

Part 1:

Task 1.1:

Relation A: Employee

1. List at least 6 different superkeys
Superkey - any combination of attributes that uniquely identifies each tuple
{EmpID}, {SSN}, {Email}, {Phone}, {EmpID, SSN}, {EmpID, Email}, {SSN, Phone}
2. Identify all candidate keys
Candidate key - a minimal superkey, that is, one from which no attribute can be removed without losing the uniqueness property
{EmpID}, {SSN}, {Email}, {Phone}
3. Which candidate key would you choose as primary key and why?
I will choose **EmpID** as primary key, because unique, the internal ID of the company does not change during operation, the integer format is effective for relationships between tables and it is simpler than SSN or other candidate keys, also it is not confidential information
4. Can two employees have the same phone number? Justify your answer based on the data shown
Based on the data provided, **no**. In the sample data, the Phone attribute is represented by unique values for each employee. And just like in the real world, each person has their own unique, inimitable phone number.

Relation B: Course Registration

1. Determine the minimum attributes needed for the primary key
To uniquely identify a registration record, we need:
StudentID – required, since multiple students may take the same course.
CourseCode – required, since a student can take multiple courses.
Section – required, since a course can have multiple sections.
Semester – required, since the same student may take the same course in different semesters.
Year – required, since “Fall 2023” and “Fall 2024” are different semesters.
Therefore, the **Primary Key = (StudentID, CourseCode, Section, Semester, Year)**
2. Explain why each attribute in your primary key is necessary
StudentID → identifies which student the registration belongs to. Without it, different students cannot be distinguished.
CourseCode → identifies which course is being taken. A student may take multiple courses.
Section → distinguishes different sections of the same course (e.g., taught by different instructors).
Semester → distinguishes when the student takes the course, since they can repeat it in different semesters.
Year → distinguishes semesters across years (e.g., Fall 2023 not equal Fall 2024).
If any of these attributes were removed, duplicate registrations violating the business rules could occur.
3. Identify any additional candidate keys (if they exist)

Additional Candidate Key can be (CourseCode, Section, Semester, Year) due to this uniquely identifies a course section in a semester/year, independent of students. This candidate key can be used to determine Credits, since credits are tied to a course section, not to individual students.

Task 1.2

1. Identify all foreign key relationships

Foreign Key: Attribute that references primary key of another relation

Student.AdvisorID to Professor.ProfID

Professor.Department to Department.DeptCode

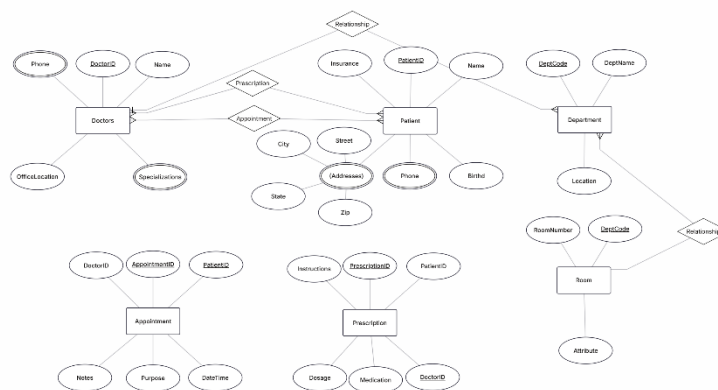
Department.ChairID to Professor.ProfID

Course.DepartmentCode to Department.DeptCode

Enrollment.StudentID to Student.StudentID

Enrollment.CourseID to Course.CourseID

Task 2.1



Task 2.2

OrderItem → is a weak entity because it cannot exist without Order and Product.

Its primary key is = (OrderID, ProductID).

The attributes (Quantity, PriceAtOrder) depend on this relationship.

