	Pass_Id	SharedAt	Status
1	1	2	1	2025-03-06 18:14:08	Accepted
4	4	5	4	2025-03-06 18:14:08	Accepted
5	5	6	5	2025-03-06 18:14:08	Pending
6	6	7	6	2025-03-06 18:14:08	Rejected
7	7	8	7	2025-03-06 18:14:08	Accepted
8	8	9	8	2025-03-06 18:14:08	Pending
9	9	10	9	2025-03-06 18:14:08	Accepted
10	10	11	10	2025-03-06 18:14:08	Rejected
11	11	1	11	2025-03-06 18:14:08	Accepted

Full Function Dependency : **Shared_Id**→ SenderUser_Id, RecieverUser_Id, Pass_Id, SharedAt, Status
Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ YES Join/Multivalued Dependency ⇒ YES

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Failed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Failed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.
- It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

For solving 3NF:

we have to eliminate the **transitive dependencies**

For Normalization,

we have to split it into two tables:

Passsharing_Passes & Passsharing_Users

Share_Id	**Pass_Id**
1	1
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11

PassSharing_Users Table:

Share_Id	SenderUser_Id	RecieverUser_Id
1	1	2
4	4	5
5	5	6
6	6	7
7	7	8
8	8	9
9	9	10
10	10	11
11	11	1

After Normalization,

3NF – Passed (No Transitive Dependencies) &

BNCF – Passed (only candidate key present)

8. UserBankAccount Table:

UserBankAccount_id	User_id	bank_id	Card_No	Card_Type	Expiry_Date
1	1	1	1234567812345678	Credit	2027-12-01
2	2	2	2345678923456789	Debit	2026-09-15
3	3	3	3456789034567890	Credit	2028-06-20
4	4	4	4567890145678901	Debit	2025-11-30
5	5	5	5678901256789012	Credit	2029-05-10
6	6	6	6789012367890123	Debit	2024-08-21
7	7	7	7890123478901234	Credit	2027-01-15
8	8	8	8901234589012345	Debit	2026-04-05
9	9	9	9012345690123456	Credit	2028-03-18
10	10	10	0123456701234567	Debit	2025-10-27

11	11	11	1111222233334444	Credit	2027-07-13
12	2	12	9999888877776666	Credit	2029-12-31

Full Function Dependency : **UserBankAccount_Id** → User_Id, Bank_Id, Card_No, Card_Type, Expiry_Date

Atomic Attributes ⇒ YES

Partial Dependency ⇒ NO

Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

9. Notifications Table:

Notification Id	User Id	Message	Read Status	Timestamp
1	1	Your pass is expiring soon!	0	2025-03-06 19:01:49
2	2	New security update available.	1	2025-03-06 19:01:49
3	3	Welcome back, Aarav!	0	2025-04-07 19:27:53
4	4	Your transaction was successful.	1	2025-03-06 19:01:49
5	5	Backup completed successfully.	0	2025-03-06 19:01:49
6	6	New device login detected.	1	2025-03-06 19:01:49
7	7	Pass updated successfully.	0	2025-03-06 19:01:49
8	8	Upcoming event reminder!	0	2025-03-06 19:01:49
9	9	Discount coupon expires soon.	1	2025-03-06 19:01:49
10	10	Password changed successfully.	0	2025-03-06 19:01:49
11	11	Security alert: Unusual login detected.	1	2025-03-06 19:01:49
12	2	Your pass "Concert Ticket" has expired!	0	2025-03-29 13:04:25
13	4	Your pass "Gym Membership" has expired!	0	2025-03-29 13:04:25
14	6	Your pass "Flight Ticket" has expired!	0	2025-03-29 13:04:25
15	8	Your pass "PlayStation Plus Membership" has expired!	0	2025-03-29 13:04:25
16	10	Your pass "Tech Conference Entry" has expired!	0	2025-03-29 13:04:25
17	2	Your pass	0	2025-03-31

		"Concert Ticket" has expired!		23:17:35

Full Function Dependency : **Notification_Id**→ User_Id, Message, Read_Status, Timestamp.

Atomic Attributes ⇒ YES

Partial Dependency ⇒ NO

Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

- BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

10. PassBankAccount Table:

Pass_ Id	**Pass_Ty pe**	**Pass_Na me**	**Status**	**Descrip tion**
1	Loyalty Card	Amazon Prime	Active	Amazon Prime

		Membership		Subscription
2	Event Ticket	Concert Ticket	Active	VIP Pass for Music Concert
3	Discount Coupon	50% Off Coupon	Inactive	Expired discount for electronics
4	Membership Card	Gym Membership	Active	Annual membership for fitness center
5	Subscription	Netflix Subscription	Active	Monthly Netflix plan
6	Boarding Pass	Flight Ticket	Active	Boarding pass for international flight
7	Gift Card	Amazon Gift Card	Inactive	Expired gift card
8	Gaming Pass	PlayStationPlus Membership	Active	Online gaming subscription
9	Cinema Ticket	Movie Ticket	Active	3D Movie Experience
10	E-learning Pass	Udemy Subscription	Active	Access to global tech event
11	E-learning Pass	Udemy Subscription	Active	Premium access to courses

Full Function Dependency : **Pass_Id** → Pass_Type, Pass_Name, Status,

Description.

Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

11. PassSync Table:

Sync_Id	User_Id	Device_Id	LastSyncAt
1	1	Device001	2025-03-06 18:14:01
2	2	Device002	2025-03-06 18:14:01
4	4	Device004	2025-03-06 18:14:01
5	5	Device005	2025-03-06 18:14:01
6	6	Device006	2025-03-06 18:14:01
7	7	Device007	2025-03-06 18:14:01
8	8	Device008	2025-03-06 18:14:01

9	9	Device009	2025-03-06 18:14:01
10	10	Device010	2025-03-06 18:14:01
11	11	Device011	2025-03-06 18:14:01

Full Function Dependency : **Sync_Id** → User_Id, Device_Id,
LastSyncAt Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

12. Transactions Table:

Transaction_Id	User_Id	Transaction_Date	Status
1	1	2025-03-06 19:01:38	Success
2	2	2025-03-06 19:01:38	Pending
4	4	2025-03-06 19:01:38	Success
5	5	2025-03-06 19:01:38	Pending
6	6	2025-03-06 19:01:38	Failed
7	7	2025-03-06 19:01:38	Success
8	8	2025-03-06 19:01:38	Success
9	9	2025-03-06 19:01:38	Pending
10	10	2025-03-06 19:01:38	Failed
11	11	2025-03-06 19:01:38	Success
12	1	2025-04-01 07:12:09	Success

Full Function Dependency : **Transaction_Id** → User_Id, Transaction_Date, Status.
Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

13. PasswordManager Table:

Password_Id	User_Id	Encrypted_Password	CreadAt
1	1	encryptedpass1	2025-03-06 18:12:22
2	2	encryptedpass2	2025-03-06 18:12:22
4	4	encryptedpass4	2025-03-06 18:12:22
5	5	encryptedpass5	2025-03-06 18:12:22
6	6	encryptedpass6	2025-03-06 18:12:22
7	7	encryptedpass7	2025-03-06 18:12:22
8	8	encryptedpass8	2025-03-06 18:12:22
9	9	encryptedpass9	2025-03-06 18:12:22
10	10	encryptedpass10	2025-03-06 18:12:22
11	11	encryptedpass11	2025-03-06 18:12:22
12	1	oldpassword1	2023-03-01 10:00:00
13	2	oldpassword2	2023-02-15 12:30:00

Full Function Dependency : **Password_Id** → User_Id, Encrypted_Password, CreatedAt.

Atomic Attributes ⇒ YES

Partial Dependency ⇒ NO

Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections).

14. Users Table:

User_Id	User_Name	Email	Password
1	Vineet Sahoo	9998887776@user.com	updatedpassword
2	Saumye Singh	saumye@example.com	hashedpassword2
3	Aarav Mehta	aarav@example.com	hashedpassword3
4	Priya Sharma	priya@example.com	updatedpassword
5	Rohan Verma	rohan@example.com	newhashedpassword
6	Ananya Roy	ananya@example.com	hashedpassword6
7	Kunal Das	kunal@example.com	updatedpassword
8	Shreya Iyer	shreya@example.com	updatedpassword
9	Rahul Nair	rahul@example.com	hashedpassword9
10	Neha Kapoor	neha@example.com	hashedpassword10
11	Arjun Desai	arjun@example.com	Updatedpassword

Full Function Dependency : **User_Id** → User_Name, Email,
Password. Atomic Attributes ⇒ YES
Partial Dependency ⇒ NO
Transitive Dependency ⇒ NO Join/Multivalued Dependency ⇒ NO

> 1NF - First Normal Form : **Passed**

- Every cell contains only **one value** (no repeating groups or sets).
- The attributes are atomic — no lists, arrays, or nested relations.

> 2NF – Second Normal Form : **Passed**

- Be in 1NF.
- Eliminate **partial dependencies** (only applies to **composite primary keys**).

> 3NF – Third Normal Form : **Passed**

- Be in 2NF.
- Eliminate **transitive dependencies** — where a non-key attribute depends on another non-key attribute.

> BCNF – Boyce-Codd Normal Form : **Passed**

- Handles cases where **candidate keys** cause anomalies not addressed by 3NF

> 4NF – Fourth Normal Form : **Passed**

- Be in BCNF.
- Eliminate **multivalued dependencies**.

> 5NF – Fifth Normal Form : **Passed**

- It is in **4NF**.

It cannot be **non-losslessly decomposed** into **two or more** smaller tables **based on join dependencies**, unless the decomposition is **trivial** (i.e., the table is itself a join of those projections