TEAM-17

PROJECT PHASE-1

HOSPITAL MANAGEMENT SYSTEM DATBASE

1.THE TASK:

This hospital management system database is designed for hospitals and clinics to manage patient records, doctor appointments, treatments, billing, and prescriptions.

Doctors will use the system to manage patient treatment plans and medical records, nurses will track patient care, receptionists will handle appointments, and administrators will oversee billing and staff schedules. Patients can book appointments, view prescriptions, and check their medical history.

The users of this system will be hospital staff, including doctors, nurses, receptionists, and administrators, as well as patients.

2.DATABASE REQUIREMENTS:

Entity Types:-

- Department
  Attributes:
  - Department_Id(Key Attribute) (Datatype : INT)
  - HOD(Key Attribute) (Datatype : INT)
  - Dpt_Name (Datatype : VARCHAR(255))
  - No. of Doctors(Derived Attribute) (Datatype : INT)
- Doctor
  Attributes:
  - Doctor_Id(Key Attribute) (Datatype : INT)
  - Doctor_Name(Composite Attribute)
  - DOB (Datatype : date)
  - Gender (Datatype : VARCHAR(10))
  - Contact_No (Datatype : INT) (Only 10 digits)
  - Available_Time(Multivalued Attribute) (Datatype : time) (from - to)
  - Department_Id (Datatype : INT)
  - Supervisor_Id (Datatype : INT)
- Patient
  Attributes:
  - Patient_Id(Key Attribute) (Datatype : INT)
  - Patient_Name(Composite Attribute) (Datatype : VARCHAR(255))
  - Patient_DOB (Datatype : date)
  - Age(Derived Attribute) (Datatype : INT)
  - Contact_No (Datatype : INT) (Only 10 digits)

    - Address(Composite Attribute) (Datatype : VARCHAR(255))
    - Weight (Datatype : INT)
    - Problem(Multivalued Attribute) (Datatype : VARCHAR(255))
    - Emergency_Contact(Composite Attribute) (Datatype : INT) (Only 10 digits)
- Nurse
  Attributes:
    - Nurse_Id(Key Attribute) (Datatype : INT)
    - Nurse_Name(Composite Attribute) (Datatype : VARCHAR(255))
    - Department_Id (Datatype : INT)
    - Gender (Datatype : VARCHAR(10))
- Staff
  Attributes:
    - Staff_Name (Datatype : VARCHAR(255))
    - Staff_Id(Key Attribute) (Datatype : INT)
    - Role (Datatype : VARCHAR(255))
- Appointment
  Attributes:
    - Appointment_Id(Key Attribute) (Datatype : INT)
    - Doctor_Id (Datatype : INT)
    - Appointment_Time (Datatype : time)
    - Date (Datatype : date)
    - Patient_Id (Datatype : INT)
- Pharmacy
  Attributes:
    - Medicine_Name (Datatype : VARCHAR(255))
    - Medicine_Id(Key Attribute) (Datatype : INT)
    - Quantity_Available (Datatype : INT)
    - Price_per_unit (Datatype : DECIMAL(20,3))
    - Expiry_Date (Datatype : date)
- Lab
  Attributes:
    - Lab_Id (Datatype : INT)
    - Lab_Name (Datatype : VARCHAR(255))
    - Staff_Id (Datatype : INT)
    - Lab_Equipment(Multivalued Attribute) (Datatype : VARCHAR(255))
- Room
  Attributes:
    - Room_No(Key Attribute) (Datatype : INT)
    - Patient_Id(Multivalued Attribute) (Datatype : INT)
    - Check_in (Datatype : time)

- Check_out (Datatype : time)
- Staff_Id(Multivalued Attribute) (Datatype : INT)

Weak Entity Types

- Prescription Attributes:
  - Prescription_Id (Partial key) (Datatype : INT)
  - Doctor_Id (Datatype : INT)
  - Patient_Id (Datatype : INT)
  - Medicines_prescribed(Multivalued attribute) (Datatype : VARCHAR(255))
  - Tests_prescribed(Multivalued attribute) (Datatype : VARCHAR(255))
- Invoice
  Attributes:
  - Patient_Id (Datatype : INT)
  - Invoice_Id (Partial key) (Datatype : INT)
  - Service_description (Multivalued and Composite attribute) (Datatype : VARCHAR(255))
  - Total_amount (Datatype : DECIMAL(20,3))
- Treatment
  Attributes:
  - Patient_Id (Datatype : INT)
  - Current_condition (Datatype : VARCHAR(255)) ○ Review_date (Datatype : date)
  - Treatment_details (Multivalued attributes) (Datatype : VARCHAR(255))
- Insurance
  Attributes:
  - Patient_id (Datatype : INT)
  - Insurance_id (Partial key) (Datatype : INT)
  - Insurance_name (Datatype : VARCHAR(255))
  - Description (Datatype : VARCHAR(255))
  - Amount_given (Datatype : DECIMAL(20,3))

RELATIONSHIPS:

- **CONSULTS**:
  Degree: 2
  Entities participating: Patient,Doctor
  Description: Many patients can consult many doctors Cardinality
  Ratio - M:N Min max constraints: For Patient-(1,N) For Doctor-
  (0,M)
- **SCHEDULES:**
  Degree: 2
  Entities participating: Patient, Appointment

Description: Patient schedules multiple appointments Cardinality Ratio - N:1 Min max constraints:

For Patient-(1,N)

For Appointment- (1,1)

- **TREATS:**

Degree: 2

Entities participating: Nurse,Patient

Description: Nurse treats Patient Cardinality Ratio - N:1 Min max constraints:

For Nurse -(0,N)

For Patient- (1,1)

- **SPECIALIZED:**

Degree: 2

Entities participating: Doctor, Department

Description: Doctor Specialized in a Department Cardinality Ratio - N:1 Min max constraints: For Doctor- (1,1) For Department-(1,N)

- **PRESCRIBES:**

Degree: 3

Entities participating: Doctor, prescription, patient

Description: Doctor prescribes prescription to a patient Cardinality Ratio- 1:N:1 Min max constraints: For Doctor-(1,N)

For Prescription-(1,1)

For Patient- (1,M)

- **SURGERY:**

Degree: 4

Entities participating: Doctor, Patient, Room, Nurse

Description: Doctor performs surgery on a patient assisted by a Nurse in a Room Cardinality Ratio- M:1:1:N Min max constraints:

for Doctor- (1,N) For Patient -(1,1)

For Room- (1,1) For Nurse- (1,M)

- **SUPERVISES:**

Degree: 2

Entities participating: Doctor,Doctor

Description: A supervisor can supervise many doctors, a supervisee has atmost one supervisor Cardinality Ratio- 1:N Min max constraints:

For supervisor- (0,M)

For supervisee- (0,1)

- **ASSIGNED_TO:**

Degree: 2
Entities Participating: Nurse,Department
Description:Nurse Working in a Department
Cardinality Ratio- N:1 Min max consraints: For Nurse-(1,1) For Department-(1,N)

- **WORKS_IN:**
  Degree: 2
  Entities Participating: Staff,Lab
  Description: Staff Working in a Lab
  Cardinality Ratio-N:1 Min max constraints:
  For Staff-(1,1)
  For Lab-(1,N)
- **ADMITTED_TO:**
  Degree: 2
  Entities Participating: Patient,Room
  Description: Patient Admitted to the Room
  Cardinality Ratio-N:1 Min max Constraints: For Patient –(0,1)
  For Room-(0,N)
- **MANAGES:**
  Degree: 2
  Entities Participating: Staff,Room
  Description: Staff Managing the Room
  Cardinality Ratio-M:N
  Min max Constraits For
  Staff-(0,N) For Room-(1,M)
- **ISSUED_TO:**
  Degree- 2
  Entities Participating:Invoice,Patient
  Description: Invoice Issued to a Patient
  Cardinality Ratio- N:1 Min max Constraints: For Invoice-(1,1) For Patient-(1,N)
- **UNDERGOES:**
  Degree: 2
  Entities Participating: Patient,Treatment
  Description: Patient Undergoes Treatment
  Cardinality Ratio-(1:1) Min max Constraints: For Patient: (1,1) For Treatment: (1,1)
- **ENROLLED_IN:**
  Degree: 2
  Entities Participating: Patient,Insurance

Description: Patient Enrolled in one or more Insurance Cardinality Ratio-(N:1) Min max Constraints: For Patient: (0,N)
For Insurance: (1,1)

SubClass:

Doctor and Nurse are Subclass of Staff.

3.FUNCTIONAL REQUIREMENTS:

1. Retrieval:

(a) Query Functions:

- i. Selection Query:
  - Example: "Retrieve all patients who have an appointment with Dr. Smith on a specific date."
  - This query retrieves complete data tuples of patients based on a specific doctor and appointment date.
- ii. Projection Query:
  - Example: "List the names and contact numbers of all doctors in the Cardiology department."
  - This query projects only specific attributes (doctor names and contact numbers) from the Doctor entity based on department.
- iii. Aggregate Function (SUM, MAX, MIN, AVG):
  - Example: "Find the average number of patients treated per day by each doctor in the last month." ○ This query calculates the average patients per doctor per day.
- iv. Search (Partial Text Match):
  - Example: "Search for all patients whose names contain 'John'." ○ This query performs a partial text match on patient names.

(b) Analysis Reports:

- i. Report 1:
  - Example: "Generate a report showing the number of surgeries performed by each doctor along with the total hospital revenue generated from those surgeries."
  - This report involves a join between Doctor, Surgery, and Invoice entities to relate surgeries to doctors and revenue.
- ii. Report 2:
  - Example: "Generate a report of patients with their doctors and total expenses for treatments exceeding $5000."

- This report requires a join between Patient, Doctor, and Invoice to find high-cost treatments and link them to patients and their doctors.

2. Modification:

(a) Insertion Operation:

- Example: "Insert a new patient's record, ensuring that the contact number and emergency contact are not the same."
- This operation involves checking for integrity constraints such as unique patient IDs and validating that contact and emergency contact numbers are different.

(b) Update Operation:

- Example: "Update the room assignment of a patient after surgery."
- This update will modify the Room entity by changing the Room_No associated with a patient's check-in.

(c) Delete Operation:

- Example: "Delete the record of a patient who has been discharged for more than 5 years."
- This deletion will ensure that records of inactive patients are removed while maintaining integrity constraints for related entities like Invoice and Prescription.

These functional requirements cover selection, projection, aggregation, search, and modification operations, as well as analysis reports that convey meaningful insights across related entities.

ASSUMPTIONS:

- For Every Department there is a department head called HOD.
- In the Entity Doctor Doctor_Name Composites of (Fname,Mname,Lname).
- The Doctor can have one or more shifts in a day.
- In the Entity Patient Patient_Name Composites of (Fname,Mname,Lname).
- In the Entity Patient Emergeny_Contact Composites of(Name,Phone_no)
- A patient can consult one or more Doctors
- A doctor can attend zero or any number of patients
- A patient can schedule multiple appointments
- For a Patient exactly one nurse is assigned.A nurse can treat many patients
- A Department can one or more Doctors.A doctor can specialize in exact one department.
- A Department has atleast one nurse and nurse worksin exactly one department.