**Scenario:**

You have been tasked with designing a database for a **Hospital Management System**. The hospital needs to track information about its **people**, **staff roles**, **departments**, **patient treatments**, and **appointments**. Below are the detailed requirements:

1. **People & Roles**

   o **Person** is a superclass representing anyone associated with the hospital (staff or patient).

   o **Staff** is a subclass of Person, with attributes common to all employees (e.g., EmployeeID, HireDate).

     ▪ **Doctor** and **Nurse** are specializations of Staff.

       ▪ **Doctor** has additional attributes (Specialty, LicenseNumber).

       ▪ **Nurse** has additional attributes (CertificationLevel).

     ▪ **AdministrativeStaff** is another subclass of Staff (e.g., Receptionist, BillingClerk).

   o **Patient** is another subclass of Person, with attributes (PatientID, AdmissionDate).

   o A Person **can be both** a Patient and a Staff member (overlapping specialization), since a staff member might be admitted as a patient.

2. **Departments**

   o The hospital is organized into **Departments** (Cardiology, Pediatrics, Radiology, etc.).

   o Each **Department** has one **HeadOfDepartment**, who is always a Doctor (partial participation: not every Doctor is a head).

   o Staff (Doctors and Nurses) **work in** exactly one Department (total participation for Staff).

3. **Appointments**

   o A **Patient** may have zero or more **Appointments**.

   o Each **Appointment** is scheduled with exactly one **Doctor** and occurs on a specific Date/Time.

   o A Doctor may have multiple Appointments (1:N relationship between Doctor and Appointment).

4. **Wards & Inpatients/Outpatients**

   o **Patient** is further specialized into **Inpatient** and **Outpatient** (disjoint specialization).

      ▪ **Inpatient** has additional attributes (WardNumber, BedNumber).

      ▪ **Outpatient** has additional attributes (VisitReason, NextAppointmentDate).

   o Every Patient **must be** either an Inpatient or an Outpatient (total participation).

5. **Treatments & Medical Records**

   o Each **Inpatient** has one or more **MedicalRecords** while admitted.

   o Each **MedicalRecord** details the Date, Diagnosis, TreatmentPlan, and is associated with exactly one Inpatient.

   o **Outpatients** may also have MedicalRecords (optional), but those records are linked to a specific Outpatient Visit.

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**Tasks:**

1. **Draw an EER Diagram** representing the above scenario, including:

   o **Superclass/Subclass hierarchies** for Person → Staff → {Doctor, Nurse, AdministrativeStaff} and Person → Patient → {Inpatient, Outpatient}.

   o **Overlapping constraint** between Staff and Patient (a Person can be both).

   o **Disjoint constraint** between Inpatient and Outpatient.

   o **Total participation** of Staff in Department, and Patient in {Inpatient, Outpatient}.

   o **Partial participation** of Doctor in HeadOfDepartment role.

2. **Identify & Label** in your diagram:

   o **Primary keys** for each entity (e.g., PersonID, EmployeeID, PatientID).

   o **Foreign key relationships** (e.g., Appointment → Doctor, MedicalRecord → Inpatient).

   o **Participation constraints** (double vs. single lines).

   o **Disjoint vs. overlapping** specialization symbols.

3. **Convert the EER Diagram into a Relational Schema** using an appropriate mapping strategy:

- o    Specify tables for each **superclass** and **subclass**.

- o    Show how you handle **overlapping specialization** (Staff/Patient).

- o    Include **foreign keys** for relationships (e.g., DepartmentID in Staff, DoctorID in Appointment, PatientID in MedicalRecord).

- o    Provide CREATE TABLE statements for all relations, clearly marking primary keys, foreign keys, and additional constraints (e.g., NOT NULL for total participation).

4.  **Explain how you would enforce** the following in your relational schema:

- o    **Disjointness** between Inpatient and Outpatient (e.g., via a discriminator column or separate tables).

- o    **Total participation** of Patient in exactly one of Inpatient/Outpatient.

- o    **Partial participation** of Doctor as HeadOfDepartment.

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This question assesses your ability to model complex hierarchies, specialization/generalization, and participation constraints in an EER context—and to implement them as a relational schema.

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