Part 1
Task 1.1

Relation A:
6 Superkeys: {EmpID}, {SSN}, {Email}, {Phone}, {EmpID, Name}, {SSN, Department}
Candidate keys: {EmpID}, {SSN}, {Email}, {Phone}
Primary key choice: EmpID
Same phone number?: No, each phone is unique in the given data.

Relation B:
Primary key: {StudentID, CourseCode, Section, Semester, Year}
Reasoning for attributes:
Student ID → identifies the student
CourseCode → identifies the course
Section → identifies the course
Semester + Year → distinguish the same course in different terms
Additional candidate keys: {CourseCode, Section, Semester, Year} (uniquely identifies Credits, but not students)

Task 1.2
Foreign key relationships:
Student.AdvisorID → Professor.ProfID
Student.Major → Deparment.DeptCode
Course.DepartmentCode → Department.DeptCode
Department.ChairID → Professor.ProfID
Enrollment.StudentID → Student.StudentID
Enrollment.CourseID → Course.CourseID

Part 2
Task 2.1
Strong: Patient, Doctor, Department, Room
Weak: Appointment, Prescription
Relationships:
Patient–Appointment–Doctor (M:N)
Doctor–Department (M:1)
Patient–Prescription–Doctor (M:N)
Room–Department (1:N)
Patient–Room (M:N if multiple stays)

Task 2.2: E-commerce
Entities: Customer, Order, Product, Category, Vendor, Inventory, Review, Address
Weak entity: OrderItem (depends on Order + Product)
M:N with attributes: Product–OrderItem–Order (needs qty, price)

Part 4
Task 4.1 (StudentProject)
FDs:
StudentID → StudentName, StudentMajor
ProjectID → ProjectTitle, ProjectType
SupervisorID → SupervisorName, SupervisorDept
(StudentID, ProjectID) → Role, HoursWorked, StartDate, EndDate

Primary Key: (StudentID, ProjectID)
2NF: Student, Project, Supervisor, StudentProject
3NF:

Student(StudentID, Name, Major)
Project(ProjectID, Title, Type)
Supervisor(SupervisorID, Name, Dept)
StudentProject(StudentID, ProjectID, Role, HoursWorked, StartDate, EndDate)

CourseSchedule
Primary Key: (StudentID, CourseID, TimeSlot)
FDs:
StudentID → StudentMajor
CourseID → CourseName
InstructorID → InstructorName
TimeSlot → Room, Building
Room → Building
(CourseID, TimeSlot) → InstructorID
Not in BCNF → Decompose

Part 5

Entities: Student, Club, Membership, Event, Officer, FacultyAdvisor, RoomReservation, Budget
ER → Relational Schema:
Student(StudentID, Name, Major)
Club(ClubID, Name, AdvisorID, Budget)
Membership(StudentID, ClubID, Role)
Event(EventID, ClubID, Date, Location)
Attendance(StudentID, EventID)
Officer(ClubID, StudentID, Position)
FacultyAdvisor(ProfID, ClubID)
RoomReservation(EventID, Room, Date)
Expense(ExpenseID, ClubID, Amount, Purpose)

Design Decision: Officer as separate entity vs. attribute in Membership → chose separate entity.

Queries:
– Find all students who are officers in the Computer Science Club
– List all events scheduled for next week with their room reservations
– Show total budget and expenses for each club