

11 Big data		Name:	 	
5		Class:	 	
		Date:	 	
Time:	50 minutes			
Marks:	37 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.

One characteristic of a data set that might result in it being classified as Big Data is that it contains a variety of different forms of information.

Describe **two other** characteristics that might result in a data set being classified as Big Data.

Characteristic 1: \_

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#### Characteristic 2: \_\_\_\_\_

(Total 2 marks)

## Q3.

In a fact-based model, data is represented as atomic facts, which are immutable (ie will never change). Fact-based models can be represented visually using a graph schema.

The figure below shows part of a graph schema for a data set about deliveries made to stores by trucks.



Sheffield

Complete the graph schema in the figure above to represent the following additional facts.

- Truck MJ15HWE has made a delivery to the Sheffield store.
- Truck PT63JTR was last serviced on 10 May 2018 and truck MJ15HWE was last serviced on 18 March 2018.
- Both of the trucks are owned by a haulage company called Ferguson's which has 15 employees and has a head office in Bolton.

(Total 3 marks)

## Q4.

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(<u>OwnerID</u>, 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.

	Insuran	ce table	, includi	ng the k	key field	•					
	CREATE	TABLE	Insura	ince (							
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<b>b</b> )	The ow	nor of th	no vohio	lo with	odictro	ion nur	nhor D		haa h	ad hic /	oor
b)	I he ow repainte	ner of tr d so tha	ne vehic at its col	le with i our is n	egistrat	ion nur	nber D	F24JUI	has h	ad his (	car
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	Comple change.	te this S	QL stat	ement t	o updat	e the d	ata in t	he Vehi	cle tab	le to re	flect this
	UPDATE_						_				
	SET				- 62		-				
	WHERE _										
							- 1				
c)	A police	officer	is follow	ving a c	ar with r	egistra	tion nu	mber Al	372XH	C. She	wants t
. ,	use the	comput	erised s	ystem t	o check	some	details	about th	ne car	and its	owner.
	Write ar	n SQL q	uery tha	t could	be used	l to retr	ieve th	e Mode	l and C	olour c	f the ca
Y	and the	Forena	me and	Surnam	ne of the	e car's o	owner.	Λ	C	<b>ГI</b> (	7
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(3)

(2)

(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.
(ii)	The server-side script includes the statement:
	<pre>RegNo = Request("RegistrationNumber")</pre>
	Explain what this statement does when executed.
(iii)	The server-side script includes the statement:
	Response.Write("Owner is " + Forename + " " + Surname)
	Explain what this statement does when executed.
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Vehicle(<u>RegistrationNumber</u>, OwnerID, Manufacturer, Model, Colour, EngineSize, DateRegistered) Owner(<u>OwnerID</u>, Title, Forename, Surname, HouseNumber, Street, Town, Postcode) Insurance(<u>PolicyNumber</u>, 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.

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hospitals

Q5.

- health centres/GPs' (doctors') surgeries
- pharmacies (chemists).

## The UK government is proposing to computerise and network the entire National Health

Service (NHS) so that it will be possible to have on-line access to the system at a level of security relevant to their status for anyone who

- works for the NHS
- uses its services
- works at a branch of government responsible for the NHS.

Patient records will be stored in multi-user distributed relational databases managed by *Database Management Systems* (DBMS).

- Every person in the UK is assigned a unique numeric key, *the patient reference number*, and is assigned for primary health care to a doctor in a health centre or a GPs (General Practitioner's or doctor's) surgery located in a single building.
- A person's doctor may, if necessary, arrange for the person to see a specialist doctor in a hospital.
- Drugs prescribed for a person by the person's GP for the treatment of an illness are obtained from a pharmacy.
- Every computer in the service of the NHS will be interconnected in *local area networks* (LANS) and the *local area networks* will be interconnected by a *wide area network* (WAN).

Which network type is most appropriate, WAN or LAN, within a health centre or GPs	
(doctor's) surgery? Justify your choice.	

(Total 2 marks)

