5.13 - Consider the relation CLASS(Course#, Univ_Section#, InstructorName, Semester, BuildingCode, Room#, TimePeriod, Weekdays, CreditHours). This represents classes taught in a university with unique Univ_Section#. Give what you think should be various candidate keys and write in your own words under what constraints each candidate key would be valid.

Answer:
Possible candidate keys include the following (Note: We assume that the values of the Semester attribute include the year; for example "Spring/94" or "Fall/93" could be values for Semester):

1. {Semester, BuildingCode, Room#, TimePeriod, Weekdays} if the same room cannot be used at the same time by more than one course during a particular semester.
2. {Univ_Section#} if it is unique across all semesters.
3. {InstructorName, Semester} if an instructor can teach at most one course during each semester.
4. If Univ_Section# is not unique, which is the case in many universities, we have to examine the rules that the university uses for section numbering. For example, if the sections of a particular course during a particular semester are numbered 1, 2, 3, …then a candidate key would be {Course#, Univ_Section#, Semester}. If, on the other hand, all sections (of any course) have unique numbers during a particular semester only, then the candidate key would be {Univ_Section#, Semester}.

5.14 - Consider the following six relations for an order-processing database application in a company:

CUSTOMER (Cust#, Cname, City)
ORDER (Order#, Odate, Cust#, Ord_Amt)
ORDER_ITEM (Order#, Item#, Qty)
ITEM (Item#, Unit_price)
SHIPMENT (Order#, Warehouse#, Ship_date)
WAREHOUSE (Warehouse#, City)

Here, Ord_Amt refers to total dollar amount of an order; Odate is the date the order was placed; Ship_date is the date an order (or part of an order) is shipped from the warehouse. Assume that an order can be shipped from several warehouses. Specify the foreign keys for this schema, stating any assumptions you make. What other constraints can you think of for this database?

Answer:
Strictly speaking, a foreign key is a *set* of attributes, but when that set contains only one attribute, then that attribute itself is often informally called a foreign key. The schema of this question has the following five foreign keys:

1. the attribute Cust# of relation ORDER that references relation CUSTOMER,
2. the attribute Order# of relation ORDER_ITEM that references relation ORDER,
3. the attribute Item# of relation ORDER_ITEM that references relation ITEM,
4. the attribute Order# of relation SHIPMENT that references relation ORDER, and
5. the attribute Warehouse# of relation SHIPMENT that references relation WAREHOUSE.

5.15 - Consider the following relations for a database that keeps track of business trips of salespersons in a sales office:

SALESPERSON (SSN, Name, Start_Year, Dept_No)
TRIP (SSN, From_City, To_City, Departure_Date, Return_Date, Trip_ID)
EXPENSE (Trip_ID, Account#, Amount)

Specify the foreign keys for this schema, stating any assumptions you make.

Answer:
The schema of this question has the following two foreign keys:
1. the attribute SSN of relation TRIP that references relation SALESPERSON, and
2. the attribute Trip_ID of relation EXPENSE that references relation TRIP.
In addition, the attributes Dept_No of relation SALESPERSON and Account# of relation EXPENSE are probably also foreign keys referencing other relations of the database not mentioned in the question.