0 1 A veterinary practice with four different surgeries intends to use a relational database to store the data that it needs to manage its business.

Customers of the practice are pet owners who bring their pets to one of the surgeries for appointments. The surgeries are staffed by vets.

- Each customer is identified by a unique identity number and the customer's forename, surname and telephone number are recorded.
- Each pet is identified by a unique identity number and the pet's name, type and date of birth are recorded.
- Each surgery is identified uniquely by its name. The town in which it is located and the surgery's telephone number are recorded.
- Each vet is identified by a unique identity number and the vet's forename and surname are recorded.

A pet is owned by one or more customers and each customer may own any number of pets. Over their lifetimes, pets may attend many appointments.

To make an appointment for a pet, a customer contacts a surgery. The appointment is made for the pet to take place on a particular date and time at a specific surgery.

Each vet is associated with one surgery which they work at; each surgery is staffed by several vets.

0 1 . 1 Complete the entity-relationship diagram below for a **fully normalised** relational database to store the data required by the veterinary practice.

Some of the entities and relationships have been drawn for you. You need to draw the remaining **three** entities and clearly show the relationships between the entities and their degree.

[3 marks]

0 2 A network of zoos uses a relational database system to store information about the animals that they have so that they can be matched up with animals at other zoos in a breeding programme.

Figure 5 shows the structure of the relations in the database.

Figure 5

Zoo(ZooName, Town, Country)

AnimalLocation(AnimalID, ZooName, DateArrived, DateLeft)

Animal(AnimalID, IndividualName, Species, DateOfBirth, Sex)

Match(AnimalFemaleID, AnimalMaleID, DateOfMatch, Successful)

- The Zoo relation stores details of the zoos that participate in the breeding programme. Each zoo is uniquely identified by its ZooName.
- The AnimalLocation relation identifies which zoos each animal has lived at. The zoo that the animal is currently at can be identified because the DateLeft attribute is set to 01/01/0001 to indicate that the animal has not left.
- The Animal relation stores details of the individual animals that are available to be matched with other animals for breeding. Each animal is identified by a unique number, the AnimalID. The individual name of the animal (eg 'Timothy') is also stored, together with the species of the animal (eg 'Red Panda'), its date of birth and its sex ('Male' or 'Female').
- The Match relation stores details of matches that have been made. The attributes AnimalFemaleID and AnimalMaleID refer to the AnimalID values of the two matched animals in the Animal relation.

0 2 . 1 Shade **one** lozenge to identify which of the properties below **does not have to be true** for a fully normalised database.

[1 mark]

A Each attribute in a relation is dependent on the primary key. ⬭

B Each attribute in a relation is dependent only on the primary key; it is not also dependent on any other attribute in the relation. ⬭

C The primary key in each relation consists of only one attribute. ⬭

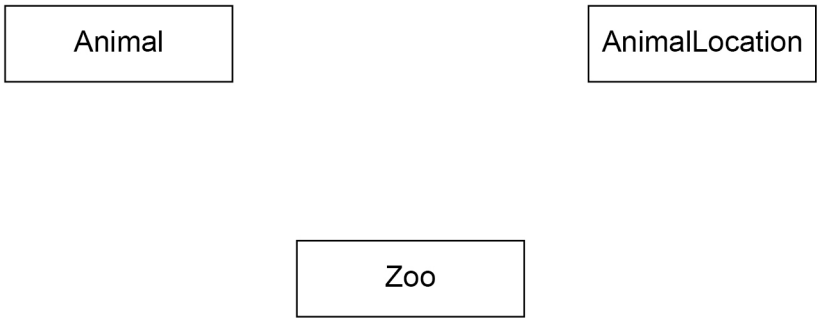
D There are no repeating groups (or equivalently each attribute is atomic). ⬭

0 2 . 2 **Figure 6** is an incomplete entity-relationship diagram for part of the database shown in **Figure 5**.

Draw lines on **Figure 6** to indicate the degree of the **two** relationships between the three entities shown in the entity-relationship diagram.

[2 marks]

Figure 6



0 2 . 3 Complete the following SQL statement to create the Animal relation, including the key field.

[3 marks]

```
CREATE TABLE Animal (_____
_____
_____
_____
_____
_____
_____
_____
_____
_____)
```

0 2 . 4 **Figure 5** is repeated below to help you answer Question **07.4** without having to turn back in the question paper.

Figure 5 (repeated)

Zoo(ZooName, Town, Country)

AnimalLocation(AnimalID, ZooName, DateArrived, DateLeft)

Animal(AnimalID, IndividualName, Species, DateOfBirth, Sex)

Match(AnimalFemaleID, AnimalMaleID, DateOfMatch, Successful)

There is a requirement to identify all of the red pandas that were present at the zoo called 'Ashdale Park' at any time between 01/04/2020 and 31/05/2020, inclusive.

The animals might still be at the zoo or may have moved to another zoo.

Write a query that will list all the red pandas that were at the zoo on any day between these dates.

For each red panda on the list, the animal's individual name and the date that the animal arrived at the zoo, and no other fields, should be listed.

[7 marks]

0 2 . 5 It is proposed that an additional attribute, ZooName, is added to the Animal relation. This will store the name of the zoo that currently has the animal. No other changes would be made to the database.

Describe **one advantage** and **one disadvantage** of adding this new attribute to the relation.

[2 marks]

Advantage

Disadvantage

0 3 A shop that sells items through a website uses a relational database to store information about the products that it sells and the sales that it has made.

Figure 6 shows the structure of the relations in the database.

Figure 6

Product(ProductID, Description, QuantityInStock, SupplierID)

Sale(SaleID, CustomerID, SaleDate)

SaleLine(SaleID, ProductID, QuantitySold)

Customer(CustomerID, Forename, Surname, EmailAddress)

Supplier(SupplierID, SupplierName, SupplierEmail)

- The Product relation stores information about the products that the shop sells and who supplies them. Each type of product is identified by a unique number and has a brief description. For example, ProductID 1 has the Description 'A4 Ring Binder – Purple'. The QuantityInStock indicates how many of the product the shop currently has in stock.
- The Sale and SaleLine relations are used to record the details of the sale of products to a customer. Each sale is identified by a unique SaleID, which is a number.
- The Customer relation stores the details of customers who have registered on the website so that they can purchase products. Each customer is identified by a unique CustomerID, which is a number.
- The Supplier relation records the details of companies who supply the products to the shop. Each supplier is identified by a unique SupplierID, which is a number.

0 3 . 1 Shade **one** lozenge to indicate which of the listed assumptions has been made when the database was designed.

[1 mark]

A A customer cannot be added to the database until a sale has been made to them. ⬭

B Each product is only supplied by one supplier. ⬭

C Each supplier only supplies one product. ⬭

D Only one sale can be made to a customer on a particular date. ⬭

E Two different products cannot be purchased as part of the same sale. ⬭