HW#1
[1] Please draw an ERD based on following description.

A private taxi company called *FastCabs* was established in Glasgow in 1992. Since then, the company has grown steadily and now has offices in most of the main cities of Scotland. However, the company is now so large that more and more administrative staffs are being employed to cope with the ever-increasing amount of paperwork. Furthermore, the communication and sharing of information within the company is poor. The Director of the company, Paddy MacKay feels that too many mistakes are being made and that the success of his company will be short-lived if he does not do something to remedy the situation. He knows that a database could help in part to solve the problem and has approached you and your team to help in creating a database application to support the running of *FastCabs*.

The Director has provided the following brief description of how *FastCabs* operates.

Each office has a Manager; several taxi owners, drivers and administrative staff. The Manager is responsible for the day-to-day running of the office. An owner provides one or more taxis to *FastCabs* and each taxi is allocated for use to a number of drivers. The majority of owners are also drivers.

FastCab taxis are not available for hire by the public hailing a taxi in the street but must be requested by first phoning the company to attend a given address.

There are two kinds of clients, namely private and business. The business provided by private clients is on an *ad hoc* basis. The details of private clients are collected on the first booking of a taxi. However, the business provided by business clients is more formal and involves agreeing a contract of work with the business. A contract stipulates the number of jobs that *FastCabs* will undertake for a fixed fee.

When a job comes into *FastCabs* the name, phone number and contract number (when appropriate) of the client is taken and then the pick-up date/time and pick-up/drop-off addresses are noted. Each job is allocated a unique jobID. The nearest driver to the pick-up address is called by radio and is informed of the details of the job.

When a job is completed the driver should note the mileage used and the charge made (for private clients only). If a job is not complete, the reason for the failed job should be noted.

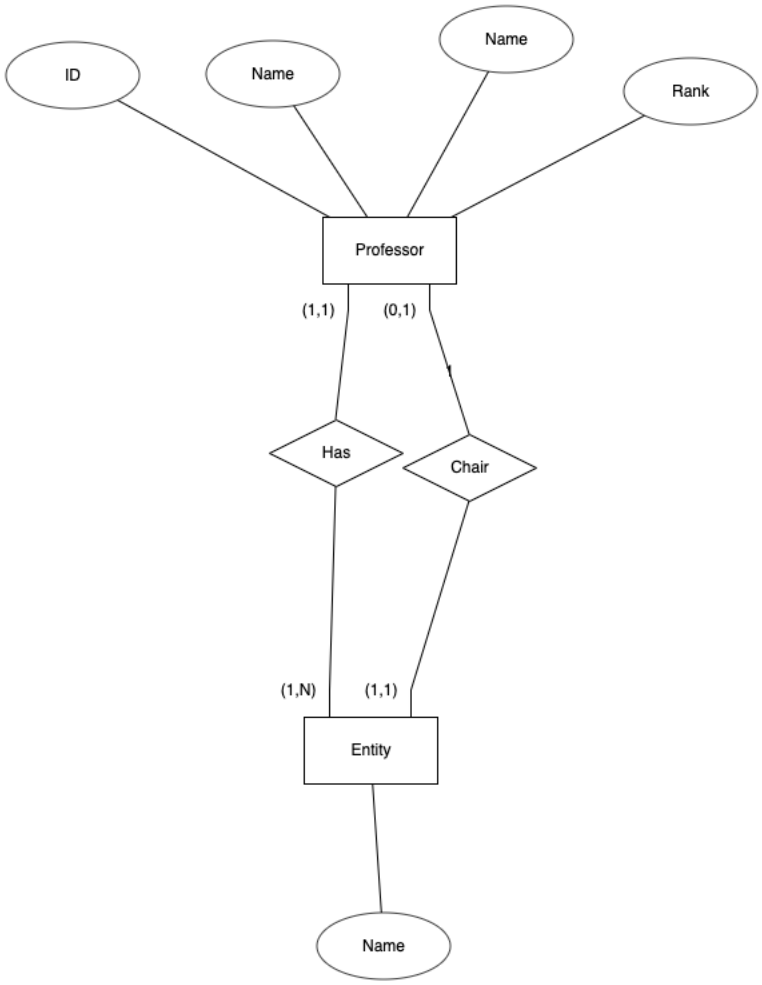
The Director has provided some examples of typical queries that the database application for *FastCabs* must support.

(a) The names and phone numbers of the Managers at each office.
(b) The names of all female drivers based in the Glasgow office.

(c) The total number of staff at each office.
(d) The details of all taxis at the Glasgow office.
(e) The total number of W registered taxis.
(f) The number of drivers allocated to each taxi.
(g) The name and number of owners with more than one taxi.
(h) The full address of all business clients in Glasgow.
(i) The details of the current contracts with business clients in Glasgow.
(j) The total number of private clients in each city.
(k) The details of jobs undertaken by a driver on a given day.
(l) The names of drivers who are over 55 years old.
(m) The names and numbers of private clients who hired a taxi in November 2000.
(n) The names and addresses of private clients who have hired a taxi more than three times.
(o) The average number of miles driven during a job.
(p) The total number of jobs allocated to each car.
(q) The total number of jobs allocated to each driver.
(r) The total amount charged for each car in November 2000.
(s) The total number of jobs and miles driven for a given contract.

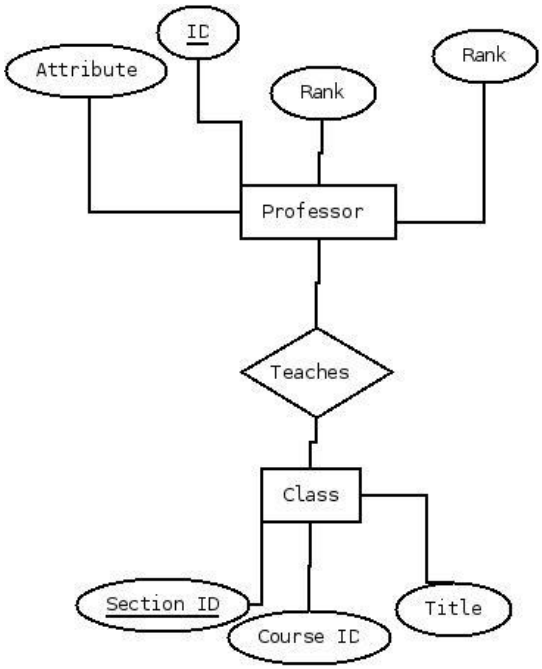
[2] Please draw an ERD based on following description.

- In a school, each department has many professors assigned to it. A professor belongs to one department. Among professors, some chair a department. A department must have only one chair. And no professor is required to accept the chair position. Therefore, DEPARTMENT (which has attribute: Name) is optional to PROFESSOR (which has attributes: ID, Name, hired-year, rank) in the “chairs” relationship.



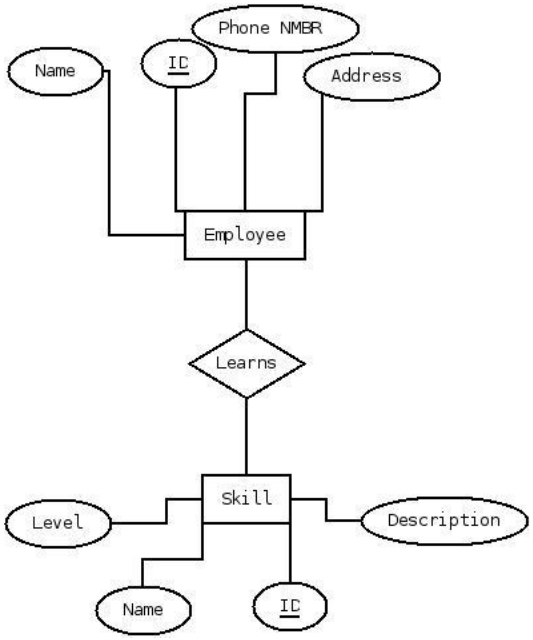
[3] Please draw an ERD based on following description.

- Each professor (attributes: ID, Name, rank) may teach up to four classes. Each classes is a section (attribute: Section ID) of a course (course ID, title). A professor may also be on a research contract and teaches no classes at all. Each class is taught by a professor.



[4] Please draw an ERD based on following description.

- An employee (attribute: ID, name, phone#, and address) can learn many skills (attribute: ID, name, description); each skill can be learned by many employees but sometimes no employee knows about some skill. An employee can have different skill levels for the different skills (e.g. an employee has two skills with different skill levels: level 4 for the skill number 1 and level 5 for the skill number 2).



[5] Please draw an ERD based on following description.

The requirements collection and analysis phase of the database design process has provided the following data requirements for a company called Reliable Rentals, which rents out vehicles (cars and vans). The Company has various outlets (garage/offices)

throughout Glasgow. Each outlet has a number, address, phone number, fax number, and a manager who supervises the operation of the garage and offices at each site.

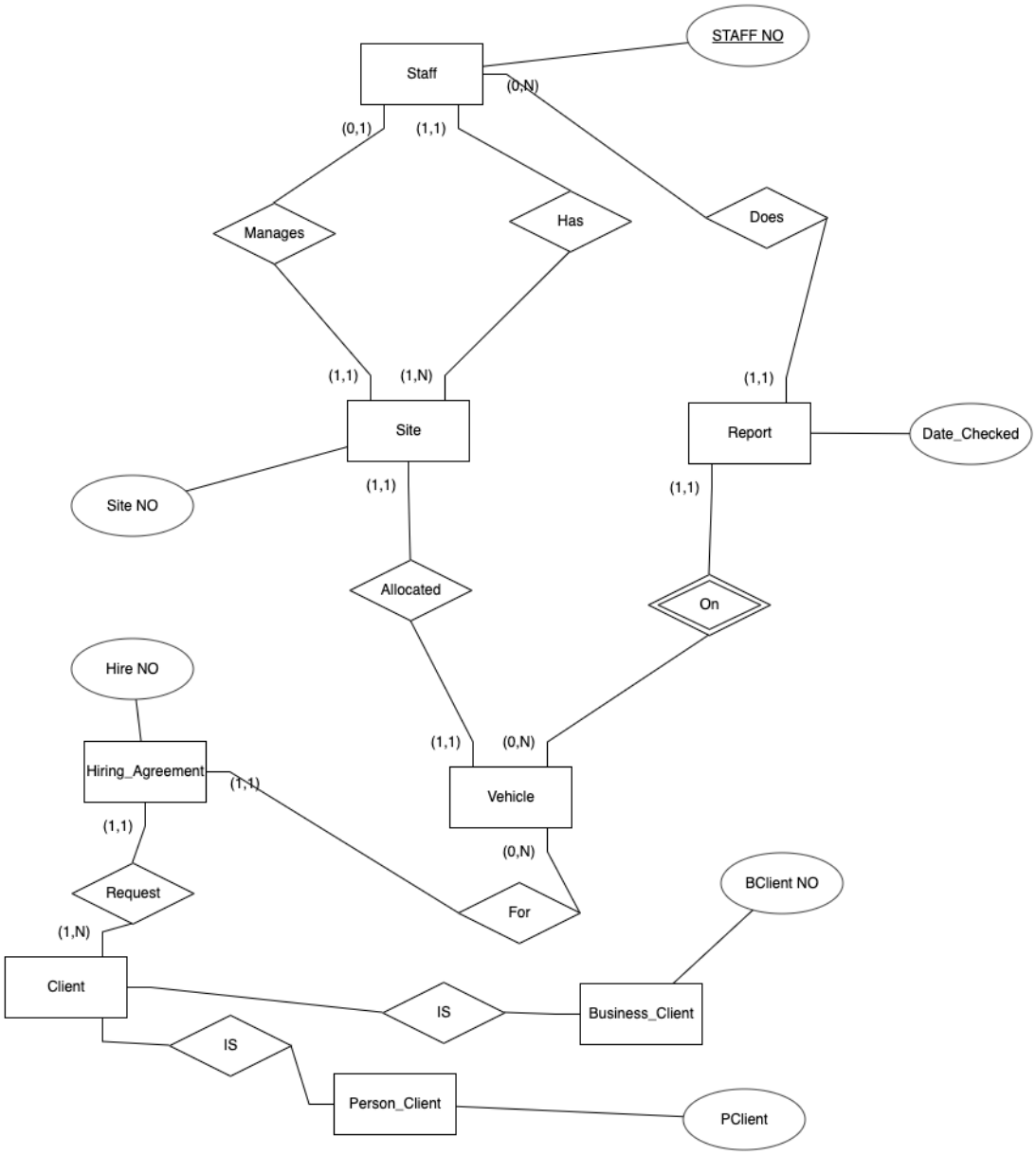
Each site is allocated a stock of vehicles for hire, however, individual vehicles may be moved between outlets, as required. Only the current location for each vehicle is stored. The registration number uniquely identifies each vehicle for hire and is used when hiring a vehicle to a client.

Clients may hire vehicles for various periods of time (minimum 1 day to maximum 1 year). Each individual hire agreement between a client and the Company is uniquely identified using a hire number. Information stored on the vehicles for hire include: the vehicle registration number, model, make, engine size, capacity, current mileage, date MOT due, daily hire rate, and the current location (outlet) of each vehicle.

The data stored on a hire agreement includes the hire number, the client's number, name, address, and phone number, date the client started the hire period, date the client wishes to terminate the hire period, the vehicle registration number, model and make, the mileage before and after the hire period. After each hire a member of staff checks the vehicle and notes any fault(s). Fault report information on each vehicle is stored, which records the name of the member of staff responsible for the check, date checked, whether fault(s) where found (yes or no), the vehicle registration number, model, make and the current mileage.

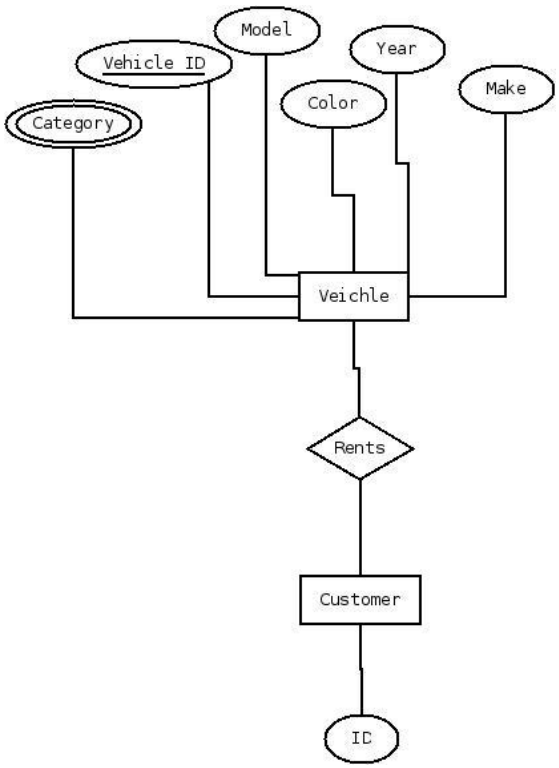
The Company has two types of clients: personal and business. The data stored on personal clients includes the client number, name (first and last name), home address, phone number, date of birth, and driving licence number. The data stored on business clients includes the client number, name of business, type of business, address, telephone, and fax numbers. The client number uniquely identifies each client and the information stored relates to all clients who have hired in the past and those currently hiring a vehicle.

Information is stored on the staff based at various outlets including: staff number, name (first and last name), home address, home phone number, date of birth (DOB), sex, National Insurance Number (NIN), date joined the Company, job title, and salary. Each staff member is associated with a single outlet but may be moved to an alternative outlet as required, although only the current location for each member of staff is stored.



[6] Please draw an ERD based on following description:

A rental car agency classifies the vehicles it rents into four categories: compact, midsize, full-size, and sport utility. The agency wants to record the following data for all vehicles: Vehicle_ID, Make, Model, Year, and Color. There are no unique attributes for any of the four classes of vehicle. The entity type vehicle has a relationship (named Rents) with a customer entity type.


Model
Vehicle ID
Year
Color
Make
Category
Veichle
Rents
Customer
ID