2. Consider the universal table T = {A, B, C, D, E, F, G, H, I, J} with the following set of functional dependencies:

{A, B} → {C}
{B, D} → {E, F}
{A, D} → {G, H}
{A} → {I}
{H} → {J}

a) What is the primary key for T?

{A, B, D} is the primary key.

b) Decompose T into 2NF tables.

T1 = {A,B,C}; T2 = {B,D,E,F}; T3 = {A,D,G,H,J}; T4 = {A,I}

c) Decompose T into 3NF tables.

T1 = {A,B,C}; T2 = {B,D,E,F}; T3 = {A,D,G,H}; T4 = {A,I}; T5 = {H,J};

3. Consider the following table:

CAR_SALE(Car#, DateSold, Salesperson#, CommissionPercent, DiscountAmt)

Assume that a car may be sold by multiple salespersons, and hence {Car#, Salesperson#} is the primary key.

Additional functional dependencies are

{DateSold} → {DiscountAmt}
{Salesperson#} → {CommissionPercent}

a) Based on the primary key, is this table in 1NF, 2NF, or 3NF? Why?

1NF because there is a partial dependency in the table.

b) How would you successively normalize it completely?

Remove the partial and transitive dependencies by splitting the table as such:

CAR_SALE(<u>Car#</u>,<u>Salesperson#</u>,DateSold);

TABLE2(<u>Salesperson#</u>,CommissionPercent);

TABLE3(<u>DateSold</u>,DiscountAmt)

4. Consider the following table for published books:

BOOK(BookTitle, AuthorName, BookType, ListPrice, AuthorAffil, Publisher)

AuthorAffil refers to the affiliation of author. Suppose the following functional dependencies exist:

{BookTitle} → {Publisher, BookType}
{BookType} → {ListPrice}
{AuthorName} → {AuthorAffil}

a) What normal form is the table in? Explain your answer.

1NF because there is a partial dependency in the table. BookTitle and AuthorName are part of the primary key set, the functional dependency {AuthorName} → {AuthorAffil} is thus a partial dependency.

b) Apply normalization until you cannot decompose the tables further. State the reasons behind each decomposition.

BOOK(<u>BookTitle</u>, Publisher, BookType)

BOOK_P(<u>BookType</u>, ListPrice)	- removes transitive dependency
AUTHOR(<u>AuthorName</u>, AuthorAffil)	- BookTitle and AuthorName do not need to be primary keys in the same table, removes partial dependency