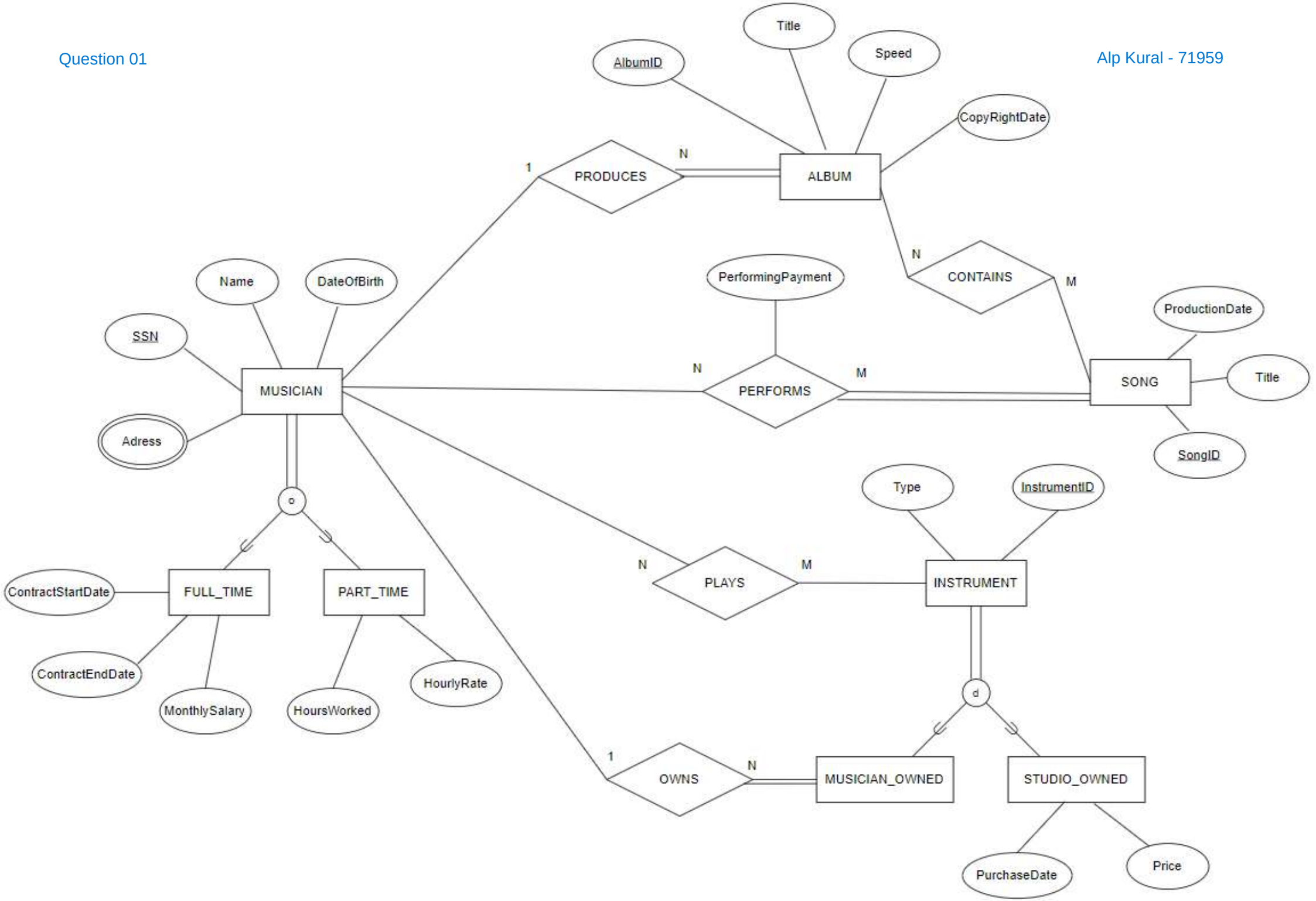
Question 01

Alp Kural - 71959



Question 02

```
CREATE TABLE Book
       (NumberOfPages: INTEGER,
      FrontCoverType: CHAR(20),
      ISBN: INTEGER,
      Title: CHAR(50),
      Price: REAL,
      BorrowCustomerID: INTEGER,
      BorrowDate: CHAR(20),
      ReturnDate: CHAR(20),
      PurchaseCustomerID: INTEGER,
      PaymentMethod: CHAR(20),
      PurchaseDate: CHAR(20),
      PRIMARY KEY (ISBN),
      FOREIGN KEY BorrowCustomerID
            REFERENCES RegisteredCustomer,
      FOREIGN KEY PurchaseCustomerID
            REFERENCES Customer)

CREATE TABLE Author
       (ID: INTEGER,
      Name: CHAR(50),
      PRIMARY KEY (ID))

CREATE TABLE Customer
       (ID: INTEGER,
      Name: CHAR(50),
      PRIMARY KEY (ID))

CREATE TABLE RegisteredCustomer
       (ID: INTEGER,
      RegistrationDate: CHAR(20),
      PRIMARY KEY (ID),
      FOREIGN KEY ID
            REFERENCES Customer)

CREATE TABLE VisitingCustomer
       (ID: INTEGER,
      Adress: CHAR(50),
      PhoneNumber: CHAR(20),
      PRIMARY KEY (ID),
      FOREIGN KEY ID
            REFERENCES Customer)

CREATE TABLE WrittenBy
       (ISBN: INTEGER,
      AuthorID: INTEGER,
      PRIMARY KEY (ISBN, AuthorID),
      FOREIGN KEY ISBN
            REFERENCES Book,
      FOREIGN KEY AuthorID
            REFERENCES Author)

CREATE TABLE CustomerEmails
       (CustomerID: INTEGER,
```

```
EmailAdress: CHAR(20),
PRIMARY KEY (CustomerID, EmailAdress),
FOREIGN KEY CustomerID
      REFERENCES Customer)
```

Question 03 is on the next pages.

Question 03

Question A.

$$\pi_{Fname,\ Bdate,\ Adress,\ Salary}\left((\sigma_{Bdate >= '01/01/1990'}\ Employee) \bowtie_{Dno = Dnumber}\ (\sigma_{Dname = 'Sales'}\ Department)\right)$$

Question B.

$$\pi_{Fname,\ Minit,\ Lname}\left(\sigma_{Dno = 8\ \wedge\ Hours\ > 20\ \wedge\ Pname = 'DataPrivacy'}\ \left(Employee \bowtie_{Ssn = Essn} Works\_On \bowtie_{Pno = Pnumber} Project\right)\right)$$

Question C.

$$A = \pi_{Pnumber}\left(\sigma_{Dnum = 5}\ Project\right)$$

$$\pi_{Lname,\ Salary}\left((Works\_On)\ /\ A\right)\ \bowtie_{Essn = Ssn}\ Employee)$$

Question D.

$$\pi_{Ei.Lname,\ Ei.Salary,\ Eii.Lname}\left(\rho(Ei, (\pi_{Ssn}\ Employee - \pi_{Ssn} Works_{On}) \bowtie Employee)\ \bowtie_{Super\_Ssn = Ssn}\ \rho(Eii, Employee)\right)$$

Question E.

$$A = \pi_{Dname}\left(\sigma_{Dlocation = 'Istanbul'}\ \left(Department \bowtie Dept\_Locations\right)\right)$$

$$B = \pi_{Dname}\left(\sigma_{Plocation = 'Istanbul'}\ Project\ \bowtie_{Dnum = Dnumber} Department\right)$$

$$A\ \cup B$$

Question F.

$$A = \pi_{Pnumber}(\sigma_{Lname = 'Gursoy'}(Project \bowtie_{Pnumber = Pno} Works\_On \bowtie_{Essn = Ssn} Employee))$$

$$B = \pi_{Pnumber}(\sigma_{Lname = 'Gursoy'}(Project \bowtie_{Dnum = Dnumber} Department \bowtie_{Mgr\_ssn = Ssn} Employee))$$

$$A \cap B$$

Question G.

$$A = Department \bowtie_{Mgr\_ssn = Ssn} Employee$$

$$\pi_{Ei.Lname,\ Ei.Salary}(A) - \pi_{Ei.Lname,\ Ei.Salary}(\sigma_{Ei.Mgr\_start\_date < Eii.Mgr\_start\_date}(\rho(Ei, A) x\ \rho(Eii, A)))$$

Question H.

$$\pi_{Fname,\ Lname}(\sigma_{Ei.Bdate > Eii.Bdate\ \wedge\ Ei.Ssn = Eii.Super\_Ssn}(\rho(Ei, Employee)\ x\ \rho(Eii, Employee)))$$