X216/701

INFORMATION
SYSTEMS
ADVANCED HIGHER

Attempt **ALL** of Section I and **ONE** part of Section II.

Section I—Attempt all questions.

Section II—This section has two parts.

    Part A—Information Systems Interfaces
    Part B—On-line Database Systems

Choose **ONE** part and answer all of the questions in this part.

Use a separate answer book for each section.

SECTION I

Complete ALL questions in this section.

Marks

1. GreenGnomes is a local garden supplies company. The manager of GreenGnomes has decided to develop a database system that will be used to track stock and sales. Presently, the tracking of stock and sales is paper-based. It is hoped that the database system will improve productivity and profitability.

(*a*) An initial investigation of the paper-based system is carried out and a number of outputs are identified. Name **two** outputs that result from the initial investigation of the system.

2

(*b*) Describe **two** information gathering techniques that could be used by the systems analyst during the preliminary investigation of the current system at GreenGnomes. You should explain the relevance of each method selected for the situation described above.

4

(*c*) Having completed the initial investigation of the current system, the analyst produces the *Systems Specification*. Outline the content of this document and explain its importance.

3

(*d*) (i) Describe **two** types of testing that could be carried out on the database system for GreenGnomes once it has been fully developed.

   (ii) Other than types of testing, name **two** additional items that should be included in the test plan for the GreenGnomes database system.

4

(*e*) Recommend the conversion technique that would be the **most** appropriate method of changeover from the paper-based system to the new database system being developed for GreenGnomes. You must justify the technique by providing **two** clear reasons.

2

(*f*) After the database system has been operational for some time, various maintenance tasks are carried out on the system. What type of maintenance would be required in each of the following situations?

   (i) The manager of GreenGnomes upgrades the operating system software.

   (ii) The manager of GreenGnomes suggests that a spell-check facility should be added to the system.

   (iii) The manager of GreenGnomes would like to update the product catalogue.

3

(*g*) Describe **four** tasks that would be carried out whenever maintenance of an existing system is required.

4

2. Rochester College is a Further Education college. The application and enrolment procedures at the college are described below.

Marks

> Students, wishing to enter the college, complete an application form. On receipt of the application form, the details of the potential student are added to the applicant file. The Admissions Secretary uses the details in the applicant file to decide whether to make the applicant an offer or reject the applicant. When an offer is made, details of the offer (including personal details of the applicant stored in the applicant file) are stored in the offers file and the status of the offer is set to "unconditional" or "conditional" to indicate whether or not the offer is dependent on future exam results. If the student is rejected, the status of the applicant is set to "rejected". At the start of each session, the details held in the applicant file are archived.
>
> Any student who receives a conditional or unconditional offer may decide to withdraw their application at any time. When this happens, the Admissions Secretary must remove the offer from the offers file. If a student decides to accept an offer, the Admissions Secretary sets the status of the offer to "accepted".
>
> All accepted students must enrol at the start of their course. At this point, details of the students, presently held in the offers file, are now added to the enrolment file. Details of any enrolled students, who withdraw from a course, are archived one month after their withdrawal.
>
> In the event of ill-health, an enrolled student may need to suspend studies. If this happens, the status of the student's enrolment is set to "suspended". When the student returns to their course, their enrolment status is set to "returned".

(*a*) Produce an entity/event matrix for the college application and enrolment system described above. **5**

(*b*) Produce an entity life history diagram for the enrolment entity. Your entity life history **should** be based on the entity/event matrix produced in part (*a*) above. **4**

[Turn over

Marks

3. Dave and Jo are working on a large database system project. Dave is responsible for producing the logical design of the system and Jo is responsible for developing its user interface.

(*a*) Dave uses a *graphical design notation* to create process descriptions.

   (i) Describe **one** benefit of using a graphical design notation compared with using *Structured English* to produce process descriptions.

   (ii) Describe **one** drawback of using a graphical design notation compared with using Structured English to produce process descriptions.   **4**

(*b*) Jo considers two options for the development of the user interface: the use of *Rapid Application Development* (RAD) tools or the use of a traditional graphical design approach.

Example of RAD Developed Interface   Example of screen Layout/Design

   (i) Outline **two** advantages of producing a user interface using RAD tools rather than using a traditional design approach.

   (ii) There are a number of possible drawbacks to creating a database system with rapid application development tools. Explain **one** possible drawback and why this might occur.   **4**

4. "Stars" is an agency that supplies "look-alikes" for parties or functions throughout Scotland.

Construct an Entity Relationship Diagram for the "Stars" agency based on the scenario below. Your diagram should indicate:

- optional/mandatory relationships
- cardinality of all relationships
- weak/strong entities
- weak/strong relationships.

When a look-alike joins the "Stars" agency, a contract is issued which contains details of:

- the look-alike (<u>lookalike#</u>, name, address, phone number, e-mail, starname)
  Note: starname refers to the name of the star that the look-alike claims to look like
- the contract (<u>contract#</u>, lookalike#, start date, length of contract).

The agency keeps records of all contracts issued over the past seven years. Many of the look-alikes have been issued with several contracts over this period of time.

When a customer books a look-alike for an event, a booking form is completed. The booking form records details of:

- the customer (<u>customer#</u>, name, address, phone number, e-mail)
- the booking (<u>customer#</u>, <u>event date</u>, starname, venue, cost)
- whether or not cancellation insurance is taken out by the customer to cover cancellation of the event. If required, this includes insurance policy details (<u>policy#</u>, customer#, event date, premium).

One booking form is required for each look-alike being booked for an event. A customer can only book one look-alike for any given date. Once a booking has been received, the "Stars" agency allocates a suitable look-alike to the event.

6

[Turn over

5. The following tables are part of an on-line ordering system that specialises in gardening equipment.

CustomerID	Name	Address
3078	John Sharkey	26 Oransay Grove
5927	Edith Whitburn	Flat 2, 117 Spiers Road
2253	Maria Mazzoni	19 Douglas Park Ave
1183	Lee Ho Chu	2 Oransay Grove

CustomerID	ProductID	Date	Quantity
5927	4492	12/05/2007	4
5927	6228	12/05/2007	2
5927	6229	12/05/2007	1
2253	4002	18/05/2007	1
5927	8852	29/05/2007	2
3078	9572	30/05/2007	1
3078	9510	30/05/2007	2

ProductID	Name	Price
9572	15 m hose	£19.99
4492	Citronella candles	£4.99
6228	Ceramic planter 12"	£8.99
6229	Ceramic planter 16"	£10.99
4002	Table top gas heater	£34.99
8852	Bamboo cane 9"	£2.50
9510	Pine trellis 6ft × 8ft	£19.99

State the functional dependencies that exist in each of the tables.   **3**

6. A DVD-club specialises in obscure DVDs that are not readily available from other sources. The club lends only to members, and membership is for one year. The club is set up along the lines of a conventional library, although members are not restricted to the number of DVDs they may borrow at one time. DVDs are only requested for return if required by another member. Most active users of the library regularly change their DVDs. Several copies of popular titles are normally available.

> In order to borrow a DVD, a member takes it to the Issue Desk and gives it to the librarian along with his/her club membership number. The librarian takes the DVD ID card from the DVD case and adds the membership number to it. The librarian places the DVD ID card into the loans file and the member leaves with the selected DVD.
>
> To reserve a DVD which is on loan, a member gives details of the DVD to the librarian and provides his/her membership number. The librarian finds the relevant DVD ID card in the loans file and adds the member's membership number to the reservations column of the card. The librarian also makes a note of the member who has the loan and sends him/her a Return Request card (the address is taken from the library copy of the club membership book).
>
> When a member returns a DVD and presents it to the librarian, the librarian finds the DVD ID card in the loans file and checks if the DVD is reserved or not. If not reserved, the librarian places the DVD ID card in the DVD case before returning the DVD to the library shelves. If reserved, the DVD is put under the counter and a Reservation Ready card is sent to the member who requested the reservation (again, the address is taken from the club membership book).
>
> When the librarian receives new DVDs from the club management committee, a new DVD ID card is completed and inserted in the DVD case.

A systems analyst has completed an initial investigation of the system and produced the Level 0 Data Flow Diagram (DFD) shown below. Produce a Level 1 DFD based on this Level 0 DFD.
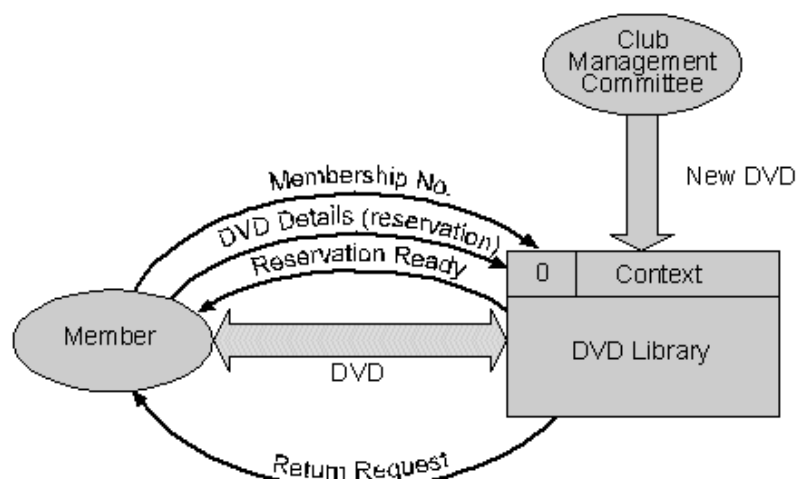
[END OF SECTION I]

12

(60)

Attempt Part A or Part B

Part A—Information Systems Interfaces

Answer ALL of the questions in this part.

Marks

7. KuteKuts is a large chain of hairdressing salons. Clients can make appointments with any one of the stylists by telephone or in person. The managing director of KuteKuts would like to introduce a computerised appointment system. A design team is working on the development of the user interface for the new system.

   (*a*) (i) What is the purpose of the *envision* stage of the *Logical User-Centred Interaction Design* (*LUCID*) framework?

   (ii) Who is involved in the envision stage of the interface design? **3**

   (*b*) The designers of the user interface for the appointment system, plan to incorporate both *graphical* and *textual modes* in the interface.

   (i) Suggest **one** use that could be made of **each** mode of interface in an appointment system for a hairdressing salon.

   (ii) Explain why an *auditory* interface would be inappropriate for the appointment system. You should justify your answer by providing **two** clear points. **4**

   (*c*) The design team produce a *low fidelity prototype* of the user interface.

   (i) Explain the importance of prototyping in the design of the appointment system.

   (ii) Outline the merits of producing a low fidelity prototype rather than a *high fidelity* prototype. **4**

   (*d*) The incomplete Entity Relationship Diagram below shows the entities and relationships that exist in the computerised appointment system for KuteKuts. Although the cardinality of the relationships is indicated on the diagram, the optionality and type of each relationship has yet to be determined.
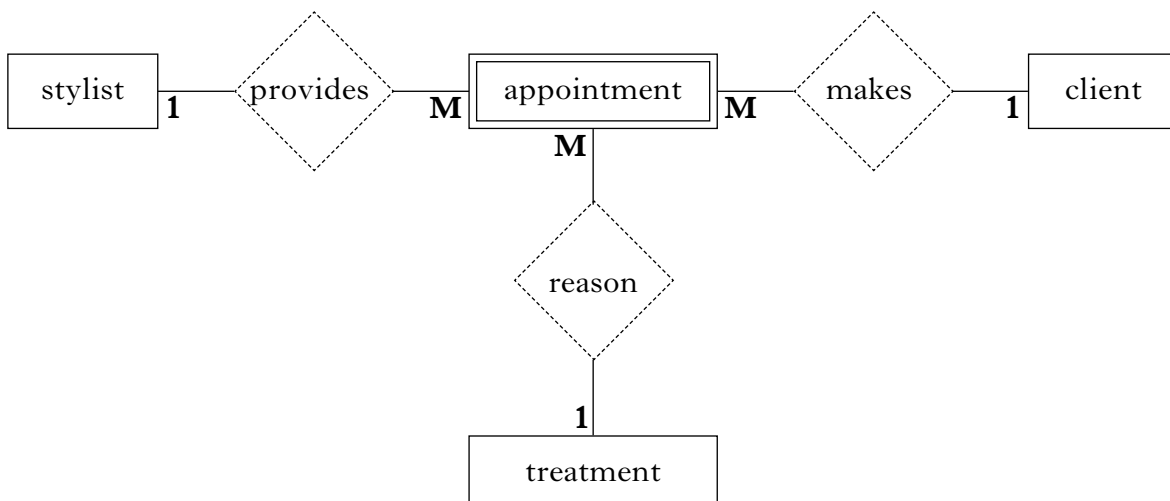
7. (*d*) (continued)

(i) One record from the appointment entity is shown below.

Stylist # – GER1
Client ID – SHM105
Treatment Code – CBD
Date – 5/6/07
Time – 3.45pm

Create a data dictionary for the appointment entity. You must indicate the primary key of the entity, the data type, size, validation and indexing required for each attribute in the entity.

(ii) Explain the term *weak entity*. Your answer should refer to the Entity Relationship Diagram above.

(iii) Relationships between entities can be *strong* or *weak*. Explain how the type of relationships between entities is determined.

6

[Turn over

8. A new natural history museum is opening in July 2007. The museum exhibits include a range of interactive information kiosks that can be used by visitors to the museum. The kiosks have been designed to take account of differing user ability levels and the requirements of visitors with disabilities or special needs.

(*a*) Name and describe **three** *inspection methods* that may be employed in the testing of the kiosks.

3

(*b*) The museum curators are keen that the kiosks make use of *natural language interaction*. Explain how the system could make use of **two** features of natural language interaction.

4

(*c*) During the release stage of the product, the developers consider how successful the kiosks have been in the museum. Recommend **two** *inquiry methods* that could be used to determine usability issues that must be addressed in any future upgrades to the kiosks. Justify your recommendations.

4

9. Judy is working on the development of a graphics application for young children. The application must have the same functionality as a traditional paint package with the additional requirements of being fun to use and simple enough to be accessible by 4-6 year olds.

(*a*) Before starting on the development of the graphics application, Judy carried out a *Feasibility Study*.

  (i) Select **two** factors that would be considered when carrying out the *technical* feasibility of the development.

  (ii) Suggest **one** example of when a development would be considered legally infeasible. **3**

(*b*) Describe a suitable interface for the graphics application in terms of its input and output devices. **2**

(*c*) What type of *quantitive measurement technique* could be used to determine how quickly young children learn to use the graphics application? Justify your choice of technique. **2**

(*d*) *Thinking aloud* and *question-asking* are two *qualitative techniques* that can be used to test the usability of the graphics application.

  (i) Give **one** advantage and **one** disadvantage of each technique over the other. You must make **four** distinct points to gain full marks.

  (ii) Which of these techniques would be more appropriate in each of the following situations? You must use each technique only once.

    (A) Judy wants to investigate the success of the graphics application in terms of user satisfaction.

    (B) Judy wants to know the thought processes of children using the clip art stamp feature of the application. **6**

(*e*) Describe **two** special requirements that must be taken into account by Judy when producing the *user documentation* for this graphics application. **2**

[Turn over

10. McGlynn's Refuse Unit is a company specialising in the disposal and recycling of waste from businesses. A system has been developed to co-ordinate the activities of the company. Several sample screens from the system are shown below.
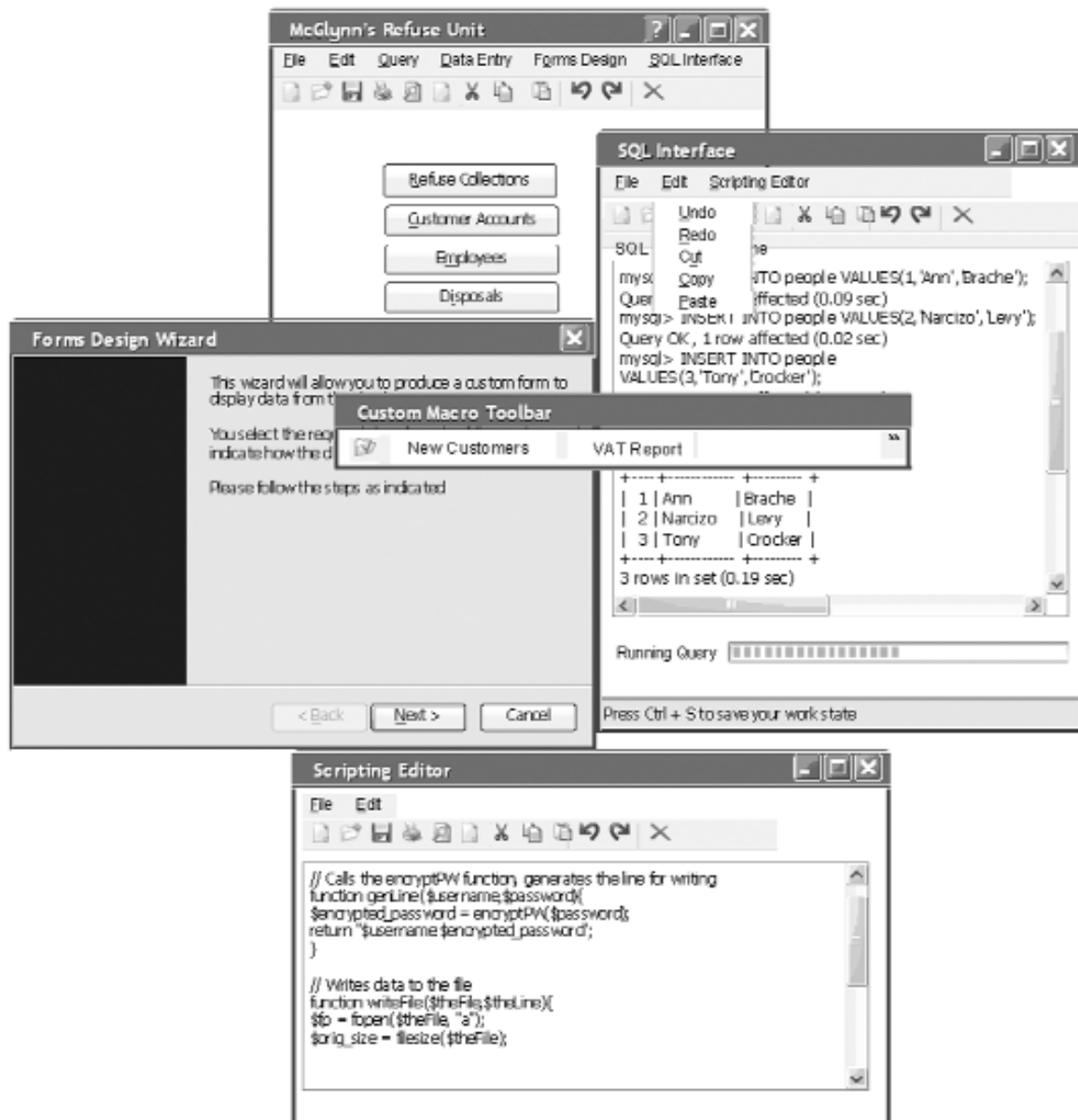
(*a*) With reference to the above sample screens, select **one** feature of the user interface which meets the needs of the following users of the system. You must justify your selection in each case, by making **two** clear points.

  (i) *Novice*

  (ii) *Knowledgeable intermittent*

  (iii) *Expert frequent*   **6**

(*b*) Select **one** *semantic* operation shown in the sample screens. Describe **two** different *syntaxes* for completing this operation that are illustrated in the sample screens.   **2**

10. **(continued)**

(*c*) A user interface is required to allow Refuse Collection data to be entered. The Refuse Collection Data interface will use the following database fields.

> Collection Date (date type ie dd/mm/yyyy)
> Collection Type (one from Green Waste, Glass, Plastic, Paper and Mixed)
> Collection Location (text: 40 characters)
> Customer Name (text: 40 characters)
> Customer Post Code (text: 8 characters)
> Customer Address (text: 300 characters)
> Collection Vehicle (text: 8 characters, in registration number format)
> Driver (text: 40)
> Disposal Instructions (text: 250 characters, instructions specific to this collection)
> Customer Contact Number (text: 20 characters)

   (i) Sketch a suitable user interface to allow entry of the above fields.

  (ii) On this user interface you should indicate opportunities to use elements of *intelligent interface design*. These elements must be clearly linked to specific fields on the form. **6**

(*d*) The developer of the database system develops an algorithm using *Structured English*. The algorithm is used to allow users to enter a rating for each refuse collection. The algorithm is shown below.

```
1.  Enter user rating value
2.  Validate user rating value
3.  Store rating value in database

1.1  Prompt user to enter value
1.2  User enters value

2.1  Repeat
2.2    If ((rating value <0) or (rating value >100)) Then
2.3         Prompt user to re-enter value
2.4    End if
2.5  Until ((rating value >=0) AND (rating value <=100))

3.1  Connect to database
3.2  Store rating value and content id in ratings table
```

With reference to the above Structured English, generate **four** items of test data for each type of test data value in (i), (ii) and (iii) below.

  (i) *Normal*

  (ii) *Extreme*

 (iii) *Exceptional* **3**

Part B—On-line Database Systems

Marks

Answer ALL of the questions in this part.

11. Allan James is a Web designer. He spends much of his time making small changes to the static Web pages which he has created for his clients. Rather than continue to make these changes for his clients, Allan suggests that he develops *Content Management Systems* for them.

    (*a*) Allan uses a project management technique to plan and monitor the development of the content management systems. In his original plan, Allan allocated 5 days for the production of graphics. However, the graphic design company, which has been contracted to produce the graphics, has told James that the graphics will take a total of 12 days to produce.

    Name **one** project management technique. Explain how Allan could use this technique to ensure that the deadline for the production of the system is still met even though the graphics will take longer to produce than originally planned. **4**

    (*b*) Name and describe **three** features of a typical *Content Management System* (CMS) relating to content control and publication. **6**

    (*c*) Allan develops a ratings system to allow customers to allocate a rating to each content item. He uses *Structured English* to produce an algorithm for the ratings system. The algorithm is shown below.

```
1.  Enter user rating value
2.  Validate user rating value
3.  Store rating value in database

1.1 Prompt user to enter value
1.2 User enters value

2.1 Repeat
2.2   If ((rating value <0) or (rating value >100)) Then
2.3        Prompt user to re-enter value
2.4   End if
2.5 Until ((rating value >=0) AND (rating value <=100))

3.1 Connect to database
3.2 Store rating value and content id in ratings table
```

    With reference to the above *Structured English* generate **four** items of test data for each type of test data value in (i), (ii) and (iii) below.

    (i) *Normal*

    (ii) *Extreme*

    (iii) *Exceptional* **3**

12. www.historyofmytown.co.uk is being developed. The developers of this website hope to provide visitors with the history of many Scottish towns. The site will include a search facility that allows visitors to enter the name of a Scottish town. The website will access a database containing vast amounts of historical data, both textual and graphical. If details of the town are held in the database, they will then be displayed for the visitor on a separate Web page.

Several layers of software are required to support the historyofmytown website. The diagram below represents the interactions between the various layers of software.
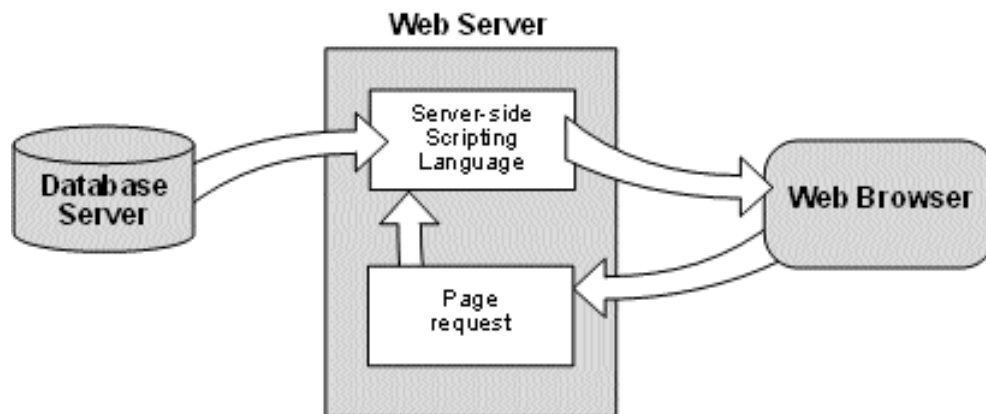
(*a*) Explain the role of the database server in accessing the historyofmytown website. **2**

(*b*) Explain the role of the server-side scripting language in accessing the historyofmytown website. **2**

13. www.mackisons.co.uk is a website that allows registered customers of Mackisons to order grocery items on-line. Customers can browse an on-line catalogue of items and order those items that are required. Once an order has been completed and a suitable delivery date and time identified, the customer then pays for the goods using either a credit card or debit card.

(*a*) (i) Suggest **three** tables that are required as part of Mackisons *e-commerce* application described above. Your answer should identify the contents of each table.

(ii) Describe how **each** of these tables would be used within the Mackisons e-commerce application. **6**

(*b*) Mackisons e-commerce application makes use of *Electronic Data Interchange* (EDI) to exchange data with grocery suppliers.

(i) Explain the need for *transaction standardisation* when carrying out EDI.

(ii) Describe **two** *legal restrictions* that would apply to the use of EDI in this system. **4**

14. A company is developing an on-line customer relationship management system.

(*a*) The development team wants to upgrade the software before the development work begins. The members of the team have considered upgrading their existing commercial software but have decided to investigate the possibility of using *open-source* software.

Describe the benefits to the development team of using open-source software. Your answer should relate to:

- security
- flexibility and adaptability
- on-going support.　　　　　　　　　　　　　　　　　　　　　　**6**

(*b*) The development team host their Web-pages and on-line databases with a company called "7-24 Hosting".

- the Web server address is – `"http://www.724hosting.com"`
- the database server address is – `"dbserver.724hosting.com"`
- the database name is – `"dbocrm"`
- the username is – `"dbadmin"`
- the password is – `"hollywood247"`

Name a server-side scripting language with which you are familiar. Use this language to generate the scripting code required to connect to this database.　　　　　　　　　　　　　　　　　　　　　　**4**

(*c*) As part of the development, a form is created to allow details of customer complaints to be recorded. Server-side scripts are written which allow the content of the form to be processed by the server.

State **one** benefit and **one** drawback of using server-side scripts in this instance.　　　　　　　　　　　　　　　　　　　　　　**2**

(*d*) The form that is used to record customer complaints collects:

- the customer name
- the date of the complaint
- details of the complaint itself (which is not more than 200 characters).

Once the form has been submitted, it is then processed by a script called `complaints.php`.

Generate the HTML code to produce the required form.　　　　　**4**

15. www.BoxClever.net is a new on-line Web store for computer games enthusiasts. The site will offer discounted games titles for the BoxClever games console. The developers of the site have created a relational database system to store details of members, orders and games. The following tables show sample data stored in each of the three tables in the database system.

MEMBER

MemberID	MemberName	DeliveryAddress	MemberEmail
7056	Steven Sharp	16 Braemar Drive, Newtown	ssharp@coldmail.net
8117	Ruth Walton	2 Orange Cottage, Ocean View	r.walt@homeshop.co.uk

ORDER

MemberID	Title	OrderDate
8117	BlastOff	15/03/07
7056	TeeUp	21/03/07

GAME

Title	Developer	Genre	Price
BlastOff	GameCorp	Action	£39.99
TeeUp	SportCode	Sport	£34.99
Chase!	SportCode	Driving	£39.99

(a) During the design of the database system, a data dictionary is produced for each entity. Explain how the information contained in the data dictionary is used during the implementation of the database system. **2**

(b) Two features of SQL are *data manipulation language* (DML) and *data querying language* (DQL). Explain the difference between DML and DQL, giving **one** keyword from each. **2**

(c) City Racing, a game in the "Driving" genre, has been developed by GameSoft. It has recently been released for the BoxClever console at a price of £34·99. Generate the SQL statement required to add this new information to the database system. **2**

(d) Generate a SQL statement that will change the price of all "Sport" genre games to £20·00. **2**

(e) Generate a SQL statement to produce a list of all game titles that are available. The title ordered most often should be at the top of the list and full details of all games should be shown. **4**

(f) Generate a SQL statement that will show the titles of the games and full mailing details for all orders in December 2006. **5**

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[*END OF SECTION II—PART B*]

[*END OF QUESTION PAPER*]

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