COIT20247 - Database Design & Development
Tutorial – Conceptual modelling (Advanced)

Theory questions

Answer each of the questions below. You should be able to answer most of these questions within about 3 to 5 sentences. Refer to the lecture slides to find the important points about each of these questions. Keep to the point and be sure to *answer the question that has been asked*. For example, if you are asked "What is the definition of a database?" then explain the important concepts in the definition a database; don't say how wonderful databases are.

1. What is the difference between a **simple attribute** and a **composite attribute**? Give an example of each.

2. What is the difference between a **single attribute** and a **multi-valued attribute**? Give an example of each.

3. What is the difference between a **stored attribute** and a **derived attribute**?

4. What is the difference between a **required attribute** and an **optional attribute?**

5. What is a **weak entity type?** What is the identifier of a weak entity type?

6. Explain what is meant by the **degree of a relationship**. Give at least two examples to illustrate your answer.

7. With regard to subtypes, what is the difference between **total specialisation** and **partial specialisation?**

8. With regard to subtypes in ER modelling, what is the difference between **disjoint subtypes** and **overlapping specialisation?**

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ER modelling practice – case studies

Construct an ER diagrams for the case studies given below. Be sure to write down any assumptions you make or clarifications you get from your tutor. Make a note of any business rules that affect your model. You will find these case studies more challenging than the ones given in the Basic Structures tutorial sheet.

Case study 1 – Milk dairy

You have been asked to develop an ER model for a milk dairy. The milk dairy receives batches of milk from a variety of suppliers which it then tests, bottles and sells. The milk dairy needs to keep a list of the milk suppliers. For each supplier it is necessary to record the name and assign a unique ID. There are a number of different types of milk suppliers: individual farmers, societies and chilling centres. Many individual farmers are members of societies and this relationship must be recorded. For each society, it is necessary to record the name of the president, secretary, and their contact numbers. Each chilling centre has a manager and his/her contact numbers must be recorded.

The milk dairy also needs to keep a list of milk batches it receives. For each batch, it is necessary to record the quantity (in litres) of milk received, the date it was received, and it is necessary to know from which supplier the batch came.

When a batch of milk is received, at least two (possibly more) samples are taken from the batch. It is necessary to keep a record of these samples. Each sample is analysed for fat percentage and SNF percentage – it is necessary to record each of these for each sample. It is also necessary to know which batch the sample came from.

At the end of each week, the milk dairy pays each supplier for the milk batches they supplied. For each payment it is necessary to record the date of payment and the amount paid. It is necessary to know which batches have been paid for in which payments. The amount paid is calculated according to the fat percentage, the SNF percentage and the quantity of milk in each batch.

It is *not* necessary to keep any records about the bottling or sale of the milk.

Case study 2 – Quikfix Electronics

Quikfix Electronics is a local electronic repair shop. They repair all kinds of electronic household goods such as televisions, video players, microwaves and stereo systems. Quikfix wants to implement a computer-based database to track all aspects of the repair jobs.

When a customer brings an electronic item in for repair, an employee records the type of equipment being brought in (for example, television, video player, etc), the make, model, and serial number. The employee also records a description of the problem, that is, the reason why the equipment has been brought in for repair. The repair job is assigned a unique number, called a Job Number. A piece of paper with the Job Number written on it is taped to the item so that the repair job can be identified without question. The Job Number is also given to the customer so that he or she can quote the Job Number when enquiring over the phone or collecting the item from the shop.

Each repair job is performed by one employee and it is necessary to record which employee performed each job. It is not, however, necessary to record which employee recorded the job information when the item is first brought in by the customer. Each employee has a unique employee number, and Quikfix maintains normal contact information about each employee. Quikfix also records the number hours taken to perform the repair job.

When an item is being repaired, it is frequently (but not always) necessary to replace certain parts. Quikfix maintains a list of part types. Each part type has a unique part number, a description (for example “belt kit”), and a price per unit. If parts are used during a repair, Quikfix records the quantity of each part type used in the repair.

For each repair job, Quikfix records the total amount due (which is derived from the hours spent and the parts used), and the date that the customer paid the amount due. Quikfix do not accept part payments (that is, they only accept payment in full), therefore it is not necessary to record multiple payments against a repair job.

Finally, Quikfix records and maintains contact details for each customer that comes in, specifically address and telephone contact details.

Case study 3 - Building Brokerage Services

Building Brokerage Services (BBS) is a brokerage service which specialises in arranging contracts involving home renovation, apartments, work premises, pool installation or any other fabrication that involves professional tradespeople. (A brokerage service or broker is a person or agency that negotiates contracts between customers and tradespeople.)

Customers contact BBS about building projects that they want completed. For each building project, BBS creates one contract, and conversely, each contract is for precisely one project. Therefore, contract and project are really the same thing and the words can be used interchangeably. BBS specifies the total cost of the project in advance, and records the start and end dates of the project as soon as they can be defined.

The majority of the work for the project is carried out by one or more of BBS' preferred suppliers. Suppliers include builders, contractors, plumbers, electricians and other tradespeople. However, BBS appoint one of their own employees to act as job foreman and oversee the project. The job foreman (or woman, as the case may be) is responsible for all aspects of the work to be carried out. The first task the job foreman undertakes is to secure a project number which will remain in force for the duration of the project. However, construction work does not commence until the project has been confirmed with the customer.

Every time that a supplier performs work for or supplies goods to a project, details of that transaction must be recorded. Recorded details include a description of what was provided, the number of units supplied, the date of supply, and the amount or cost of the transaction. (If a service has been supplied, the number of units would be 1.)