Patient — Patient_ID, P_Name, Age, Gender, Appointment Type, Doctor_ID, Disease, Contact, Address, Blood_Group

Schedules Appointment (1 : N)

Appointment — Appointment No, P_ID, Doctor_ID, Date, Time

Attended by (N : 1)

Doctor — Speciality, Gender, Address, Contact, Doctor Name, E_ID, Dept_ID, Doctor ID

ISA — Intern, Visiting, Specialists, Head Doctor

Checks (1 : N)

Associated with (N : 1)

Department — Dept_ID, Dept_Name, Description

Records — P_ID, Diagnosis, Doctor_ID, Treatment, Record_ID, Bill No., Date of Discharge, Date of Admission

Maintains (N : M)

Front Desk Staff — E_ID, E_Name, Duty

Employees — Employee_ID, E_Name, Gender, Contact, Position, Address, Salary

issues (M : N)

ISA

Nurse — Nurse_Name, Nurse_ID, E_ID, Duty, Doctor_ID, Dept_ID

Manages (1 : N)

Admitted Patient — Admission_ID, P_ID, Room No., Date_of_Admission, Date_of_Discharge, Doctor_ID

Decides (1 : 1)

Lab Report — Lab Report No., P_ID, Results, Date, Diagnosis Test Name, Doctor_ID, Doctor Name, Test Fees

Tracking Expenses (M : N)

Monthly Expenditure — Expenditure_ID, Amount, Dept_ID, Date, Description

Inventory Management (M : N)

Inventory — Supplier_Name, Inventory_ID, Quantity, Item Code, Dept_ID, Item Name, Expiry Date, Unit Price, Last Updated, Total Value

Admitted to (N : 1)

Room — Room No, Room Type

Undergoes Surgery (1 : 1)

Take Care of (1 : N)

Patient not Admitted

Issued to (1 : 1)

Bill — P_ID, Bill No., Advance, Lab_Charges, Bill_Charges, Medical_Insurance, Room_Charges, Operation_Charges, Medicine_Charges

Admitted to (1 : N)

Surgery_Patient — Surgery_Patient_ID, Admission_ID, Record_ID, Description, Surgery Time, Surgery Date, Room No., Emergency Contact_ID

Attends (N : 1)

Surgery Emergency Link (1 : N)

Emergency Contact Person — R_ID, P_ID, Name, Contact No., Address

Patient

Patient_ID	VARCHAR(10)
P_Name	VARCHAR(30)
Age	INT
Gender	CHAR
Contact	DECIMAL(10)
Address	VARCHAR(50)
Disease	VARCHAR(20)
Blood Group	VARCHAR(5)
Doctor_ID	VARCHAR(10)
Appointment Type	VARCHAR(100)

Employees

Employee_ID	VARCHAR(10)
E_Name	VARCHAR(30)
Gender	CHAR
Position	VARCHAR(30)
Contact	DECIMAL(10)
Address	VARCHAR(50)
Salary	INT

Lab Report

Lab Report No.	INT
P_ID	VARCHAR(10)
Doctor_ID	VARCHAR(10)
Doctor Name	VARCHAR(30)
Date	DATE
Diagnosis Test Name	VARCHAR(50)
Results	VARCHAR(100)
Test FEES	INT

Head Doctor

Doctor_ID	VARCHAR(10)
Department_ID	VARCHAR(10)

Appointment

Appointment_No.	VARCHAR(10)
P_ID	VARCHAR(10)
Doctor_ID	VARCHAR(10)
Date of Appointment	DATE
Time of Appointment	TIME

Admitted_Patient

Admission_ID	VARCHAR(10)
P_ID	VARCHAR(10)
Room No.	VARCHAR(4)
Date of Admission	DATE
Date of Discharge	DATE

Front Desk Staff

Employee_ID	VARCHAR(10)
E_Name	VARCHAR(20)
Duty	VARCHAR(20)

BILL

Bill No.	VARCHAR(10)
P_ID	VARCHAR(10)
Advance	DECIMAL
Lab Charges	DECIMAL
Room Charges	DECIMAL
Medicine Charges	DECIMAL
Operation Charges	DECIMAL
Bill Charges	DECIMAL
Medical Insurance	CHAR(50)

Room

Room No.	VARCHAR(4)
Room Type	VARCHAR(20)

Doctors

Doctor_ID	VARCHAR(10)
Doctor Name	VARCHAR(30)
Employee_ID	VARCHAR(10)
Department_ID	VARCHAR(10)
Gender	CHAR
Contact	DECIMAL(10)
Address	VARCHAR(50)
Speciality	VARCHAR(20)

Nurse

Nurse_ID	VARCHAR(10)
Nurse Name	VARCHAR(20)
Employee_ID	VARCHAR(10)
Department_ID	VARCHAR(10)
Duty	VARCHAR(50)
Doctor ID	VARCHAR(10)

Department

Department_ID	VARCHAR(10)
Dept_Name	VARCHAR(30)
Description	VARCHAR(100)

Record

Record_ID	VARCHAR(10)
P_ID	VARCHAR(10)
Diagnosis	VARCHAR(30)
Treatment	VARCHAR(30)
Doctor_ID	VARCHAR(10)
Date of Admission	DATE
Date of Discharge	DATE
Bill No	VARCHAR(10)

Inventory

Inventory_ID	VARCHAR(10)
Item Name	VARCHAR(20)
Item Code	INT
Quantity	INT
Unit Price	INT
Total Value	INT
Supplier_Name	VARCHAR(20)
Expiry Date	DATE
Last Updated	DATE
Department_ID	VARCHAR(10)

Monthly Expenditure

Expenditure_ID	VARCHAR(10)
Amount	INT
Description	VARCHAR(100)
Department_ID	VARCHAR(10)
Date	DATE

Surgery_Patient

Surgery_Patient_ID	VARCHAR(10)
Admission_ID	VARCHAR(10)
Description	VARCHAR(100)
Record_ID	VARCHAR(10)
Emergency Contact_ID	VARCHAR(10)
Room No.	VARCHAR(4)
Surgery Date	DATE
Surgery Time	TIME

Emergency Contact Person

R_ID	VARCHAR(10)
P_ID	VARCHAR(10)
Name	VARCHAR(20)
Contact No.	INT
Address	VARCHAR(50)

TABLE	FUNCTIONAL DEPENDENCIES	BCNF	CONVERSION TO BCNF/KEY
Patient	patient_ID -> P_Name patient_ID -> Age patient_ID -> Gender patient_ID -> Contact patient_ID -> Address patient_ID -> Disease patient_ID -> Blood Group patient_ID -> Appointment_Type	☑	Key: patient_ID
Appointment	Appointment_No -> P_ID Appointment_No-> Doctor_ID Appointment_No-> Date_of_App Appointment_No -> Time_of_App	☑	Key: Appointment_No
Employee	Employee_ID-> E_Name Employee_ID-> Gender Employee_ID-> Contact Employee_ID-> Address Employee_ID-> Salary Employee_ID-> Position	☑	Key: Employee_ID
Lab Report	Lab_Report_No. -> P_ID Lab_Report_No. -> D_ID Lab_Report_No. -> Doctor Name Lab_Report_No. -> Date Lab_Report_No. -> Diagnosis Test Name Lab_Report_No. -> Results Lab_Report_No. -> Test FEES	☑	Key: Lab_report_No.
Patient Admitted	Admission_ID-> P_ID Admission_ID-> Room No. Admission_ID-> Date of Admission Admission_ID-> Date of Discharge	☑	Key: Admission_ID
Doctor	Doctor_ID -> Doctor Name Doctor_ID -> Gender Doctor_ID -> Contact Doctor_ID -> Address Doctor_ID -> Speciality Doctor_ID -> Department¬_ID Doctor_ID -> Employee_ID	☑	Key: Doctor_ID
Nurse	Nurse_ID -> Nurse Name Nurse_ID -> Contact Nurse_ID -> Duty Nurse_ID -> Employee_ID Nurse_ID -> D_ID Nurse_ID -> Doctor_ID	☑	Key: Nurse_ID
Front Desk Staff	Employee_ID -> E_Name Employee_ID -> Duty	☑	Key: Employee_ID
Record	Record_No. -> Diagnosis Record_No. -> Treatment Record_No. -> P_ID Record_No. -> Doctor_ID Record_No. -> Date of Admission Record_No. -> Date of Discharge	☑	Key: Record_No

	Record_No. -> Bill No.		
Room	Room_No. -> Room Type	☑	Key: Room_No.
Bill	Bill_No -> Advance Bill_No -> Lab Charges Bill_No -> Room Charges Bill_No -> Medicine Charges Bill_No -> Operation Charges Bill_No -> Bill Charges Bill_No -> Medical Insurance	☑	Key: Bill_No
Surgery Patient	Surgery_Patient_ID -> Admission_ID Surgery_Patient_ID -> Surgery Date Surgery_Patient_ID -> Surgery Time Surgery_Patient_ID -> Description Surgery_Patient_ID -> Room_No. Surgery_Patient_ID -> Record_No. Surgery_Patient_ID -> Emergency Contact	☑	Key: Surgery_Patient_ID
Department	Department_ID ->Name Department_ID -> Description	☑	Key: Department_ID
Monthly Expenditure	Exp.ID. -> Date Exp.ID. -> Amount Exp.ID. -> Description	☑	Key: Exp.ID
Emergency Contact Person	R_ID -> Name R_ID -> Contact No. R_ID -> Address R_ID-> P_ID	☑	Key: R_ID
Inventory	Inventory_ID -> Item Name Inventory_ID -> Item Code Inventory_ID -> Quantity Inventory_ID -> Unit Price Inventory_ID -> Total Value Inventory_ID -> Supplier Name Inventory_ID -> Expiry Date Inventory_ID -> Last update date Inventory_ID -> Department_ID Item_Code -> Item_Name Item_Code -> Quantity Item_Code -> Unit Price Item_Code -> Total Value Item_Code -> Supplier Name Item_Code -> Expiry Date Item_Code -> Last Update Item_Code -> Department_ID	☒	Key: Inventory_ID , Item_code
Head Doctor	Doctor_ID-> Department_ID	☑	Key: Doctor_ID

Proofs and Justifications

In BCNF

The Patient, Appointment, Lab Report, Patient Admitted, Doctor, Nurse, Front Desk Staff, Room, Record, Bill, Surgery_Patient, Department, Monthly Expenditure, Emergency Contact Person and Head Doctor are all in BCNF. This is because their primary keys are super keys, meaning that they uniquely determine all other attributes in the table.