AQA Computer Science A-Level

4.10.3 Database design and normalisation techniques

Past Paper Questions

June 2012 Comp 3

9 A library uses a database management system (DBMS) to store details of the books that it stocks, its members and the loans that it has made. These details are stored in a database using the following three relations:

Book(BookID, Title, Author, Publisher)

Member(MemberID, Surname, Forename, HouseNumber, StreetName, Town, County, Postcode, DateOfBirth, EmailAddress)

Loan(MemberID, BookID, LoanDate, DueBackDate, Returned)

The library does not stock more than one copy of the same book.

9 (b) The relations in this database have been fully normalised.

State **two** properties that the relations in a fully normalised database must have.

Property 1: .....

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Property 2: .....

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(2 marks)

9 (f) The system requirements have changed. The library now needs to be able to stock more than one copy of the same book. Two different copies of the same book will have the same BookID.

Explain how the database design could be modified to meet this new requirement, whilst ensuring that the database remains normalised.

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(3 marks)

June 2017 Paper 2

1 0 A garage services and repairs cars. It uses a relational database to keep track of the jobs that customers have booked for it to carry out. The database includes jobs that have been completed and jobs that are waiting to be done.

The details of the jobs that the garage does, together with the parts that it stocks and uses are stored in the database using the four relations shown in **Figure 7**.

Figure 7

Job (JobID, CarRegNo, JobDate, InGarage, JobDuration)

Car (CarRegNo, Make, Model, OwnerName, OwnerEmail, OwnerTelNo)

Part (PartID, Description, Price, QuantityInStock)

PartUsedForJob (JobID, PartID, QuantityUsed)

- Each car has a unique CarRegNo.
- A type of car can be uniquely identified by the combination of its Make and Model. Different Makes may use the same Model name and a particular manufacturer (Make) will produce several different car Models.
- A booking made for a car on a particular date counts as one job, regardless of how many different tasks are completed upon it.
- A job might require the use of any number of parts, including zero.
- Some of the details are stored in the database as soon as a booking is made and others are only added when a job has been completed.

The attribute JobID is the Entity Identifier (Primary Key) of the Job relation.

It has been suggested that the owner details (OwnerName, OwnerEmail, OwnerTelNo) should not be stored in the Car relation and that a new relation should be created to store owner details separately from car details.

1 0 . 2 Explain why storing the owner details separately would improve the design of the database.

[2 marks]

There are restrictions on which parts can be fitted to which cars. For example:

- The driver's door mirror with PartID 104 can only be fitted to one particular make and model of car.
- The ignition switch with PartID 27 can be fitted to any model of car for one particular make as the maker uses the same ignition switch in all models.
- The tyre with PartID 97 can be fitted to a wide range of cars of different makes and models as it is a standard size.

If the information about which parts could be fitted to which makes and models of cars were represented in the database, it could be used to help a mechanic identify the correct parts to use for a job.

1 0 . 7 Explain how the database design could be modified to represent which makes and models of car a part can be fitted to.

[3 marks]

June 2013 Comp 3

9 A company sells furniture to customers of its store. The store does not keep the furniture in stock. Instead, a customer places an order at the store and the company then orders the furniture required from its suppliers. When the ordered furniture arrives at the store a member of staff telephones or e-mails the customer to inform them that it is ready for collection. Customers often order more than one type of furniture on the same order, for example a sofa and two chairs.

Details of the furniture, customers and orders are to be stored in a relational database using the following four relations:

Furniture(FurnitureID, FurnitureName, Category, Price, SupplierName)

CustomerOrder(OrderID, CustomerID, Date)

CustomerOrderLine(OrderID, FurnitureID, Quantity)

Customer(CustomerID, CustomerName, EmailAddress, TelephoneNumber)

9 (a) These relations are in Third Normal Form (3NF).

What does this mean and why is it important that the relations in a relational database are in Third Normal Form?

Meaning: .....

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(2 marks)

Why important: .....

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(2 marks)

Specimen Paper 2

0 9 . 2 Relations in a database should usually be fully normalised.

Define what it means for a database to be fully normalised.

[2 marks]