

Part 1

Task 1.1)

A)

1. Superkeys:

EmpID - SSN

EmpID - Email

EmpID - SSN - Email

EmpID - Phone

EmpID - Name

EmpID - Phone - Name

2. Candidate keys:

SSN, Phone, SSN, EmpID

3. EmpID, since it's always unique, never null

4. No

5. They shouldn't, ultimately it depends on the company policy.

I personally think it would thwart the workflow in the company.

Database-wise "Phone" is a candidate key, thus it can't be duplicated

B)

1. One attribute, StudentID

2. StudentID is unique and never null, belongs to each individual student

3. No other candidate key

Task 1.2)

Student - No foreign keys

Professor - No foreign keys

Course - No foreign keys

Department - No foreign keys

Enrollment - StudentID (from Student), CourseID (from Course)

Part 2

Task 2.1)

1. Strong - Patients, Doctors, Departments

Weak - Appointments, Prescriptions, HospitalRooms

2. Simple attributes are not noted for convenience

Patients: PatientID(Unique), Name, Birthdate, Address(Composite), Insurance, Phone(Multivalued)

Doctors: DoctorID(Unique), Name, OfficeLocation, Phone, Specialization(Multivalued)

Departments: DeptCode(Unique), DeptName(Unique), DeptLocation

HospitalRooms: RoomNumber, DoctorID(Foreign Key), DeptCode(Foreign Key)

Appointments: PatientID(Foreign Key), DoctorID(Foreign Key), Purpose, Time, Notes, Date

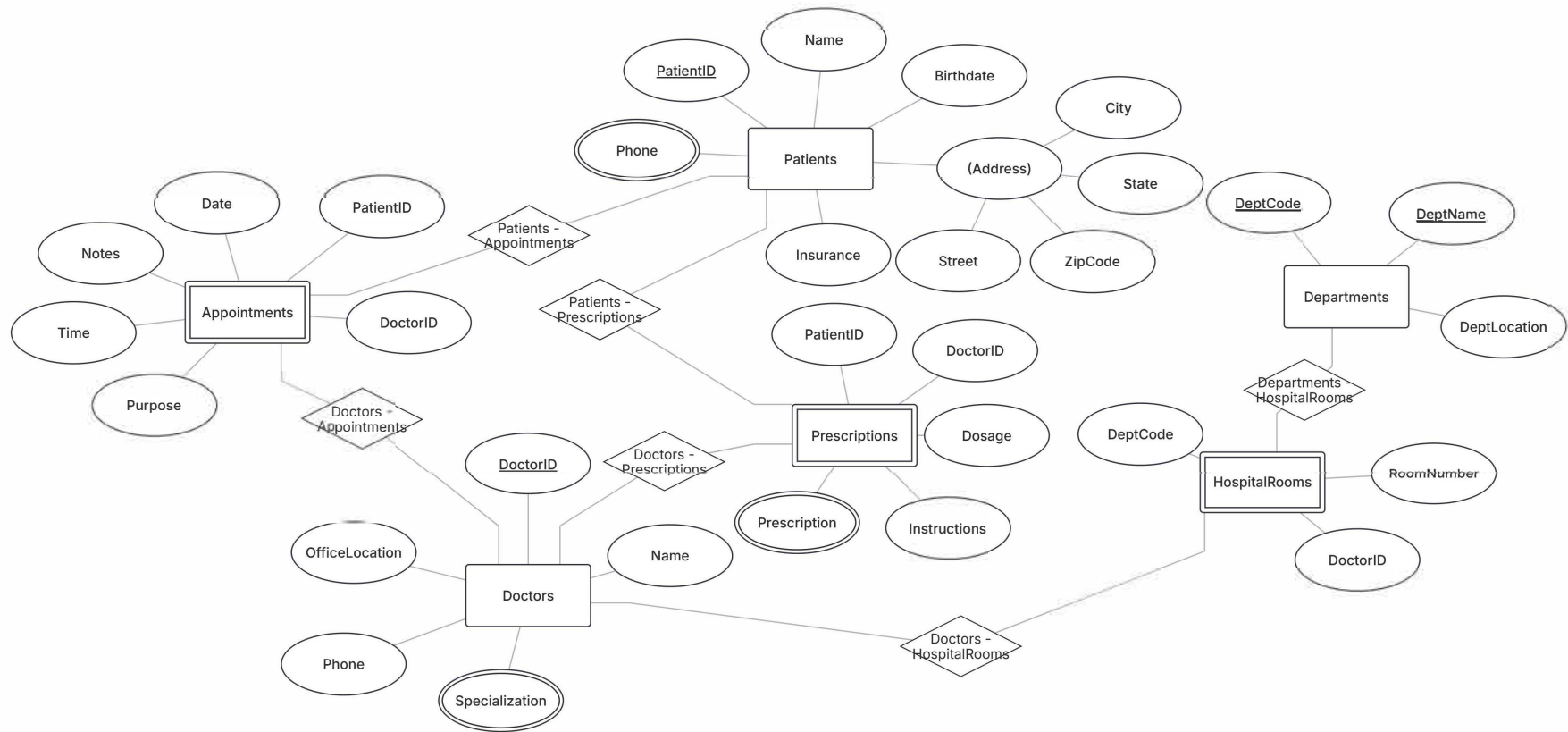
Prescriptions: PatientID(Foreign Key), DoctorID(Foreign Key), Dosage, Instructions, Prescription(Multivalued)

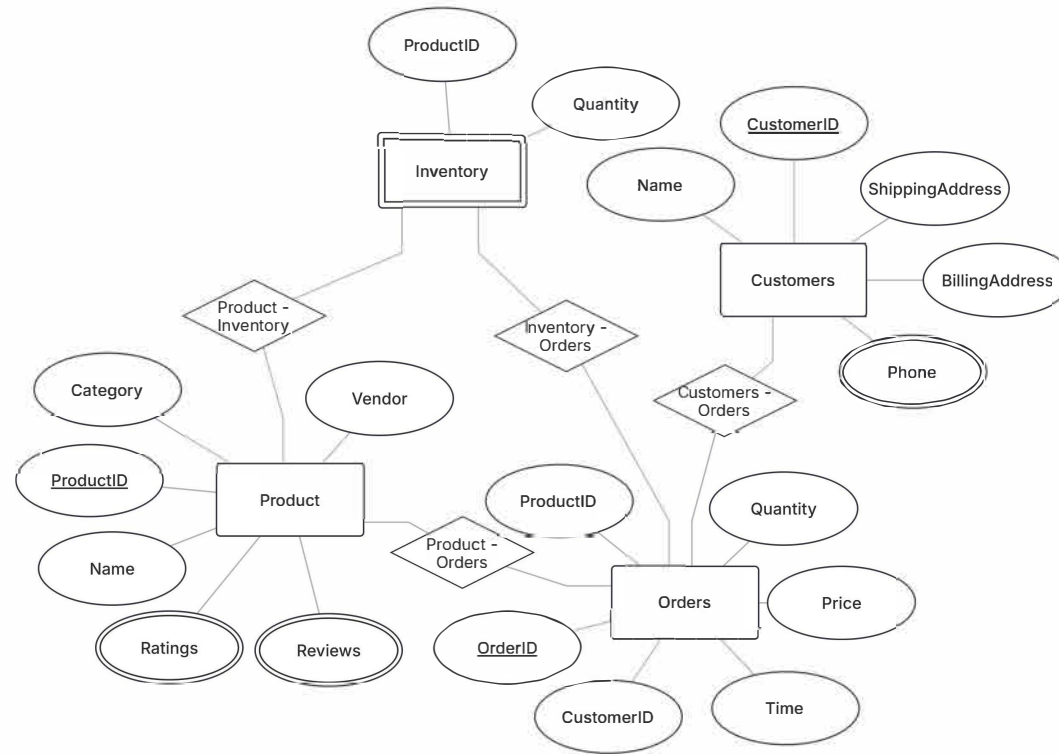
3. Patients-Appointments, Patients-Descriptions(1:N)

Doctors-Appointments, Doctors-Prescriptions, Doctors-HospitalRooms(1:N)

Departments-HospitalRooms(1:1)

4. Image embed





Part 4

Task 4.1)

1.

StudentID -> StudentName

StudentID -> StudentMajor

ProjectID -> ProjectTitle

ProjectID -> ProjectType

SupervisorID -> SupervisorName

SupervisorID -> SupervisorDept

StudentID -> Role

StudentID -> HoursWorked

ProjectID -> StartDate

ProjectID -> EndDate

2.

Redundancies could be ProjectID, ProjectType, ProjectTitle, SupervisorID, SupervisorName, SupervisorDept since they all will show up repeatedly on every StudentID row.

Update anomaly: You would have to change EndDate or StartDate on every row instead of one since the table is denormalized, which is computationally costly

Insert anomaly: You wouldn't be able to insert a student into the table if they're not a part of any project yet

Delete anomaly: If you delete a student who was the only member of a project in the table, you would delete the project itself

3. If any single column is multivalued it could violate the 1NF, also if a project has multiple supervisors and they're put in a list in a single cell that would also be a violation. I would fix it by normalizing the table and creating new joint tables

4. Primary key: StudentID, ProjectID

Partial dependencies:

StudentID -> StudentName

StudentID -> StudentMajor

ProjectID -> ProjectTitle

ProjectID -> ProjectType

ProjectID -> SupervisorID

ProjectID -> StartDate

ProjectID -> EndDate

5. Primary key: StudentID, ProjectID

Partial dependencies: See above

Remove partial dependencies by dividing the table into a bunch of smaller ones:

Students: StudentID, StudentName, StudentMajor, Role, HoursWorked

Projects: ProjectID, ProjectTitle, ProjectType, StartDate, EndDate

Supervisors: SupervisorID, SupervisorName, SupervisorDept

Task 4.2)

1. Primary key: TimeSlot

2. TimeSlot -> Building, Room, StudentID, InstructorID, CourseID

StudentID \rightarrow StudentMajor

InstructorID \rightarrow InstructorName

CourseID \rightarrow CourseName

3. Not in BCNF since for every functional dependency $A \rightarrow B$, A is not a superkey

4. Decompose into BCNF by dividing the table into separate tables similarly to previous task

Students(StudentID (PrimaryKey), StudentMajor)

Courses(CourseID (PrimaryKey), CourseName)

Instructors(InstructorID (PrimaryKey), InstructorName)

TimeSlot(Room, Building, CourseID, StudentID)

5. I don't think we lost anything here

Part 5

Task 5.1)

1. Image Embed

2. Image Embed

3. I could have had Budget be a sub entity of Clubs, but I decided on making a separate entity for convenience

4. Show me how much the Drama Club spent on the performance on february second.

What position is Mark on in the Carpentry Club?

Where and when will the SD club hold their meeting?

