

NORMALIZATION

Travel Vendor Table:

FD1: VendorID → VendorName, InvoiceNo, VendorEmail, PhoneNo, VendorCategory

- **Step 1:** Primary key? Yes, VendorID
 - **1NF Complete**
- **Step 2:** 2NF test. Any partial dependency? No
 - **2NF Complete**
- **Step 3:** 3NF test. Any transitive dependency? No
 - **3NF Complete**
- **Step 4:** BCNF test. Are any determinants not candidate keys? No
- **Normalize to BCNF result:**
 - **R1:** (VendorID, VendorName, InvoiceNo, VendorEmail, PhoneNo, VendorCategory)

Expense Record Table:

FD1: ExpenseID → ExpenseDate, ExpenseAmt, ExpenseCategory, CategoryMaxLimit, VendorID, TravelRequestID

FD2: ExpenseCategory → CategoryMaxLimit (Each ExpenseCategory is associated with a fixed CategoryMaxLimit)

- **Step 1:** Primary key? Yes, ExpenseID
 - **1NF Complete**
- **Step 2:** 2NF test. Any partial dependency? No
 - **2NF Complete**
- **Step 3:** 3NF test. Any transitive dependency? Yes,
 - ExpenseCategory → CategoryMaxLimit
 - Splitting:
 - R1(ExpenseID, ExpenseDate, ExpenseAmt, ExpenseCategory, VendorID, TravelRequestID)
 - R2(ExpenseCategory, CategoryMaxLimit)
 - **3NF Complete**
- **Step 4:** BCNF test. Are any determinants not candidate keys? No
- **Normalize to BCNF result:**
 - **R1:** (ExpenseID, ExpenseDate, ExpenseAmt, ExpenseCategory, VendorID, TravelRequestID)
 - **R2:** (ExpenseCategory, CategoryMaxLimit)

Receipts Table:

FD1: ReceiptNo → UploadDate, UploadFileNo, TotalAmt, ExpenseID

- **Step 1:** Primary key? Yes, ReceiptNo
 - **1NF Complete**

- **Step 2:** 2NF test. Any partial dependency? No
 - **2NF Complete**
- **Step 3:** 3NF test. Any transitive dependency? No
 - **3NF Complete**
- **Step 4:** BCNF test. Are any determinants not candidate keys? No
- **Normalize to BCNF result:**
 - **R1:** (ReceiptNo, UploadDate, UploadFileNo, TotalAmt, ExpenseID)

Payment_Record Table:

FD1: PaymentNo → Amount, PaymentRecordDate, PaymentType, ExpenseID

- **Step 1:** Primary key? Yes, PaymentNo
 - **1NF Complete**
- **Step 2:** 2NF test. Any partial dependency? No
 - **2NF Complete**
- **Step 3:** 3NF test. Any transitive dependency? No
 - **3NF Complete**
- **Step 4:** BCNF test. Are any determinants not candidate keys? No
- **Normalize to BCNF result:**
 - **R1:** (PaymentNo, Amount, PaymentRecordDate, PaymentType, ExpenseID)

Department Table:

FD1: DepartmentID → DeptName, Location

- **Step 1:** Primary Key? Yes, DepartmentID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No
 - **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:** (DepartmentID, DeptName, Location)

Staff Table:

FD1: StaffID → StaffName, PhoneNo, StaffEmail, DepartmentID

- **Step 1:** Primary Key? Yes, StaffID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No

- **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:**(StaffID,StaffName,PhoneNo,StaffEmail,DepartmentID)

Auditor Table:

FD1: StaffID → StaffName, PhoneNo, StaffEmail

- **Step 1:** Primary Key? Yes, StaffID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No
 - **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:** (StaffID, StaffName, PhoneNo, StaffEmail)

Employee Table:

FD1: StaffID → StaffName, PhoneNo, StaffEmail

- **Step 1:** Primary Key? Yes, StaffID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No
 - **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:**(StaffID,StaffName,PhoneNo,StaffEmail)

Travel_Request Table:

FD1: TravelRequestID → Destination, DepartureDate, ReturnDate, EstimatedCost, SubmissionDate, StaffID

- **Step 1:** Primary Key? Yes, TravelRequestID

- **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No
 - **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:** (TravelRequestID, Destination, DepartureDate, ReturnDate, EstimatedCost, SubmissionDate, StaffID)

Reimbursement Request Table:

FD1: ReimbursementID → Amount, ReimbursementRequestDate, AmountPaid, PaymentStatus, TravelRequestID, StaffID

FD2: TravelRequestID → StaffID

- **Step 1:** Primary Key? ReimbursementID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No
 - **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? Yes
 - FD1: (ReimbursementID , Amount, ReimbursementRequestDate, AmountPaid, PaymentStatus, TravelRequestID, StaffID)
 - FD2: (TravelRequestID ,StaffID)
 - Splitting :
 - R1: (ReimbursementID , Amount, ReimbursementRequestDate, AmountPaid, PaymentStatus, TravelRequestID)
 - R2: (TravelRequestID , StaffID)
 - **3NF complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relations:**
 - **R1:** (ReimbursementID, Amount, ReimbursementRequestDate, AmountPaid, PaymentStatus, TravelRequestID)
 - **R2:** (TravelRequestID, StaffID)

Approval Track Table:

FD1: ApprovalID → ApprovalStatus, ApprovalDate, ApprovalComments, StaffID (fk)

- **Step 1:** Primary Key? ApprovalID
 - **1NF Complete**
- **Step 2:** 2NF Partial-key dependencies? No

- **2NF Complete**
- **Step 3:** 3NF Transitive dependencies? No
 - **3NF Complete**
- **Step 4:** BCNF Non-candidate Keys? No
 - **BCNF Complete**
- **Relation:**
 - **R1:** (ApprovalID, ApprovalStatus, ApprovalDate, ApprovalComments, StaffID(fk))