

X216/701

NATIONAL
QUALIFICATIONS
2011

MONDAY, 16 MAY
1.00 PM – 3.30 PM

INFORMATION
SYSTEMS
ADVANCED HIGHER

Attempt **all** questions in Section I.

Attempt **one** sub-section of Section II.

Part A Information Systems Interfaces
Part B Online Database Systems

Page 12
Page 22

Questions 7 to 10
Questions 11 to 14

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Each section should be answered in a separate answer book.



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SECTION I

Marks

Answer ALL questions in this section.

1. The management of Amity College has decided to develop a new electronic registration system.

(a) At the start of the development, a *feasibility study* is carried out.

(i) Describe **one** factor that would be considered as part of the *economic feasibility*. 1

(ii) Describe **one** factor that would be considered as part of the *legal feasibility*. 1

(b) *Questionnaires* and *interviews* could be used to investigate the current registration system.

Describe **two** other information gathering techniques that could be used. 2

(c) Explain the use made of the *system specification* during *testing*. 2

(d) The *documentation* for the new system will include a *user guide*.

Explain the purpose of a user guide. 2

(e) Once the new system has been developed, *conversion* can take place.

Assume that the current registration system is a paper-based system. Which conversion technique would you recommend? Give **one** reason to support your recommendation. 2

(f) The *evaluation* of the implemented system comments on the system's *ease of use*.

Describe **two** aspects of an information system that will affect its ease of use. 2

[Turn over

SECTION I (continued)

Marks

2. Andrew Class is developing an information system that will be used to record car sales in a garage.

- (a) Andrew produces a *project plan* at the start of the development.

Explain the use made of the project plan in *monitoring* the progress of the development.

2

- (b) State **one** feature of the system that would be considered in the *physical design* that would **not** be considered in the *logical design*.

1

- (c) The implementation of the new information system will include the creation of *tables, forms* and *scripts*.

Give **one** example of how **each** of these components could be used in an information system to record car sales.

3

- (d) Andrew designs a *test plan* for the system being developed. The test plan indicates the *sequence of testing* and the *types of testing* to be performed.

The types of testing should include *systems testing* and *acceptance testing*.

In which sequence should these types of testing be carried out? Justify your answer by describing what is involved in each type of testing.

3

SECTION I (continued)

Marks

3. A radio station keeps a list of all songs played on air. A systems analyst is investigating the existing system used to record the playlists.

- (a) During the investigation of the system, the analyst comes across the following set of instructions issued by the station managers to the programme presenters:

Identify songs for programme playlist before the programme begins.

At the end of the programme:

- put a tick beside each song on playlist that was played on air
- cross off any songs not played
- add to the playlist any songs played that were not on the original playlist

Pass finalised playlist to accounts department for payment.

State the *result from the investigation* that **best** describes the above set of instructions.

1

- (b) The radio station accounts department performs the following tasks:

When a finalised playlist is received:

- in the Song entity, the “number of plays” is increased by 1 of each song in the playlist.

At the end of each calendar month:

- a report showing the “artist name”, “song title” and “number of plays” of each song played during the month is produced.

Copy and complete the partial *entity-event matrix* below using the details provided above.

	Artist	Song	Programme	Playlist
Receive finalised playlist				
Produce report at end of month				

2

[Turn over

SECTION I (continued)

4. Cassandra Beauty Salon uses a paper-based system to record customer appointments for haircuts and beauty treatments.

Customers make an appointment for a given date and time with one member of the salon staff for a single treatment; each member of staff specialises in either hair treatments or beauty treatments.

A sample from the existing appointments book is shown:

Cassandra Beauty Salon

Appointments for: 28/5/2011

Member of Staff

Time	John	Sam	Louise
09:00	Cut colour Mrs Smith 09987654321	Cut blow dry Mr Jones 01377898989	Facial Ms Adams 01234 234 234
09:30			
10:00		Cut colour Miss Reed 01212 885544	Nail treatment Ms Adams 01234 234 234
10:30			
11:00	Cut blow dry F Paterson		Nail treatment Mrs Smith 09987654321
11:30			
12:00	Lunch	Cut blow dry I McVey 01475715000	Nail colour Ms Singh 01775 287654
12:30	Dry trim C Gray 01561 303030		Lunch
	Cut colour		Facial

The salon manager would like to develop an electronic information system to replace the paper-based appointment system.

4. (continued)

- (a) A development team analyses the salon's requirements and produces the following list of attributes that will be required in the new information system:

StaffID
 StaffName
 StaffContactNumber
 StaffStatus
 StaffNINumber
 AppointmentDate
 AppointmentTime
 TreatmentID
 TreatmentDescription
 TreatmentCost
 CustomerID
 CustomerName
 CustomerContactNumber

Taking StaffID as the primary key, *normalise* the attributes listed above to create a solution in third normal form (3NF). You should show all stages of the normalisation process.

The following points should be noted:

- no new attributes may be introduced
- StaffStatus is used to indicate whether the member of staff is fully trained or a trainee
- customers are uniquely identified by CustomerID
- treatments are uniquely identified by TreatmentID.

12

- (b) Customers are given a receipt after paying for their treatments:

 Cassandra Beauty Salon			
Mrs Smith	09987654321		
Date	Time	Treatment Description	Cost
28/05/2011	09:00	Haircut & colouring	£95
	11:00	Nail treatment	£15
		Total	£110

Describe **one** method the developers could use to produce this receipt.

2

5. MealDealz is a web-based service which offers restaurant bookings at discounted rates. People who want to make a last-minute restaurant booking can do so online. The processes involved are described below.

CUSTOMER REGISTRATION

Before searching for suitable offers, customers must first register with the MealDealz service. Customers provide details of their name, address, phone number and e-mail address, and then choose a username and a password for the service. These details are saved in the Customer file.

RESTAURANT REGISTRATION

Restaurants wishing to participate in the service register their name, address, postcode and telephone details, as well as the type(s) of meals they offer. These details are recorded in the Restaurant file.

REGISTER SPECIAL OFFERS

When a restaurant wishes to make special offers available, it sends details of the date, type of meal (lunch or dinner), price, maximum number of diners, and the start and finish time limits of the offer to MealDealz. These details are recorded on the Offer file.

SEARCH FOR OFFERS

To use the search facility, customers must first provide their username and password and have these log-in details verified using the Customer file. They can then search for offers by providing details of the town, number of diners, date, type of meal and a price range. These requirements are used to search the Offer file for suitable matches. Any matches found are sent to the customer. If there are no matches then a “no offers available” message is sent to the customer. To book a particular offer, the customer selects it and details of the customer and the selected offer are passed to the Make Booking process.

MAKE BOOKING

A booking form is sent to the customer, who completes it and returns it to MealDealz. Customers are then asked to confirm or abandon the booking and respond accordingly. Confirmed booking details are added to the Booking file. The Offer file is updated to remove the chosen offer. Copies of the confirmed booking details are passed to the customer and to the restaurant concerned.

Create a *Level 1 Data Flow Diagram* to represent the processes described above.

11

SECTION I (continued)

Marks

6. Madeira School of Magic is developing a new information system to store pupil details. The current system has been analysed and the following entities and relationships have been established.

	pupil	subject	pet	animal	house
pupil		studies (M)	<i>owns</i> (1)		allocated to (1)
subject	<i>studied by</i> (M)				
pet	owned by (1)			is type of (1)	
animal			<i>classifies</i> (M)		
house	is allocated for (M)				

Note: *italics* have been used to indicate relationships that are optional.
 (M) and (1) have been used to indicate the cardinality of the relationship.
 For example: each animal may classify many pets
 each pet is one type of animal.

Details of the attributes stored in each entity are provided below.

Entity	Attributes
pupil	<u>pupilID</u> , firstName, lastName, DOB, *houseName
subject	<u>subjectCode</u> , title, level, credits
pet	* <u>pupilID</u> , petName, *animalType
animal	<u>animalType</u> , classification
house	<u>houseName</u> , colour, symbol, headOfHouse

Note: underlined attributes indicate primaryKeys
 asterisked attributes indicate *foreignKeys

Create an *entity relationship diagram* to represent the entities and relationships detailed above. You should resolve any many-to-many relationships and should clearly indicate:

- all entities, relationships in the system
- weak and strong entities
- weak and strong relationships
- cardinality of each relationship
- whether each relationship is mandatory or optional.

11

[END OF SECTION I]

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SECTION II

Attempt ONE sub-section of Section II

Part A	Information Systems Interfaces	Page 12	Questions 7 to 10
Part B	Online Database Systems	Page 22	Questions 11 to 14

For the sub-section chosen, attempt *all* questions.

[Turn over

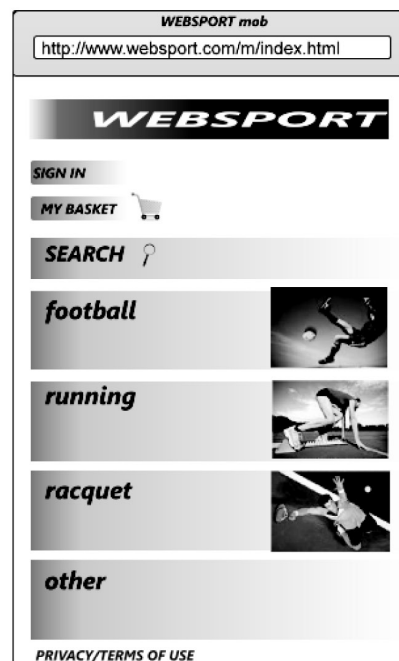
Part A—Information Systems Interfaces

Answer ALL questions in this part.

7. WebSport sells sports equipment to customers via its company website. The company management has recently introduced a separate website interface for users of mobile devices. The two versions of the home pages are shown below.



Standard home page



Home page for mobile devices

- (a) (i) State **one** social factor which has led to the development of the new website interface. 1
- (ii) Name and describe the type of *maintenance* which has taken place in creating the new website interface. 2
- (b) The company could use *surveys* to determine the usability of the original interface for the website. Describe how a survey could be used for this purpose. 2
- (c) (i) Describe **one** use that could be made of an *agent-based* interface on the WebSport websites. 1
- (ii) Describe **one** benefit of your answer to (c) (i) for visitors to the websites. 1
- (d) (i) The time taken by users to search for running shoes on the two interfaces is compared. State which *quantitative technique* is being used in this situation. 1
- (ii) At a later date, timings are repeated for users who have not used the website during the period since the first testing. State which quantitative technique is now being carried out. 1

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

7. (continued)

- (e) The WebSport websites adhere to *web accessibility guidelines*. Explain what is meant by this. **1**

- (f) Devices used to access the websites are classified as either “standard” or “mobile”. The WebSport web server is programmed to detect the type of device accessing the websites and then send the correct version to the device. This ensures that mobile phone users accessing the WebSport website receive the reduced content interface for the website.

- (i) Part of the design to carry out this task is described using *structured English*:

```
Get device type
If device type is "standard" then send standard home page
```

Produce the structured English description needed to ensure that mobile phone users receive the correct content. **2**

- (ii) The structured English design below allows users to “sign in” to the WebSport websites. The design contains **one** error.

```
When "sign in" option selected
Ask for username
Ask for password
If username is correct then login successful
```

Describe the error in the design of the “sign in” process. **1**

- (iii) The “store locator” option available on the standard home page allows a user to enter the name of a town and either have details of the store displayed or be notified that there is no store in the town entered. The incomplete structured English design for the “store locator” option is provided below:

```
When "store locator" option selected
Ask user for required town
If required town is in store_list
    Display store name, store address, store phone number
End if
```

Produce the structured English needed to complete the design for this option. **2**

- (iv) State **one** *graphical design notation* that can be used as an alternative to structured English. **1**

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

7. (continued)

- (g) When purchasing items from WebSport via the website, customers must indicate the quantity required. When a quantity is entered by a customer, the following rule is applied:

The minimum quantity ordered is 1 and the maximum quantity ordered is 8.

The test data values in the table below are used to ensure that this rule is applied correctly. Copy and complete the table to indicate the type of test data for each set of values and whether or not each set would be accepted by the system.

Test Data Values		Type of Test Data	Accepted (Y/N)
Set 1	1, 8		
Set 2	2, 3, 4, 5, 6, 7		
Set 3	0, 9		

3

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

8. IntellAgent Systems is a company which provides tailored operating systems to a wide range of customers, many of whom have specialised needs or requirements.

(a) Name **two** *technical factors* that have contributed to the development of graphical user interfaces and explain the contribution that these factors have made.

2

(b) Visually impaired users can have a speech recognition module called “Boss” added to the standard operating system. “Boss” allows the user to operate many of the computer’s facilities via spoken instructions. For example, users can start an application by saying “Open” followed by the name of the application and can search the help files by speaking a question such as “How do I copy a file?”

(i) Identify **two** forms of *intelligent interface* contained in the description of “Boss”.

2

(ii) A *heuristic evaluation* is one type of *quality inspection method*. State **two** heuristics that could be used in the evaluation of the “Boss” interface described above.

2

(c) Menu options in IntellAgent’s operating systems change according to selections made and users’ habits. Name the intelligent behaviour demonstrated by these changes.

1

[Turn over

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

9. A smartphone is a hand-held device that combines the features of a mobile phone with the features of a personal digital assistant (PDA). The *feature set* for the new CassisSmart is provided below:

CassisSmart: Feature Set

- Trackpad navigation
- Bright, hi-resolution touch screen
- Full QWERTY keyboard
- Wi-Fi and Bluetooth enabled
- 256Mb built-in flash memory
- 3.2 Megapixel digital camera
- Integrated speaker and microphone
- Multimedia player
- Applications including wireless e-mail, attachment viewing, document editing, calendar, address book and calculator
- Web browser
- Phone
- CassisOS with graphical interface
- SMS/MMS



- (a) Describe the CassisSmart device in terms of:

(i) *mode*;

2

(ii) *methods of input/output*.

2

In each case, you should justify your answer by making reference to the feature set above.

- (b) The development team responsible for the interface for the CassisSmart used the *LUCID methodology* to ensure that there was as much user involvement as possible during its design.

(i) Explain the use made of *RAD tools* during *design foundation* stage of the LUCID methodology. Justify your answer by referring to the purpose of the design foundation stage.

2

(ii) *Self-reporting logs* can be used during the *release* stage of the LUCID methodology. Explain the purpose of the release stage and describe how self-reporting logs would be used.

2

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

9. (continued)

- (c) (i) Compare the use made of *co-discovery* and *question asking protocol* as *qualitative techniques* for use during usability testing. You should refer to:
- who is involved in the testing;
 - role of the development team.
- 2**
- (ii) Recommend **one** of these techniques for usability testing of the CassisSmart device. Give **one** reason to support your answer. **2**
- (d) At the end of usability testing, users are asked to rate the interface design as shown below.

Please indicate how you would rate the overall ease of use of the device:			
Easy to use	Quite easy	Confusing	Complicated
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- Name the *quantitative technique* demonstrated above. **1**
- (e) In addition to usability testing, the interface of the CassisSmart device is subjected to a *quality inspection*.
- (i) Who performs the quality inspection of a device's interface? **1**
- (ii) The feature set is the **only** quality inspection method applied to the CassisSmart device. Assess the completeness of the results of this quality inspection. **2**

[Turn over

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

9. (continued)

- (f) The CassisSmart is used by law enforcement officers to gain wireless access to data stored in a relational database by DVLA about drivers and vehicles in the UK. Look at the following *data dictionary* extract.

Attribute	Entity	Type/Size	Validation	Index/Key
ownerID	Owner	Text(18)	–	Yes (PK)
ownerName	Owner	Text(30)	–	No
vehicleReg	Vehicle	Text(8)	–	Yes (PK)
vehicleMake	Vehicle	Text(15)		No
ownerID	Ownership			Yes (PK, FK)
vehicleReg	Ownership			Yes (PK, FK)
dateRegistered	Ownership	Date		No

- (i) Values stored in the attribute vehicleMake must be selected from a list of known car manufacturers.
Describe a validation rule that could be used to ensure that this is the case. **1**
- (ii) Provide the Type/Size and Validation for the ownerID and vehicleReg attributes in the Ownership entity. **2**
- (iii) Describe a validation rule that could be applied to the dateRegistered attribute of the Ownership entity. **1**

[Turn over for Question 10 on *Page twenty*

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

10. A bank cash machine is being developed for a Scottish airport.

- (a) *Storyboards* are used to show the design of each screen used on the cash machines.

State **one** benefit to the client of using storyboards for this purpose.

1

- (b) Screens (1) to (5) below illustrate the withdrawal of cash using the cash machine.

Screen (1)

Screen (2)

Screen (3)

Screen (4)

Screen (5)

- (i) Explain, with reference to the screens above, why a *walkthrough* is a suitable method of evaluating the usability of the cash machine.

1

SECTION II
Part A—Information Systems Interfaces (continued)

Marks

10. (b) (continued)

(ii) Additional features of the cash machine are described below:

- If the **SCREEN BALANCE** option is selected at Screen (3), the customer's account balance is displayed on a new screen. When the **CONTINUE** option on this new screen is selected, the display returns to Screen (3).
- If the **PRINTED BALANCE** option is selected at Screen (3), an account balance is printed but there is no change in the display screen.
- If invalid data is entered at either Screen (2) or Screen (4), a timed error message is displayed before returning to the original Screen (2) or Screen (4) respectively.
- After a short period of time, Screen (5) automatically returns to Screen (1).
- Pressing **CANCEL** at any stage returns the customer to Screen (1) and the customer's cash card is ejected.

Produce a *state transition diagram* representing each of the features provided by the cash machine

You should base your diagram on the information provided in Screens (1) to (5) along with the information provided in the descriptions of additional features above.

10

- (c) The main language used on the cash machine will be English. Once fully developed, the cash machine will provide an option to display each of the screens in Spanish.

The Spanish language screens will be generated from the English language version using *machine translation*.

- (i) Explain what is meant by the term machine translation.

1

- (ii) State **one** problem that may occur as a result of using machine translation.

1

[END OF SECTION II—PART A]

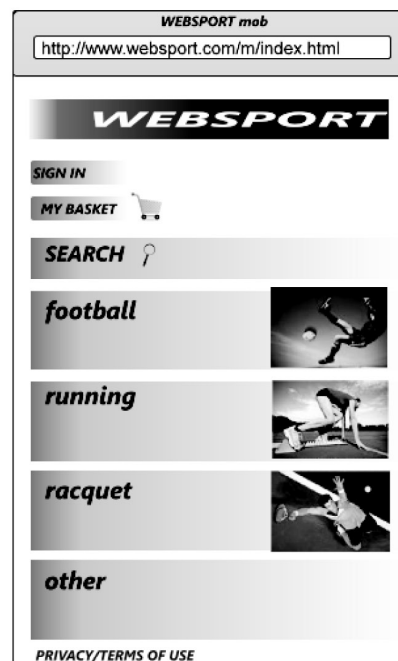
Part B—Online Database Systems

Answer ALL questions in this part.

11. WebSport sells sports equipment to customers via its company website. The company management has recently introduced a separate website interface for users of mobile devices. The two versions of the home pages are shown below.



Standard home page



Home page for mobile devices

- (a) Name and describe the type of *maintenance* which has taken place in creating the new interface. 2
- (b) By allowing customers to purchase products via the company websites, WebSport runs a successful *e-commerce* business. Describe **two** disadvantages to the company of running e-commerce. 2
- (c) WebSport uses *Customer Relationship Management* (CRM) software. Describe **two** features of CRM software which may help improve WebSport sales. Justify your answer by explaining how each feature can be used to improve sales. 4

SECTION II
Part B—Online Database Systems (continued)

Marks

11. (continued)

- (d) Devices used to access the websites are classified as either “standard” or “mobile”. The WebSport web server is programmed to detect the type of device accessing the websites and then send the correct version to the device. This ensures that mobile phone users accessing the WebSport website receive the reduced content interface for the website.

- (i) Part of the design to carry out this task is described using *structured English*:

```
Get device type
If device type is "standard" then send standard home page
```

Produce the structured English description needed to ensure that mobile phone users receive the correct content.

2

- (ii) The structured English design below allows users to “sign in” to the WebSport websites. The design contains **one** error.

```
When "sign in" option selected
Ask for username
Ask for password
If username is correct then login successful
```

Describe the error in the design of the “sign in” process.

1

- (iii) The “store locator” option available on the standard home page allows a user to enter the name of a town and either have details of the store displayed or be notified that there is no store in the town entered. The incomplete structured English design for the ‘store locator’ option is provided below:

```
When "store locator" option selected
Ask user for required town
If required town is in store_list
    Display store name, store address, store phone number
End if
```

Produce the structured English needed to complete the design for this option.

2

- (iv) State **one** *graphical design notation* that can be used as an alternative to structured English.

1

[Turn over

SECTION II
Part B—Online Database Systems (continued)

Marks

11. (continued)

- (e) When purchasing items from WebSport via the website, customers must indicate the quantity required. When a quantity is entered by a customer, the following rule is applied:

The minimum quantity ordered is 1 and the maximum quantity ordered is 8.

The test data values in the table below are used to ensure that this rule is applied correctly. Copy and complete the table to indicate the type of test data for each set of values and whether or not each set would be accepted by the system.

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Set 1	1, 8		
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Set 3	0, 9		

3

SECTION II
Part B—Online Database Systems (continued)

Marks

12. The Mimosa Club is a group of car enthusiasts specialising in the Mimosa DS series of cars. The Club maintains an online forum in which registered members can read news, access events on a calendar and post questions, contributions or answers. The forum has expanded rapidly and the amateur webmaster is struggling to cope with the amount of work and updates which have to be posted. He is considering the use of a *Content Management System* (CMS) to ease his workload.

The webmaster does not have a large budget and is tempted to use *open-source software* rather than a *commercial* alternative.

- (a) Compare the open-source and commercial alternatives by making at least **one** point about **each** type of software with regard to:

- *flexibility*;
- *ongoing support by a community of users*.

4

- (b) The webmaster would like registered forum members to be able to add their own content without altering the appearance of the site.

Explain how a Content Management System will help in achieving these aims.

2

- (c) In allowing members to add their own content, the webmaster risks having inaccurate or malicious content added to the forum. Unfortunately, he does not have time to read all contributions before they are posted.

Describe how a Content Management System could be used to allow members to post content without overburdening the webmaster with moderating and checking posts.

2

- (d) A forum member updates his contact e-mail address:

Mimosa Club: Update Contact Information	
Membership Number –	01357
Member Name –	Donnie MacKay
Existing e-mail Address –	dmac@carenthusiast.com
New e-mail Address	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Type new e-mail address here</div>

- (i) Write the HTML code for the *input element* used to enter the new e-mail address as shown above. Your answer should clearly indicate the use made of the *type*, *name* and *value* attributes.

3

- (ii) Explain how a secure database server can be used to protect the privacy of forum members.

2

SECTION II
Part B—Online Database Systems (continued)

Marks

13. A smartphone is a hand-held device that combines the features of a mobile phone with the features of a personal digital assistant (PDA). The *feature set* for the new CassisSmart is provided below:

CassisSmart: Feature Set

- Trackpad navigation
- Bright, hi-resolution touch screen
- Full QWERTY keyboard
- Wi-Fi and Bluetooth enabled
- 256Mb built-in flash memory
- 3.2 Megapixel digital camera
- Integrated speaker and microphone
- Multimedia player
- Applications including wireless e-mail, attachment viewing, document editing, calendar, address book and calculator
- Web browser
- Phone
- CassisOS with graphical interface
- SMS/MMS



David Young is a law enforcement officer and uses his CassisSmart to access the DVLA database. This database is used to store details of all drivers and vehicles in the UK.

- (a) To connect to the DVLA database, David must enter his username and password.

DVLA Database	
Enter username	<input type="text" value="dav331you"/>
Enter password	<input type="text" value="cHArLiE189"/>
<input type="button" value="SUBMIT"/>	

- (i) Write the HTML code for the *form element* used to create the form above.

You should clearly indicate the values of the form's *action* and *method* attributes used to submit the details entered to the file called "dvlasecuredb.php".

SECTION II
Part B—Online Database Systems (continued)

Marks

13. (a) (continued)

- (ii) A *server-side script* is used to connect to the database called “dvlaDB” held on the server called “dvladb.org.uk”.

Using a server-side scripting language with which you are familiar, write the script needed to make the server and database connection.

3

- (b) A witness reports a speeding car and provides the registration number. David accesses the DVLA database to find details of the car’s owner. The SQL query below is required.

SELECT reg, ownerID FROM vehicle WHERE reg = 'SC54LOL' ;

Using a server-side scripting language with which you are familiar, write the script needed to execute the SQL query above.

2

- (c) The DVLA uses a relational database to store details of drivers and vehicles. Look at the following *data dictionary* extract.

Attribute	Entity	Type/Size	Validation	Index/Key
ownerID	Owner	Text(18)	–	Yes (PK)
ownerName	Owner	Text(30)	–	No
vehicleReg	Vehicle	Text(8)	–	Yes (PK)
vehicleMake	Vehicle	Text(15)		No
ownerID	Ownership			Yes (PK, FK)
vehicleReg	Ownership			Yes (PK, FK)
dateRegistered	Ownership	Date		No

- (i) Values stored in the attribute vehicleMake must be selected from a list of known car manufacturers.

Describe a validation rule that could be used to ensure that this is the case.

1

- (ii) Provide the Type/Size and Validation for the ownerID and vehicleReg attributes in the Ownership entity.

2

- (iii) Describe a validation rule that could be applied to the dateRegistered attribute of the Ownership entity.

1

[Turn over

SECTION II
Part B—Online Database Systems (continued)

Marks

13. (continued)

(d) In his leisure time, David manages the website for the Inverclyde Running Club. The website provides up-to-date information about club activities and competition results. The website content is stored on a database server.

- (i) When he is away from home, David uses his CassisSmart to access *server-based database management tools* that enable him to update the site content and modify the database structures.

Give **two** advantages of server-based database management tools for David.

2

- (ii) When club members participate in national competitions, David sends electronic files containing members' details to the competition organisers. Once the results have been confirmed, David receives them electronically from the competition organisers. The sharing of data in this way makes use of *Electronic Data Interchange* or *EDI*.

- (A) Explain why David will need to use *translation software* before sending the electronic files with members' details and when receiving competition results.

2

- (B) Name and describe **one** method of *EDI communication*.

2

- (C) Discuss **two** *legal restrictions* that apply in this situation.

2

[Turn over for Question 14 on *Page thirty*

SECTION II
Part B—Online Database Systems (continued)

Marks

14. Tayside Marina rents berths to boat owners. Each berth can accommodate one boat. The management of the marina uses a relational database to store details of boats and berths rented.

- (a) Part of the database is shown below. The entry for Berth A1 indicates that it is being used to moor Boat D2345/7; the blank entry for Berth A2 indicates that it is available for renting.

Table: Reserved

<i>Berth</i>	<i>Boat</i>
A1	D2345/7
A2	
A3	E2341/8
A4	F2434/8
B1	F1111/9
B2	
B3	C1234/1
B4	

- (i) Complete the following *Structured Query Language* (SQL) query to list details of all berths that are available for rental.

```
SELECT Berth, Boat
FROM Reserved
```

2

- (ii) Berth IDs run from A1 to Z4. Use the *NOT operator* to complete the following SQL query to list details of all berths **except for** berths K1 to L4 inclusive.

```
SELECT Berth, Boat
FROM Reserved
```

2

SECTION II
Part B—Online Database Systems (continued)

Marks

14. (continued)

- (b) The marina management arranges repairs for boats berthed at the marina. Details are stored in the Owner and Repairs tables of the database.

Table: Owner

<i>OwnerID</i>	<i>LastName</i>	<i>FirstName</i>	<i>Address</i>	<i>City</i>
1	Morgan	George	Forfar Road	Dundee
2	George	Susan	Lawside Drive	Edinburgh
3	Duncan	Alfred	Stewart Street	Helensburgh
4	McMillan	Peter	Davidson Drive	Glasgow

Table: Repair

<i>RepairID</i>	<i>Date</i>	<i>Details</i>	<i>Cost</i>	<i>OwnerID</i>
1	12/10/2009	rudder repair	£600·00	1
2	14/10/2009	hull repair	£2,400·00	4
3	30/10/2009	engine service	£300·00	1
4	12/11/2009	steering repair	£1,200·00	2
5	15/02/2010	hull repair	£3,500·00	1

- (i) The marina management wishes to produce details of all repairs sorted by the owner's last name.

<i>LastName</i>	<i>Cost</i>	<i>RepairID</i>	<i>Date</i>
George	£1,200·00	4	12/11/2009
McMillan	£2,400·00	2	14/10/2009
Morgan	£300·00	3	30/10/2009
Morgan	£600·00	1	12/10/2009
Morgan	£3,500·00	5	15/02/2010

The SQL query used is given below.

```
SELECT Owner.LastName, Repair.Cost, Repair.RepairID, Repair.Date
FROM Owner
INNER JOIN Repair ON (Owner.OwnerID = Repair.OwnerID)
GROUP BY Owner.LastName;
```

Explain why the query above will **not** produce the results required.

1

- (ii) Explain the purpose of the SQL statement `INNER JOIN` in this example.

1

[Turn over

SECTION II
Part B—Online Database Systems (continued)

Marks

14. (continued)

- (c) The marina management wishes to calculate the average cost of repairs. Write the SQL query to calculate this average. **2**

- (d) SQL queries are applied to the Repair table:

- one query uses `SUM (Repair.Cost)`
- the other query uses `COUNT (Repair.Cost)`

Explain the different output produced from the two queries. **2**

- (e) Describe the purpose of SQL's *Data Manipulation Language (DML)*. **1**

[END OF SECTION II—PART B]

[END OF QUESTION PAPER]