ERD Activity: Hospital Management System

Scenario:

A hospital wants to develop a database to manage **patients**, **doctors**, **appointments**, **wards**, **nurses**, and **medications**. The system should track relationships between these entities, ensuring proper cardinality.

Entities and Attributes

- **Patient** (Patient_ID (PK), First_Name, Last_Name, DOB, Gender, Phone, Address, Ward_ID (FK))
    - A patient can have multiple appointments.
    - A patient can be admitted to only one ward at a time.
- **Doctor** (Doctor_ID (PK), First_Name, Last_Name, Specialization, Phone, Email)
    - A doctor can have multiple appointments.
    - A doctor can prescribe multiple medications.
- **Appointment** (Appointment_ID (PK), Patient_ID (FK), Doctor_ID (FK), Date, Time, Diagnosis, Status)
    - Each appointment is for one patient and one doctor.
- **Ward** (Ward_ID (PK), Ward_Name, Capacity, Head_Nurse_ID (FK))
    - A ward can have multiple patients.
    - Each ward has one assigned head nurse.
- **Nurse** (Nurse_ID (PK), First_Name, Last_Name, Phone, Email, Ward_ID (FK))
    - A nurse can be the head of one ward.
- **Medication** (Medication_ID (PK), Name, Dosage, Side_Effects)
    - A medication can be prescribed to multiple patients.
- **Prescription** (Prescription_ID (PK), Patient_ID (FK), Doctor_ID (FK), Medication_ID (FK), Dosage, Start_Date, End_Date)
    - A patient can have multiple medications prescribed.
    - A doctor prescribes medications.

Relationships and Cardinality

1. **Patient & Appointment → 1:M** (One patient can have multiple appointments, but each appointment is for one patient).
2. **Doctor & Appointment → 1:M** (One doctor can have multiple appointments, but each appointment is assigned to only one doctor).
3. **Patient & Ward → 1:M** (A patient can be assigned to only one ward, but a ward can have multiple patients).
4. **Ward & Nurse → 1:1** (Each ward has one head nurse, and a nurse can head only one ward).
5. **Patient & Prescription → 1:M** (A patient can have multiple prescriptions, but each prescription is for one patient).

6. **Doctor & Prescription → 1:M** (A doctor can prescribe multiple medications, but each prescription is linked to only one doctor).
7. **Medication & Prescription → M:N** (A single medication can be prescribed to multiple patients, and a patient can be prescribed multiple medications).

Task:

1. **Design a Physical Data Model** based on the given entities and relationships.
2. Indicate **primary keys (PKs) and foreign keys (FKs)** in the diagram.
3. Properly label **cardinality** (1:1, 1:M, M:N).
4. **Explain your design choices**, focusing on why certain relationships have the assigned cardinality.
5. **Identify any weak entities** and explain their dependence on strong entities.

Criteria	Excellent (10 pts)	Good (7-9 pts)	Satisfactory (4-6 pts)	Needs Improvement (1-3 pts)	No Attempt (0 pts)
Entities & Attributes	All required entities are included with well-defined attributes, primary keys (PKs), and foreign keys (FKs).	Most entities and attributes are included; minor issues with PKs/FKs.	Some entities or attributes are missing; PKs/FKs not properly identified.	Several key entities are missing; attributes lack clarity; incorrect PKs/FKs.	No entities or attributes are defined.
Relationships & Cardinality	All relationships are correctly defined with proper cardinality (1:1, 1:M, M:N).	Most relationships are correctly defined, with minor mistakes in cardinality.	Some relationships are incorrect or missing; cardinality is unclear or incorrect.	Many relationships are incorrect or missing; little to no understanding of cardinality.	No relationships or cardinality are included.
Diagram Structure & Organization	ERD is clear, well-organized, and easy to read with properly labeled entities and relationships.	ERD is mostly clear and organized, but some labels or structures are confusing.	ERD is cluttered or difficult to read; relationships and entities are not well-aligned.	ERD lacks organization, making it difficult to understand.	No ERD is provided.
Primary Keys (PKs) & Foreign Keys (FKs)	All PKs and FKs are correctly placed and well-structured.	Most PKs and FKs are correctly placed, with minor mistakes.	Some PKs and FKs are missing or incorrectly placed.	Many PKs and FKs are incorrect or missing.	No PKs or FKs are included.
Explanation of Design Choices	Clear, detailed explanation of why entities, relationships, and cardinality were chosen.	Mostly clear explanation, with some minor gaps in reasoning.	Some explanation provided but lacks depth or misses key points.	Minimal explanation, with little justification for design choices.	No explanation provided.
Weak Entities	Identifies and	Identifies	Weak entities	Weak entities	No mention

Criteria	Excellent (10 pts)	Good (7-9 pts)	Satisfactory (4-6 pts)	Needs Improvement (1-3 pts)	No Attempt (0 pts)
& Justification	correctly explains weak entities with proper justification.	weak entities but with minor issues in explanation.	are mentioned but not properly explained.	are missing or incorrectly defined.	of weak entities.