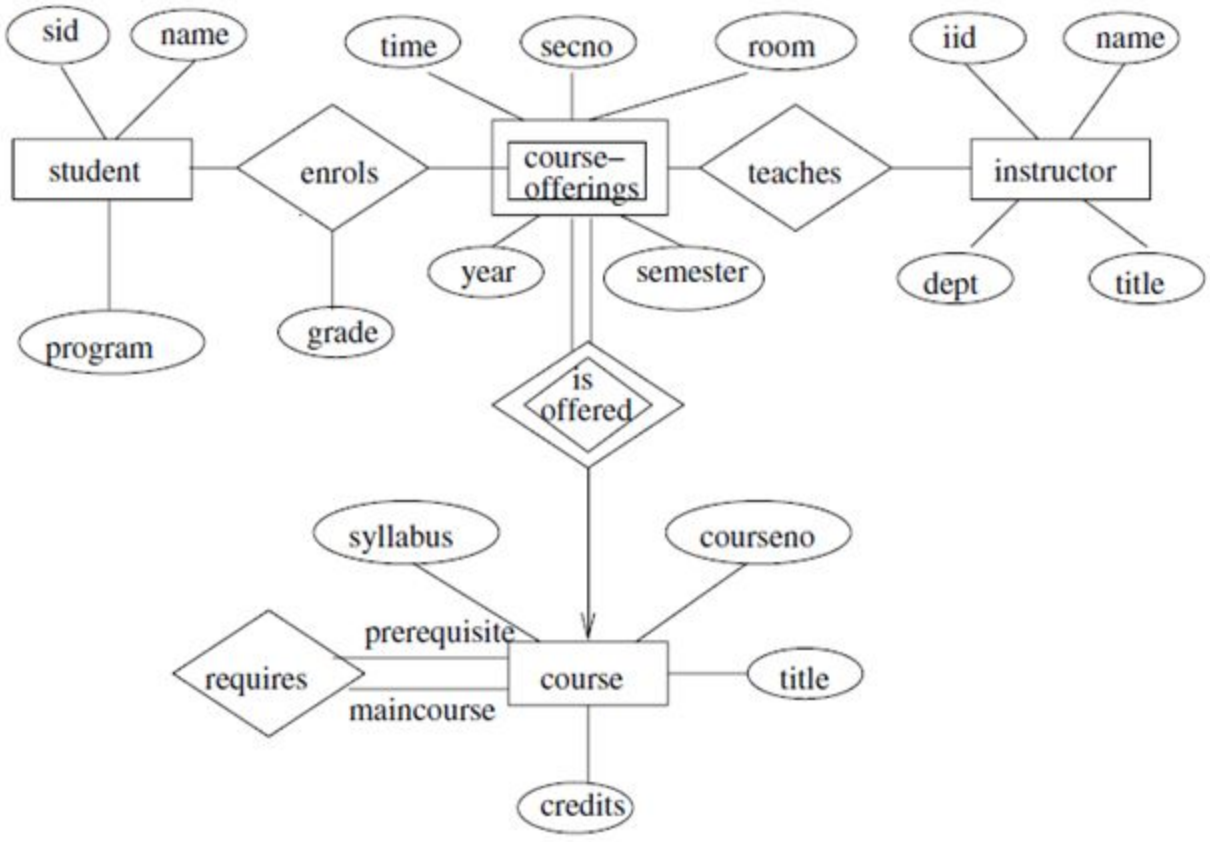
Question 1: A university registrar's office maintains data about the following entities:

1. courses, including number, title, credits, syllabus, and prerequisites;
2. course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;
3. students, including student-id, name, and program;
4. instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

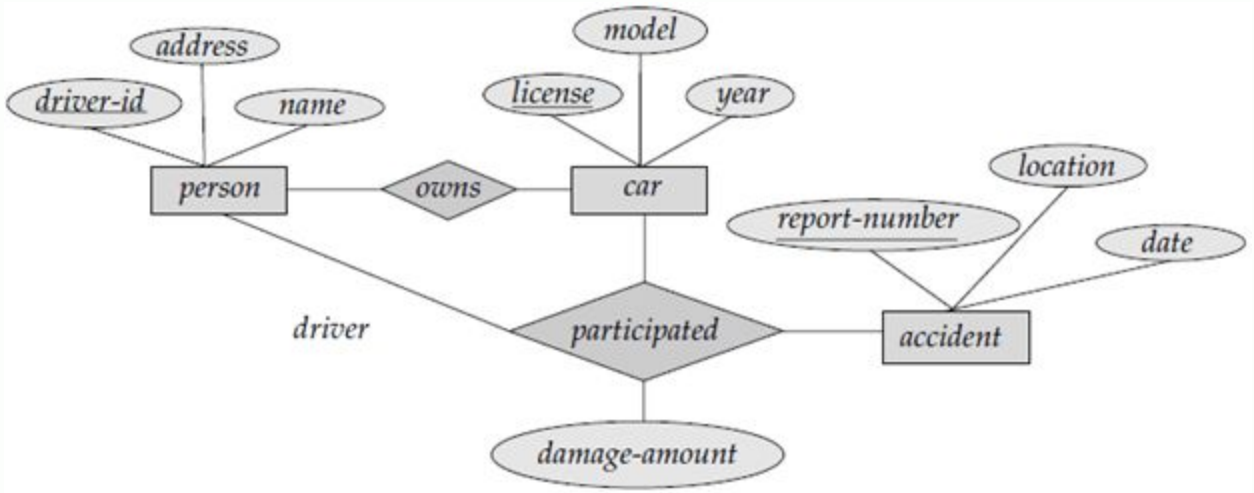
Answer.



E-R diagram for a university.

Question 2: Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Answer.



E-R diagram for a Car-insurance company.

Question 3: Construct appropriate tables for the ER diagram of the above question.

Answer.

Car insurance tables:

person (driver-id, name, address)

car (license, year,model) //license is a unique ID for car here. You can write car ID too.

owns(driver-id, license)

accident (report-number, date, location)

participated(driver-id, license, report-number, damage-amount)

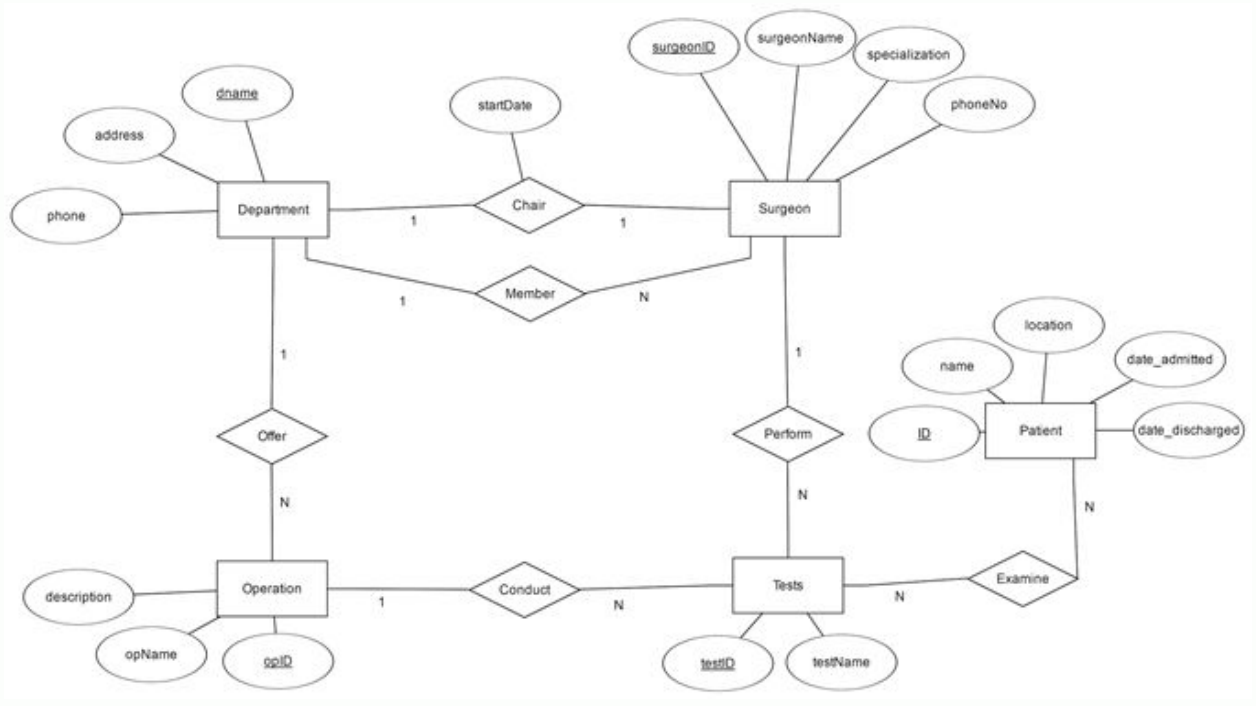
Question 4: You are asked to design the database for the new hospital to be built only for Surgery in California. Here is the list of information that you gather:

1. Different departments (Heart, plastic, etc.) will be available for different kinds of surgery.
2. Each department can be uniquely identified by a dname. Database also contains information about the address and phone number of the department.
3. Department can have multiple surgeons to deal with different operations and tests.
4. A surgeon has surgeonID, surgeonName, specialization and phone number.
5. Each department is headed by a surgeon from some specific date.
6. A department can offer varied number of operations.
7. An operation has a unique opID, a opName and a description.
8. Different kinds of tests for an operation is performed by one surgeon.
9. There may be possibility of conducting multiple tests for some operation. Each test is uniquely tracked by testID and testName.
10. A patient has an unique ID, name, location (home address or office address), date_admitted and date_discharged.

11. A patient may be examined for multiple tests for some operation.

    a) Design an ER diagram describing the database discussed above. Do not use the quaternary relationships. Also, specify the cardinality and participation constraints in the relationships. Write your assumptions if any.
    b) Transform this ER diagram into relational schema. Describe the relation - attributes and the constraints on the relations thus obtained.

Answer. Note that there may be multiple correct answers depending upon your assumptions made. Below is the one possibility



A patient can undergo multiple tests, and a test can have multiple patients. As an example, multiple patients undergo test for diabetes and blood pressure.

b) Department(dname, address, phone)
Surgeon(surgeonID, surgeonName, specialization, phoneNo)
Operation(opID, opName, description)
Patient(ID, name, location, date_admitted, date_discharged)
Tests(testID, testName)
Chair(dname, surgeonID, startDate)
Member(dname, surgeonID)
Offer(dname, opID)
Perform(surgeonID, testID)
Conduct(opID, testID)
Examine(ID, testID)