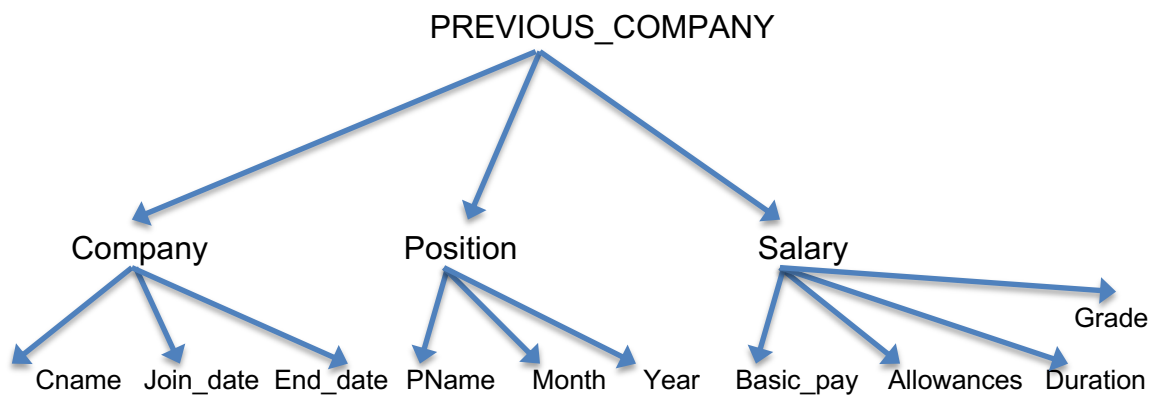


## Solutions Review questions II (questions 2-5)

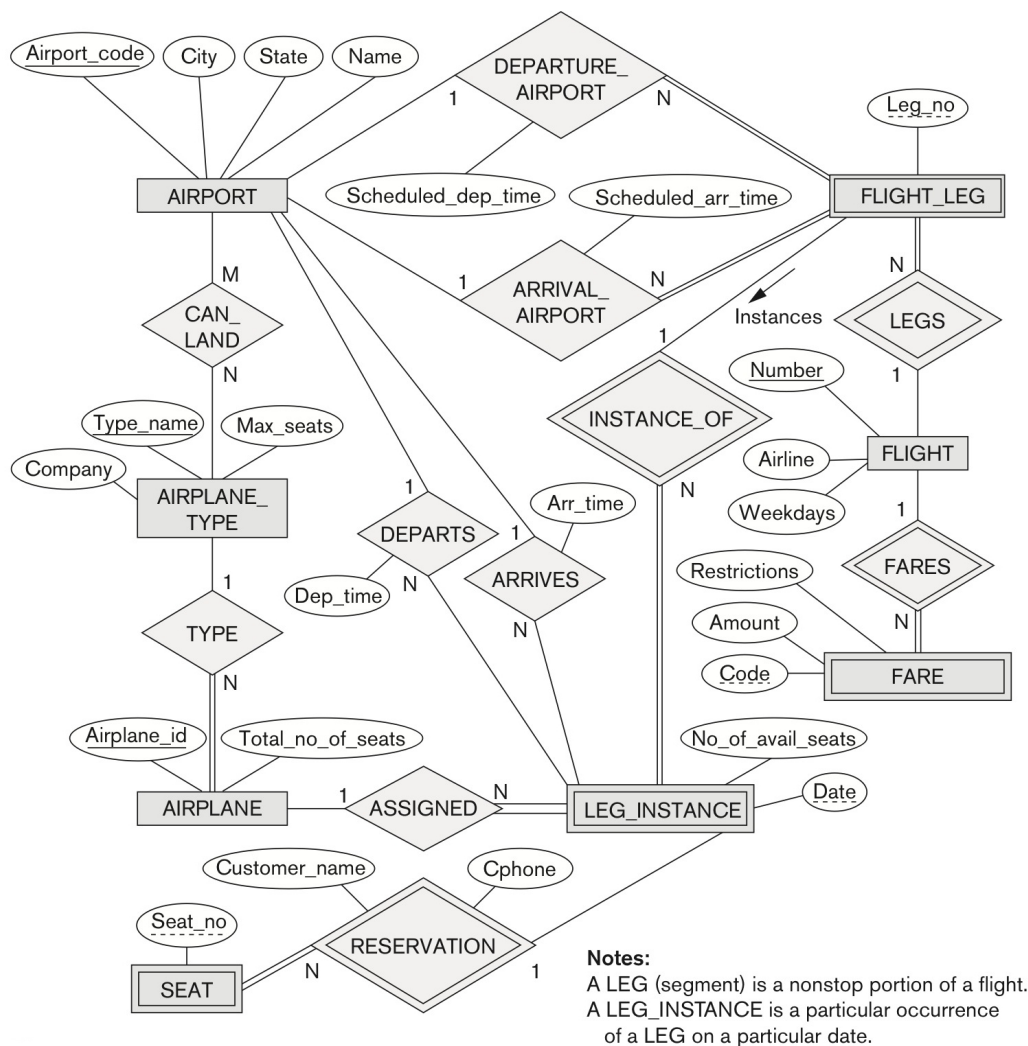
### Question 2

#### Answer:

```
{PREVIOUS_COMPANY( Company{Cname, Join_date,  
End_date},Position(PName, Month, Year), Salary(Basic_pay, Allowances, Duration,  
Grade))}}
```



### Question 3



#### Answer:

(1) The database represents each AIRPORT, keeping its unique AirportCode, the AIRPORT Name, and the City and State in which the AIRPORT is located.

(2) Each airline FLIGHT has a unique number, the Airline for the FLIGHT, and the Weekdays on which the FLIGHT is scheduled (for example, every day of the week except Sunday can be coded as X7).

(3) A FLIGHT is composed of one or more FLIGHT LEGs (for example, flight number CO1223 from New York to Los Angeles may have two FLIGHT LEGs: leg 1 from New York to Houston and leg 2 from Houston to Los Angeles). Each FLIGHT LEG has a

DEPARTURE AIRPORT and Scheduled Departure Time, and an ARRIVAL AIRPORT and Scheduled Arrival Time.

(4) A LEG INSTANCE is an instance of a FLIGHT LEG on a specific Date (for example, CO1223 leg 1 on July 30, 1989). The actual Departure and Arrival AIRPORTs and Times are recorded for each flight leg after the flight leg has been concluded. The Number of available seats and the AIRPLANE used in the LEG INSTANCE are also kept.

(5) The customer RESERVATIONs on each LEG INSTANCE include the Customer Name, Phone, and Seat Number(s) for each reservation.

(6) Information on AIRPLANES and AIRPLANE TYPEs are also kept. For each AIRPLANE TYPE (for example, DC-10), the TypeName, manufacturing Company, and Maximum Number of Seats are kept. The AIRPORTs in which planes of this type CAN LAND are kept in the database. For each AIRPLANE, the AirplaneId, Total number of seats, and TYPE are kept.

#### Question 4

Consider the ER diagram in Figure 3.23. Assume that an employee may work in up to two departments or may not be assigned to any department. Assume that each department must have one and may have up to three phone numbers. Supply (min,max) constraints on this diagram.

Under what conditions would be relationship HAS\_PHONE be redundant in this example?

Assuming the following additional conditions:

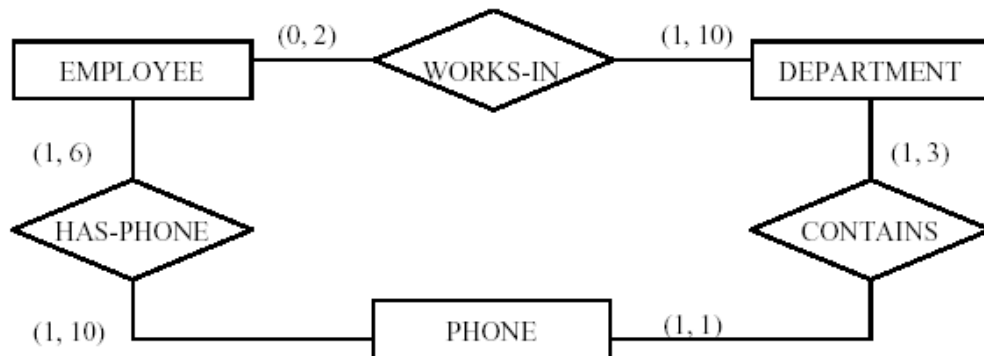
- Each department can have anywhere between 1 and 10 employees.
- Each phone is used by one, and only one, department.
- Each phone is assigned to at least one, and may be assigned to up to 10 employees.
- Each employee is assigned at least one, but no more than 6 phones.

**Answer:**

Relationship HAS-PHONE would be redundant under the following conditions:

- Each employee is assigned all of the phones of each department that he/she works in.
- An employee cannot have any other phones outside the departments he/she works in.

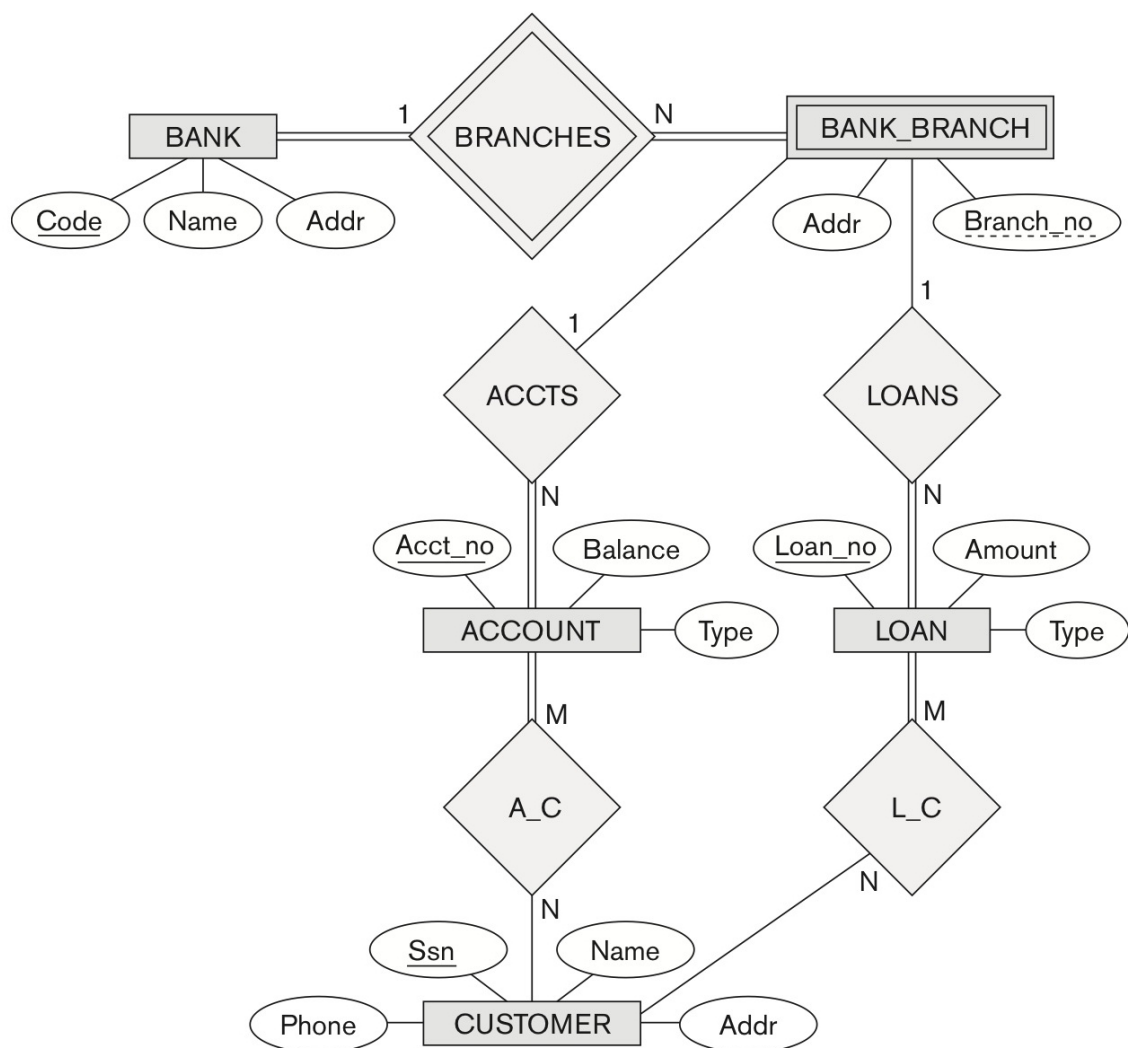
**Figure A**



### Question 5

Consider the ER diagram shown in Figure 3.22 for part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans.

- List the strong (nonweak) entities in the ER diagram.
- Is there weak entity? If so, give its name, partial key, and identifying relationship.
- List concisely the user requirements that led to this ER schema design.
- Suppose that every customer must have at least one account but is restricted to at most two loans at a time, and a bank branch cannot have more than 1,000 loans. Represent this constraints in the Er diagram.



**Answer:**

(a) Entity types: BANK, ACCOUNT, CUSTOMER, LOAN

(b) Weak entity type: BANK-BRANCH. Partial key: BranchNo.

Identifying relationship: BRANCHES.

(c) The requirements may be stated as follows: Each BANK has a unique Code, as well as a Name and Address. Each BANK is related to one or more BANK-BRANCHes, and the BranchNo is unique among each set of BANK-BRANCHes that are related to the same BANK.

Each BANK-BRANCH has an Address. Each BANK-BRANCH has zero or more LOANS and zero or more ACCTS. Each ACCOUNT has an AcctNo (unique), Balance, and Type and is related to exactly one BANK-BRANCH and to at least one CUSTOMER. Each LOAN has a LoanNo (unique), Amount, and Type and is related to exactly one BANK-BRANCH and to at least one CUSTOMER. Each CUSTOMER has an SSN (unique), Name, Phone, and Address, and is related to zero or more ACCOUNTs and to zero or more LOANS.

(d)

