



Sheet 3

Q1)

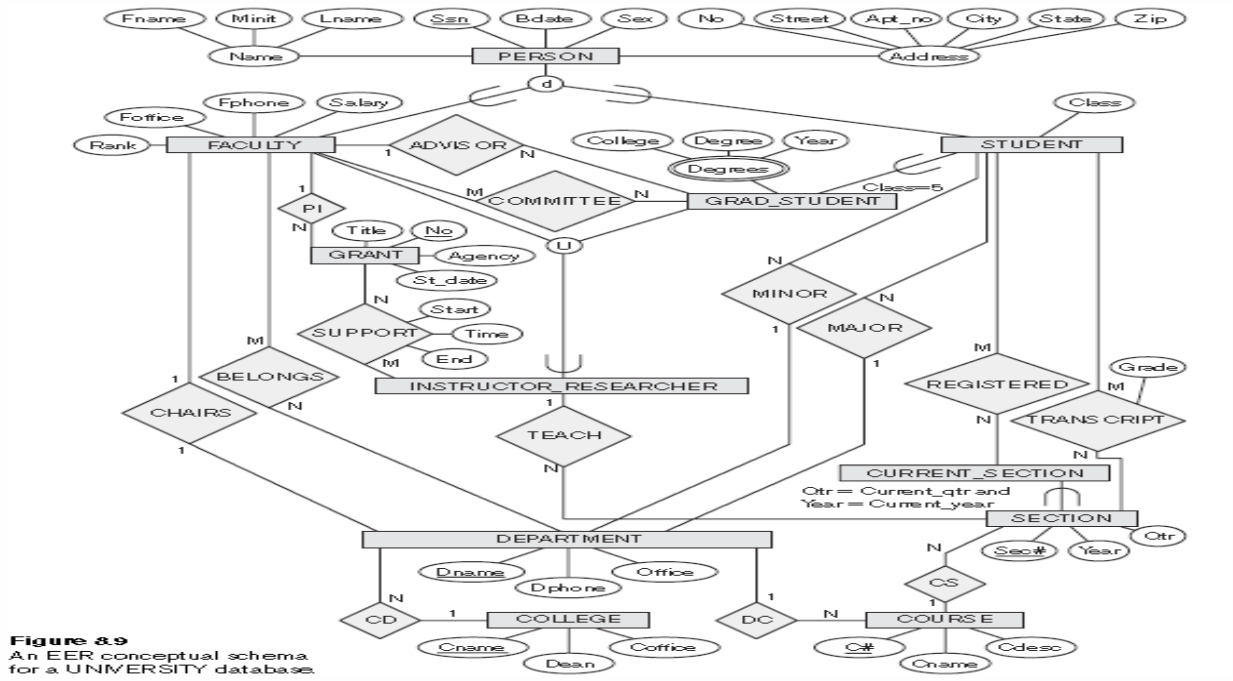


Figure 8.9
An EER conceptual schema
for a UNIVERSITY database

Q2) Consider the BANK ER schema in Figure 7.21, and suppose that it is necessary to keep track of different types of ACCOUNTS (SAVINGS_ACCTS حساب استثمار, CHECKING_ACCTS حساب جاري, ...) and LOANS (CAR_LOANS, HOME_LOANS, ...). Suppose that it is also desirable to keep track of each ACCOUNT's TRANSACTIONS (deposits, withdrawals, checks, ...) and each LOAN's PAYMENTS دفعات القروض; both of these include the amount, date, and time. Modify the BANK schema, using ER and EER concepts of specialization and generalization. State any assumptions you make about the additional requirements.

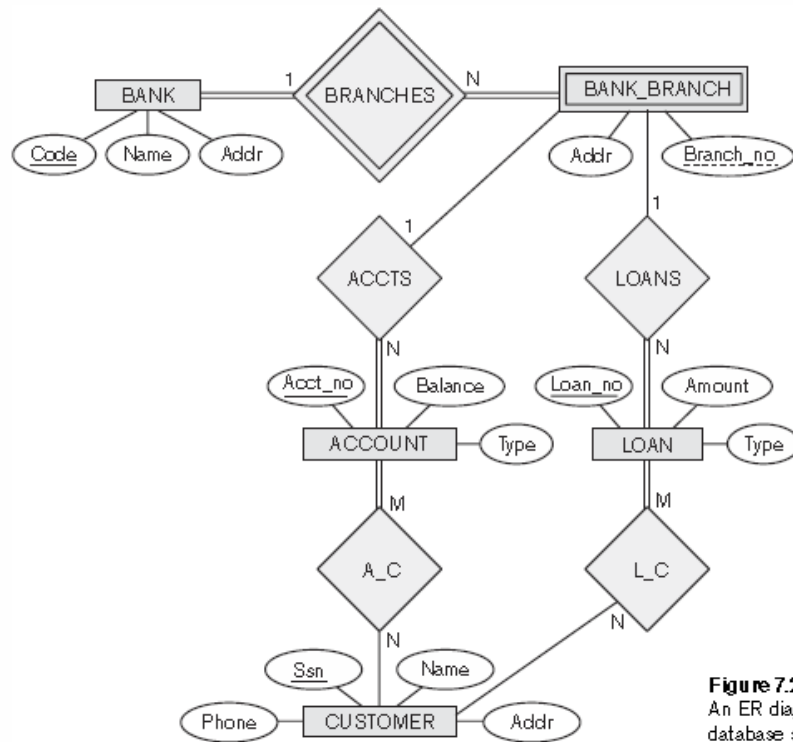


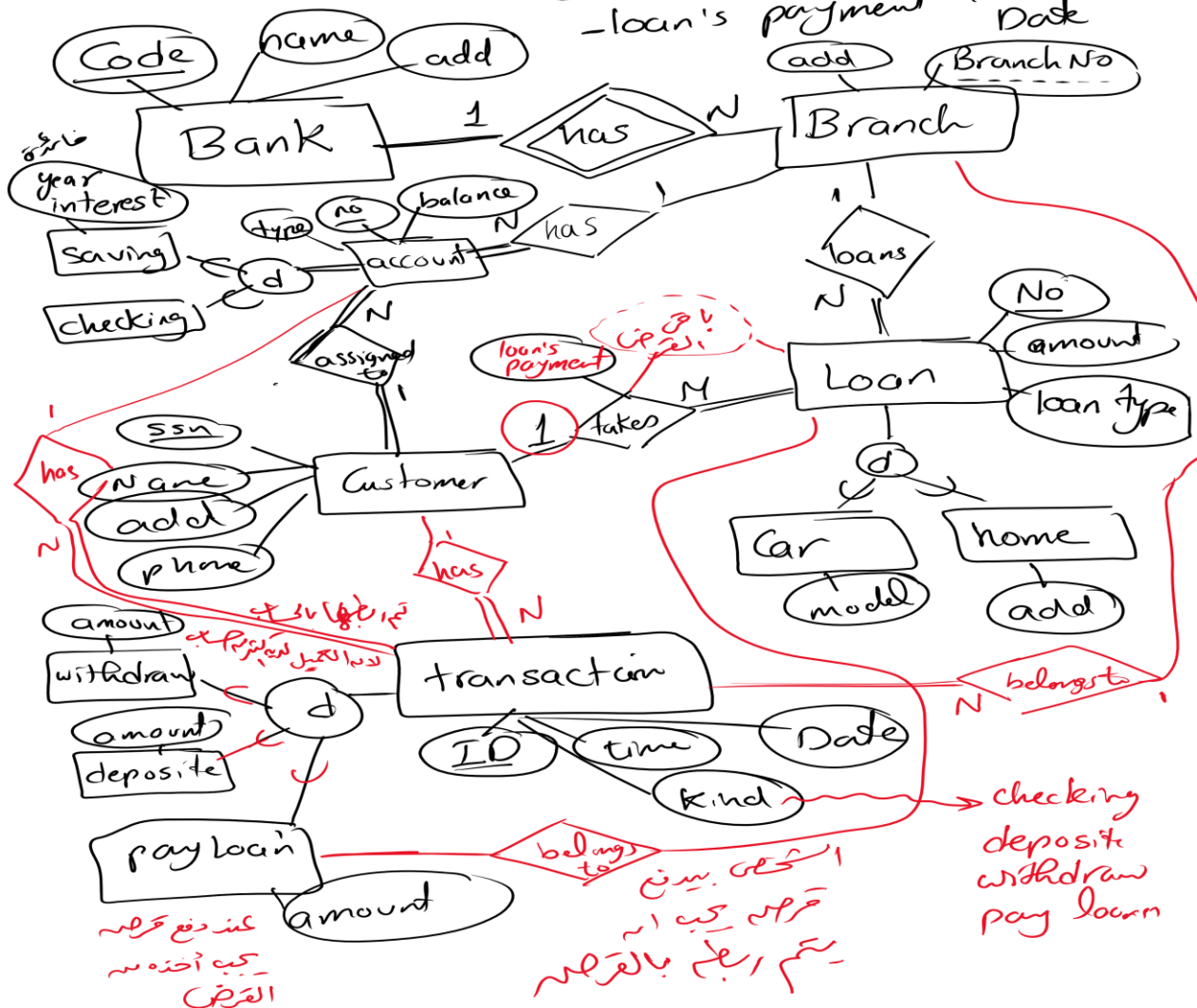
Figure 7.21
An ER diagram for a BANK database schema.

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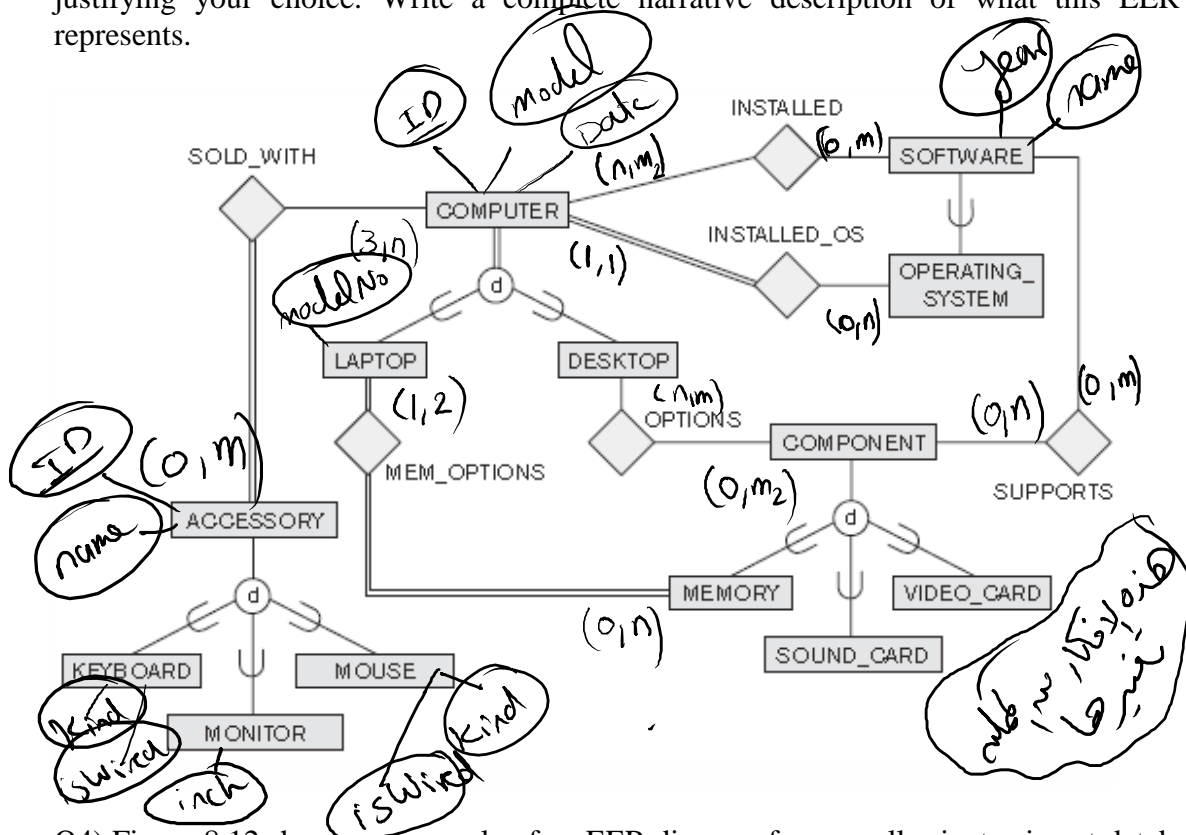
graph TD
    Loan[Loan] --> Car[car]
    Loan --> Home[home]

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- transaction
 - withdraw
 - deposit + time
 - check + Date
- loan
 - loan's payment + time
 - loan's interest + Date



Q3) Consider the following EER diagram that describes the computer systems at a company. Provide your own attributes and key for each entity type. Supply max cardinality constraints justifying your choice. Write a complete narrative description of what this EER diagram represents.



Q4) Figure 8.12 shows an example of an EER diagram for a small private airport database that is used to keep track of airplanes, their owners, airport employees, and pilots. From the requirements for this database, the following information was collected: Each AIRPLANE has a registration number [Reg#], is of a particular plane type [OF_TYPE], and is stored in a particular hangar [STORED_IN]. Each PLANE_TYPE has a model number [Model], a capacity [Capacity], and a weight [Weight]. Each HANGAR has a number [Number], a capacity [Capacity], and a location [Location]. The database also keeps track of the OWNERS of each plane [OWNS] and the EMPLOYEES who have maintained the plane [MAINTAIN]. Each relationship instance in OWNS relates an AIRPLANE to an OWNER and includes the purchase date [Pdate]. Each relationship instance in MAINTAIN relates an EMPLOYEE to a service record [SERVICE]. Each plane undergoes service many times; hence, it is related by [PLANE_SERVICE] to a number of SERVICE records. A SERVICE record includes as attributes the date of maintenance [Date], the number of hours spent on the work [Hours], and the type of work done [Work_code]. We use a weak entity type [SERVICE] to represent airplane service, because the airplane registration number is used to identify a service record. An

OWNER is either a person or a corporation. Hence, we use a union type (category) [OWNER] that is a subset of the union of corporation [CORPORATION] and person [PERSON] entity types. Both pilots [PILOT] and employees [EMPLOYEE] are subclasses of PERSON. Each PILOT has specific attributes license number [Lic_num] and restrictions [Restr]; each EMPLOYEE has specific attributes salary [Salary] and shift worked [Shift]. All PERSON entities in the database have data kept on their Social Security number [Ssn], name [Name], address [Address], and telephone number [Phone]. For CORPORATION entities, the data kept includes name [Name], address [Address], and telephone number [Phone]. The database also keeps track of the types of planes each pilot is authorized to fly [FLIES] and the types of planes each employee can do maintenance work on [WORKS_ON].

Show how the SMALL_AIRPORT EER schema in Figure 8.12 may be represented in UML notation. (Note: We have not discussed how to represent categories (union types) in UML, so you do not have to map the categories in this and the following question.)

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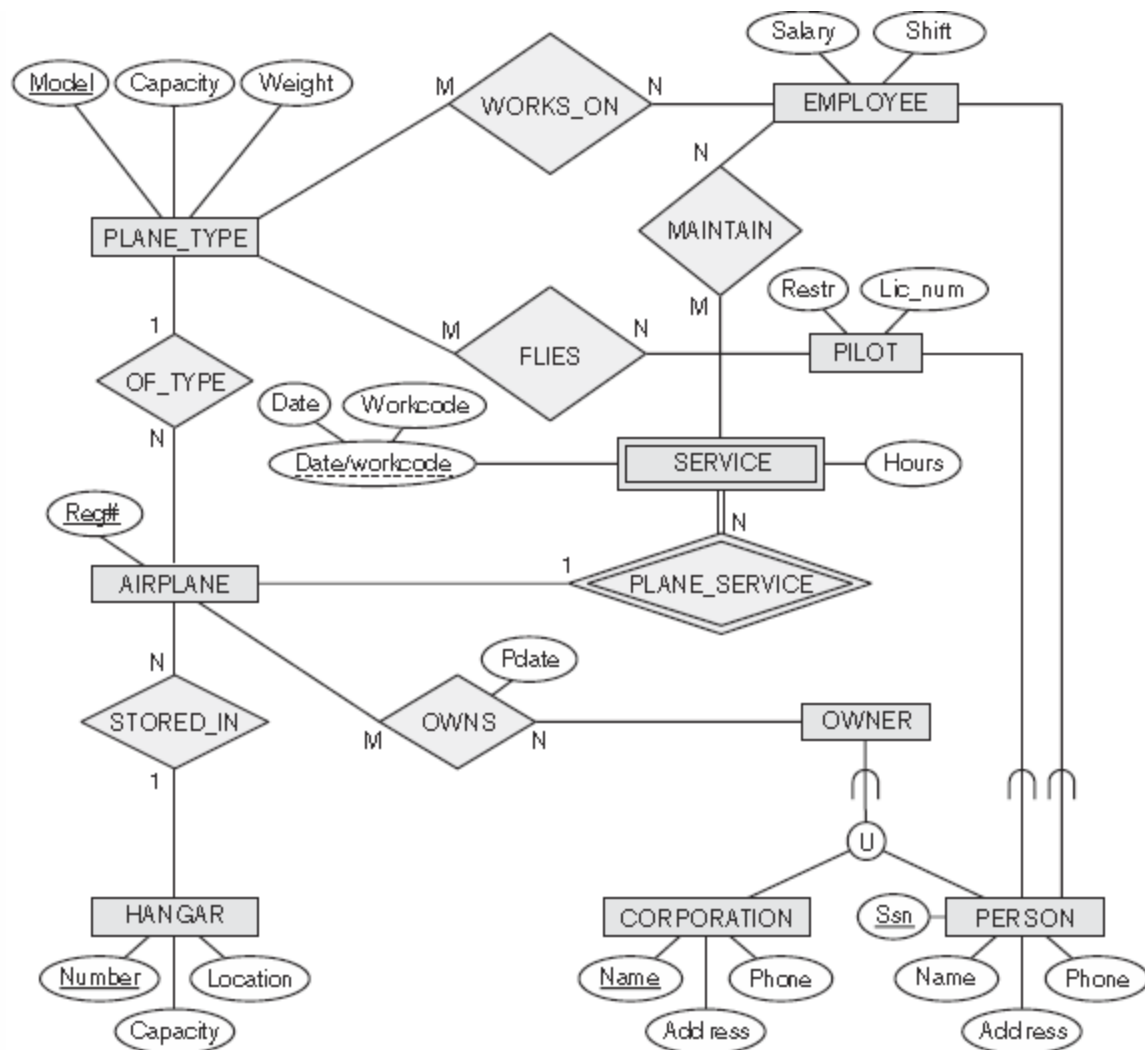


Figure 8.12
EER schema for a SMALL_AIRPORT database.