



10.5 Client server databases

Name: _____

Class: _____

Date: _____

Time: **72 minutes**

Marks: **50 marks**

Comments:

Q1.

Employees at a bank use client computers to access data that is stored on a database server.

The database server uses software to query and modify data stored in a database on hard disk drives. It returns the results of these queries to the clients over the bank's computer network.

The performance of the system is unsatisfactory: the time-delay between a client sending a query to the server and the client receiving the results is unacceptably long.

Explain how the performance of the system might be improved. You should consider the following factors that might be affecting the performance:

- the hardware of the server
- the design of the computer network
- the database and software running on the server.

In your answer you will be assessed on your ability to follow a line of reasoning to produce a coherent, relevant and structured response.

(Total 12 marks)

Q2.

A government agency is responsible for storing information about vehicles and their owners. Each vehicle that is driven must be registered with this agency. Vehicles must be insured to be driven, so the agency also keeps a record of vehicle insurance policies.

Details of the vehicles, owners and insurance policies are stored in a relational database using the following three relations:

Vehicle(RegistrationNumber, OwnerID, Manufacturer, Model, Colour, EngineSize, DateRegistered)

Owner(OwnerID, Title, Forename, Surname, HouseNumber, Street, Town, Postcode)

Insurance(PolicyNumber, RegistrationNumber, DateStarted, PolicyType, ExcessAmount)

In this system, the following restrictions apply to some attributes:

- RegistrationNumber: a mixture of exactly 7 letters and numbers, eg MA11FXB
- EngineSize: a whole number value representing the capacity of the engine, eg 1597
- PolicyType: can be either 'Comprehensive' or 'Third Party' and nothing else
- ExcessAmount: a monetary value, eg 100

- (a) Complete the following Data Definition Language (DDL) statement to create the Insurance table, including the key field.

```
CREATE TABLE Insurance (
```

(3)

- (b) The owner of the vehicle with registration number DF24JUT has had his car repainted so that its colour is now pink.

Complete this SQL statement to update the data in the Vehicle table to reflect this change.

UPDATE _____

SET _____

WHERE _____

(2)

- (c) A police officer is following a car with registration number AB72XHC. She wants to use the computerised system to check some details about the car and its owner.

Write an SQL query that could be used to retrieve the Model and Colour of the car and the Forename and Surname of the car's owner.

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(4)

- (d) The police officer requests the information using a hand held terminal that connects to the Internet. She types the vehicle registration number into a form on a secure webpage and the details about the car and owner are then displayed in the web browser on the terminal.

A server-side script is used to search for the required information.

- (i) Explain what a server-side script is.

(2)

- (ii) The server-side script includes the statement:

```
RegNo = Request("RegistrationNumber")
```

Explain what this statement does when executed.

(2)

- (iii) The server-side script includes the statement:

```
Response.Write("Owner is " + Forename + " " + Surname)
```

Explain what this statement does when executed.

(2)

The definitions of the three relations in the database are repeated here.

Vehicle(RegistrationNumber, OwnerID, Manufacturer,
Model, Colour, EngineSize, DateRegistered)

Owner(OwnerID, Title, Forename, Surname, HouseNumber,
Street, Town, Postcode)

Insurance(PolicyNumber, RegistrationNumber,
DateStarted, PolicyType, ExcessAmount)

- (e) The database is to be extended to store information about vehicle safety certificates. Each year, a vehicle must be taken to a garage where it will be tested. If the vehicle passes the test, a certificate will be issued. Each certificate will have a unique Certificate Number. Certificates will last for 12 months so the date that a certificate is issued must be recorded, as must the name of the garage that issued the certificate.

The database must keep a record of all the certificates that have been issued for each vehicle. For a particular vehicle this will include the current certificate together with any certificates that have been issued in the past.

Explain how you would change the design of the database so that the information about safety certificates can be stored.

(3)
(Total 18 marks)

Q3.

A company is building an e-commerce website. The website will display details of the products that the company sells and allow customers to place orders. Customers must register on the website before they can place an order and each order can be for one or more different products.

The product, customer and order details will be stored in a relational database. It was originally proposed that the following three relations were required:

Product(ProductNumber, ProductPrice, ProductDescription, QuantityInStock)

Order(OrderNumber, OrderDate, CustomerID, OrderingComputerIPAddress, ProductNumber, Quantity)

Customer(CustomerID, CustomerName, Address, Postcode, EmailAddress, PaymentCardNumber)

The computer programmer identified a problem with the Order relation and stated that it should be divided up into two separate relations:

Order(OrderNumber, OrderDate, CustomerID, OrderingComputerIPAddress)

OrderLine(OrderNumber, ProductNumber, Quantity)

- (a) Describe the problem that the programmer identified with the original Order relation and explain what the cause of this problem was.

(2)

- (b) Complete the Entity-Relationship diagram below to show the degree of any **three** relationships that exist between the entities.

Customer

Product

Order

OrderLine

(3)

- ## CREATE TABLE Product

()

- Explain what a *server-side script* is.

(2)

- (e) The definitions of the four relations in the database are repeated here so that you can answer the questions on these pages without having to turn back in the question booklet.

Order(OrderNumber, OrderDate, CustomerID, OrderingComputerIPAddress)

OrderLine(OrderNumber, ProductNumber, Quantity)

Customer(CustomerID, CustomerName, Address, Postcode, EmailAddress, PaymentCardNumber)

A customer can add a product to an order by loading the product's web page, typing the quantity of the product required into a text box and then pressing the order button on the page. The web browser then sends the ProductNumber and Quantity to the web server.

After the user has pressed the order button, the CGI script shown below is executed.

Line No

```
1.  ProdNum = Request("ProductNumber")
2.  SaleQuant = Request("Quantity")
3.  ProdDetails = ExecuteSQL("SELECT ProductPrice
                             FROM Product WHERE ProductNumber = " + ProdNum)
4.  ItemPrice = ProdDetails.GetField("ProductPrice")
5.  TotalPrice = ItemPrice * SaleQuant
6.  Response.Write ("Total Price is " + TotalPrice)
```

(i) Explain the purpose of lines 1. and 2. of the CGI script:

```
ProdNum = Request("ProductNumber")
SaleQuant = Request("Quantity")
```

(2)

(ii) Explain the purpose of line 3. of the CGI script:

```
ProdDetails = ExecuteSQL("SELECT ProductPrice
                          FROM Product WHERE ProductNumber = " + ProdNum)
```

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(2)

(iii) Explain the purpose of line 6. of the CGI script:

```
Response.Write ("Total Price is " + TotalPrice)
```

(1)

(f) A web page is required that will display a summary of the products that are on a particular order.

The summary must include only the ProductNumber, ProductDescription,

ProductPrice and the Quantity of the product that has been ordered. These must be displayed in ascending order of ProductNumber.

Write an SQL query that will find the data needed to produce the order summary web page for order number 4013.

(5)

(Total 20 marks)

