

X216/12/01

NATIONAL THURSDAY, 7 MAY
QUALIFICATIONS 9.00 AM – 11.30 AM
2015

INFORMATION
SYSTEMS
HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

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

Part A	Applied Multimedia	Page 10	Questions 16 to 19
Part B	Expert Systems	Page 14	Questions 20 to 23
Part C	The Internet	Page 16	Questions 24 to 28

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

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.



SECTION I

Marks

Attempt ALL questions in this section.

1. The organisers of a school cross country league store details about all runners and schools in a single table database. Below is a record from this table. “Runner number” is the primary key.

Runner number	457
Name	Steven Thomson
Age Group	Under 12
School	Jackson Academy
School Address	56 Linton Street, Stonewall

- (a) Describe **one** problem associated with deleting a record from this table. 2
- (b) Suggest a suitable *domain* for the Age Group attribute. 2
2. Lyndsay and Jindra attend St Andrew’s Primary School and Kerry attends Hillview Primary School.
- (a) Draw an entity occurrence model to illustrate the relationship between primary school and pupil. 2
- (b) State the *cardinality* of the relationship between primary school and pupil. 1
3. Define the terms:
- (a) *referential integrity* 2
- (b) *entity* 1

SECTION I (continued)

Marks

4. Supasonic Electronics uses a database to store order details. The data is stored in a table using the primary key and fields as shown below.
- Customer No
Customer Name
Customer Address
Order Date
Item No
Description
Price (£)
Quantity
- (a) State the normal form of this data giving **two** reasons for your answer. **3**
- (b) Describe how an RDBMS would use a calculated field and a summary field to calculate the total bill for a customer for all items ordered. **2**
5. State **three** different types of organisational information systems. **3**
6. State **two** characteristics which affect the quality of information. **2**
7. A group of 5th year pupils has created the latest edition of the school magazine.
- (a) Describe how *pagination* could help in the layout of the magazine. **2**
- (b) State **two** features of text formatting that can be controlled by a *style sheet*. **2**
8. Describe **one** economic implication of ICT for a business. **2**
9. Describe what is meant by a *denial of service* attack. **2**
10. In terms of a back-up strategy, describe what is meant by an *archive*. **2**
- (30)**

[END OF SECTION I]

[Turn over for SECTION II on Page four

SECTION II

Attempt ALL questions in this section.

11. Customers at Sunshine Holidays are sent a summary of their holidays. Samples of summaries for the Atlanta hotel are shown below.

Your Sunshine Holiday

Customer No: 1263 **Name:** Joy McGregor

Address: 23 High Street, Strathdon

Telephone: 01542 377642

Holiday ID: FD17K

Departure Date: 08/07/2015 **Duration:** 7 nights **Cost:** £1758

Hotel: Atlanta **Hotel Rating:** ****

Your Sunshine Holiday

Customer No: 1654 **Name:** Douglas Buchan

Address: 65 Market Street, Balloch

Telephone: 01976 646727

Holiday ID: FD675K

Departure Date: 08/07/2015 **Duration:** 7 nights **Cost:** £2995

Hotel: Atlanta **Hotel Rating:** ****

Your Sunshine Holiday

Customer No: 1263 **Name:** Joy McGregor

Address: 23 High Street, Strathdon

Telephone: 01542 377642

Holiday ID: FD17K

Departure Date: 09/10/2015 **Duration:** 7 nights **Cost:** £1650

Hotel: Atlanta **Hotel Rating:** ****

Your Sunshine Holiday

Customer No: 7645 **Name:** Tom Ferguson

Address: 78 Johnstone Avenue, Elderslie

Telephone: 01776 476634

Holiday ID: FD675L

Departure Date: 09/10/2015 **Duration:** 14 nights **Cost:** £3088

Hotel: Atlanta **Hotel Rating:** ****

11. (continued)

This data can be represented in un-normalised form as:

Customer No
 Name
 Address
 Telephone
 Holiday ID
 Departure Date
 Duration
 Cost
 Hotel
 Hotel Rating

Using Customer No as the primary key, transform this un-normalised data to third normal form.

You **must** show the intermediate stages of first normal form and second normal form and identify all primary and foreign keys at each stage of normalisation.

17

12. Inverdon Electrical is a small company supplying electrical goods to a few shops in the local area. The structure of the data model they intend to use is shown below.

Customer	Order	Supplier	Item
<u>Customer number</u>	<u>Item number*</u>	<u>Supplier name</u>	<u>Item number</u>
Customer name	<u>Order date</u>	Supplier address	Item name
Customer address	<u>Customer number*</u>	Supplier telephone	Price
Customer telephone	Number ordered		Photo
			Supplier name*

(a) Draw an *entity relationship diagram* to represent this data model.

6

(b) (i) The following data dictionary represents the Item entity. It has a number of missing entries which are highlighted as A, B, C, D and E. State a suitable entry for each of the missing values.

5

Attribute	Data Type	Validation	Unique	Index	Key
Item number	A	>=1000 and <=9999	Y	Y	PK
Item name	Text		N	Y	
Price	B	>0.50 and <1000.00	N	N	
Photo	C		N	N	
Supplier name	Text	D	E	Y	FK

(ii) State **one** advantage OR **one** disadvantage of indexing an attribute.

2

SECTION II (continued)

Marks

13. Northbank Council is planning to replace the majority of computer hardware and software in a local secondary school over a two week period in March.

- (a) (i) Copy and complete the following table to show what the Council should consider before starting this replacement programme. **3**

Area	Points to Consider
Future Proofing	
Compatibility	
Legacy Systems	

- (ii) The Council should have a strategy to manage these three areas. State this type of strategy. **1**

- (b) Other than cost, state **five** criteria that the Council should use to help choose the most appropriate software for the school. **5**

- (c) The Council uses a *client/server LAN* where each computer has a *network adapter*.

Define the following terms:

- (i) client/server;
- (ii) LAN;
- (iii) network adapter. **3**

SECTION II (continued)

Marks

14. Morag plays the online game ZombeeZ. Her social media persona is “Buttercup” but when she plays ZombeeZ she prefers to use the persona “Axeman”.

The screen below shows the webpage with the highest scores.

ZombeeZ		
Name	Highest Score	Titles Earned
1. Ripper	35454	Skull Cracker
2. Slayer	34300	Skull Cracker
3. Axeman	32988	Sorcerer
4. Xena	32566	Skull Cracker

- (a) Suggest **one** reason why Morag has decided to use the persona “Axeman”. 2

- (b) Information can be categorised in terms of its *use*. For example, the information on the above webpage is for *control* and is useful to Morag to see the scores she needs to beat.

Other than *use* and *nature*, categorise the information on the above webpage under four additional headings by copying and completing the following table. 8

Heading	Category
Use	Control
Nature	Formal and Quantitative

- (c) Changing the font to **Chiller** could enhance the highest scores webpage for ZombeeZ gamers.

Describe **three** features of *web authoring software* that could be used to enhance this page. 3

[Turn over

SECTION II (continued)

Marks

15. The diagram below shows the critical path for a construction project.

Project A							
Task 1							
			Task 2				
				Task 3			
					Task 4		

Task 1, Task 3 and Task 4 form the critical path.

- (a) Describe what is meant by *critical path analysis*. 2
 - (b) (i) State the type of software used to carry out critical path analysis. 1
 - (ii) Other than critical path analysis, state **two** further features of this type of software. 2
- (60)**

[END OF SECTION II]

SECTION III

Attempt ONE sub-section of Section III

Part A	Applied Multimedia	Page 10	Questions 16 to 19
Part B	Expert Systems	Page 14	Questions 20 to 23
Part C	The Internet	Page 16	Questions 24 to 28

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

Part A—Applied Multimedia**Attempt all questions.**

16. An extract from an e-mail from the head coach at Bankhaven swimming club to a multimedia development team is shown below.

. . . to develop a DVD ROM to support newly qualified coaches at Bankhaven swimming club by providing sample lesson plans and instructional video clips.

The development team use the information to help produce a *requirements specification*.

- (a) State **three** items found in a requirements specification and give an example of each from the e-mail extract. 6
- (b) List the personnel responsible within the development team for each of the tasks 1 to 5 below. 5

Task	Personnel Responsible
1. Inserts video clips of swimmers into product	
2. Checks lesson plans are correct	
3. Agrees the completion date	
4. Decides on a colour scheme	
5. Edits the video clips	

Part A—Applied Multimedia (continued)

16. (continued)

The screen below includes an instructional video for the breaststroke from the completed DVD ROM.

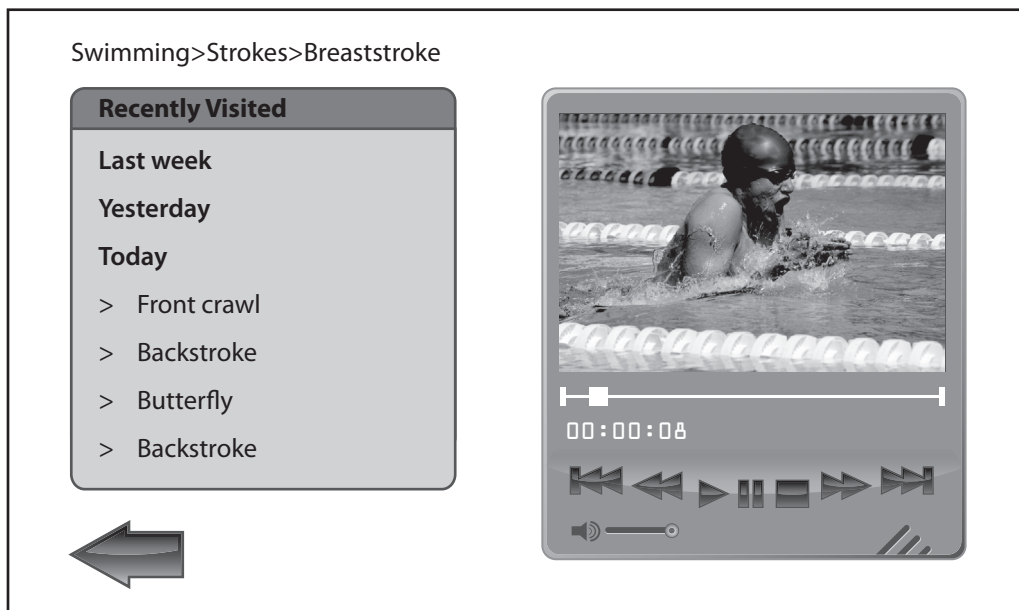
(c) A *metaphor* has been used in the design of this screen.

(i) Explain what is meant by a metaphor.

2

(ii) Identify the metaphor used in this case.

1



(d) Name and describe the **three** methods that have been used in the sample screen to aid navigation in hyperspace.

6

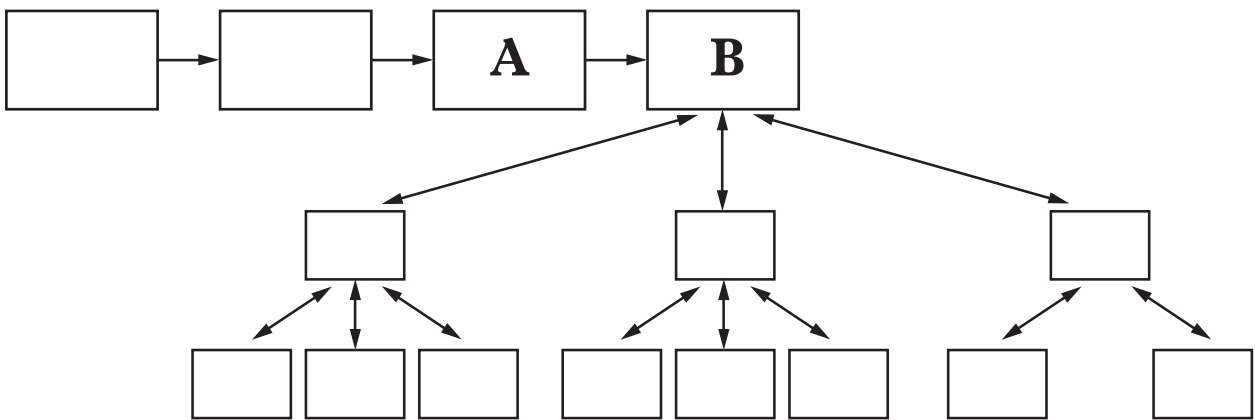
[Turn over

Part A—Applied Multimedia (continued)

17. Total Action Games are having their website updated. Part of the requirements specification is shown below.

. . . users will be able to create an account and then choose from **four** different types of on-line games, **Arcade**, **Role Play**, **Tower Defence** and **Puzzles**. Background music should continue to play as the user moves from page to page.

The developer's navigational map for the updated website is shown below.

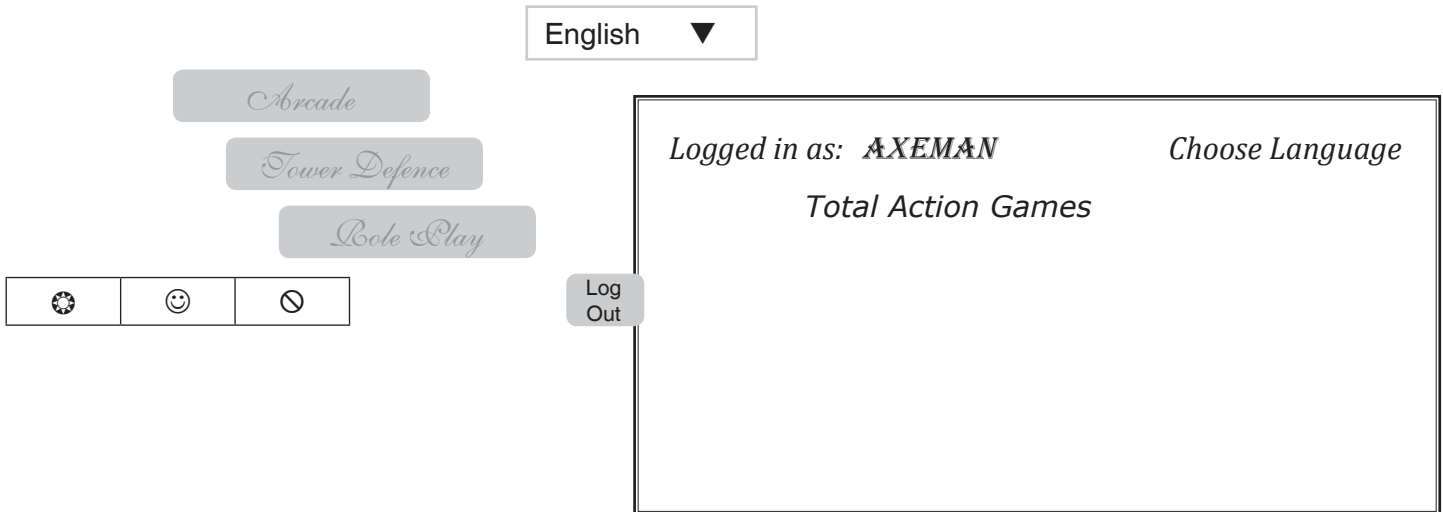


- (a) State the type of navigation structure shown above. 1
- (b) On Screen A, a user enters their e-mail address and then creates their username and password. Passwords have to be entered twice.
- A button has to be created to allow the user to return to the previous page and another button created to submit their details and continue.
- The company logo appears at the top of the screen. The pathname to the logo is:
- C:\Total_Action\website\images\logo.png
- (i) Pathnames can be *absolute* or *relative*. State the type of pathname shown above. 1
- (ii) Draw an *outline storyboard* for Screen A. 5
- (iii) State the most suitable type of user interface for Screen A. 1
- (iv) Explain why users are asked to enter a password twice on this screen and identify whether this process of double entry relates to data security, data integrity or data privacy. 2

Part A—Applied Multimedia (continued)

17. (continued)

- (c) The website has been created and is ready for testing. When Screen B is opened, the screen below is displayed but no background music plays.



Screen B could fail all four types of testing for four **different** reasons.

- (i) With reference to the requirements specification on the facing page, copy and complete the following table suggesting **one** reason for failure of this screen in each type of testing. 8

Type of Testing	Reason for Failure
Screen Testing	
Integration Testing	
Acceptance Testing	
Usability Testing	

2

- (ii) Evaluate Screen B in terms of accessibility.

18. *Kerning* and *anti-aliasing* can be used to enhance the appearance of media elements. Describe kerning **OR** anti-aliasing. You may use a diagram to illustrate your answer. 2

8

19. *TIFF*, *JPEG*, *GIF*, *MP3*, *MIDI* and *MPEG* are all standard file types. Choose **four** of these file types and for each give a description of its features and use. (50)

[END OF SECTION III—PART A]

Part B—Expert Systems

Attempt all questions.

20. Throughout history there have been several pandemics. Pandemics are widespread and uncontrolled diseases that significantly reduce world population. Bubonic Plague, Cholera and Spanish Flu are diseases which still exist and can lead to pandemics.

- (a) Describe **one** benefit and **one** drawback that would particularly apply to an expert system on diseases. 4

Here are some notes from records kept during outbreaks of each disease.

“ . . . the shopkeeper had swollen glands a week ago. He died this morning. Doctor Johnston tells us he had Bubonic Plague and that fleas carry this disease . . . ”

“ . . . the water supply in the city is contaminated. Cholera is spreading throughout the population. There have been many cases of diarrhoea. Some citizens are dying within hours of feeling unwell . . . ”

“ . . . I have the fever. We should not have let the sailors land. Islanders are dying within hours. It is an outbreak of Spanish Flu . . . ”

- (b) (i) Derive **three** attribute pairs for cholera. 3
- (ii) Create a *factor table* for these **three** diseases. 4
- (iii) Create three rules, **one** for each type of disease. 5
- (iv) Rewrite **one** of your rules in part (iii) using a different method of *chaining*. State this method of chaining. 2
- (v) Derive a question that would be part of a user consultation in an expert system based on the notes above. 2
- (c) The process of developing an expert system on diseases involves three stages. State a suitable entry for each of the missing values labelled A to E. 5

Stage of Development	Personnel	Activity
A	Researcher	Contacting experts, searching references
Knowledge representation	B	C
D	E	Testing

- (d) State the names of **two** classical expert systems with a medical domain. 2

SECTION III

Marks

Part B—Expert Systems (continued)

21. Some expert systems make use of *certainty factors*. Describe what certainty factors are and how they are used in an expert system. **6**
22. To play the online game, BeetleBlast, Gwen has to create an account and give her e-mail address.
- (a) Explain why gamers are asked to enter an e-mail address twice when creating an account and identify whether this process of double entry relates to data security, data integrity or data privacy. **2**
- Gwen has developed the following strategy for playing BeetleBlast.
“Whenever Gwen sees an ant and her character is not hungry then Gwen will blast it.”
- (b) Represent this strategy in *predicate logic*. **3**
- (c) Represent this strategy in *propositional logic*. **2**
- One of the rules of the game is shown below.
“Gamers who capture a dung ball and are not injured achieve the rank of bombardier beetle.”
- (d) Represent this rule using the more suitable logic (predicate or propositional). **6**
23. (a) Explain what is meant by a *deductive database*. **2**
- (b) Compare a relational database with an expert system in terms of the method of extracting information. **2**
- (50)**

[END OF SECTION III—PART B]

[Turn over

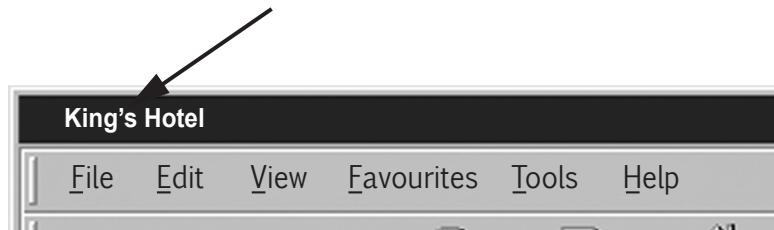
Part C—The Internet**Attempt all questions.**

24. The King's Hotel is opening a new conference centre and is adding information about it to its website. All the photographs of the conference rooms have still to be uploaded to the web server. The current HTML code for the web page is shown below.

```
<html>
<head>
</head>
<body>
<div style="text-align: center;">
<h1>King's Hotel</h1>
<br>
<h3>Conference Facilities</h3>
<br>

</div>
</body>
</html>
```

- (a) Sketch the output that would be produced by this code. 4
- (b) Create the HTML code required to display “King’s Hotel” as shown in the diagram below and describe where in the existing code it should be placed. 3



- (c) The e-mail address for the hotel is info@King'sHotel.biz.co.uk. Create the HTML code to add a link for this e-mail address to the webpage. 4

Part C—The Internet (continued)

24. (continued)

(d) The developer has added the following table to the webpage.

Strathbrae Room	£250 per day
Braemar Room	£175 per day

State suitable entries for each of the missing values A, B, C and D to complete the code for the table.

4

```
<table A = " B ">
<tbody>
< C >
<td style=" D : 184px;">Strathbrae Room</td>
<td style=" D : 112px;">£250 per day</td>
</ C >
< C >
<td style=" D : 184px;">Braemar Room</td>
<td style=" D : 112px;">£175 per day</td>
</ C >
</tbody>
</table>
```

(e) (i) The conference room photograph has now been uploaded and can be found using the URL:

<http://www.kingshotel.biz/conference/images/Strathbrae.jpg>

Identify and name **two** parts of the structure of this URL.

4

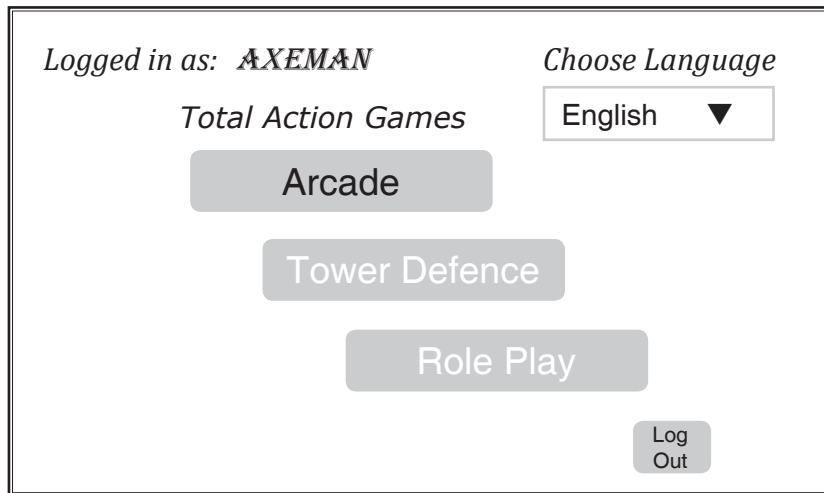
(ii) State the *protocol* which translates a URL into an IP address.

1

[Turn over

Part C—The Internet (continued)

25. Total Action Games are updating their website. A screenshot of one of the pages the developer has produced is shown below.



- (a) Using the webpage above, copy and complete the last 3 rows of the following table to evaluate the design of this page of the website. 3

Characteristic	Comment
Uniformity of presentation	Good as fonts, sizes and styles are consistent with other web pages
Page structure and layout	
Download efficiency	
Browser compatibility	

- (b) The developer has used *cascading style sheets* to implement uniformity of presentation of the website.
- (i) State what is meant by cascading style sheets. 2
- (ii) The username “AXEMAN” could be formatted using an internal or external style sheet. State which type of style sheet would be more appropriate in this case. Justify your answer. 2
- (iii) State whether or not this webpage is dynamic. Justify your answer. 3

SECTION III

Marks

Part C—The Internet (continued)

26. There are several organisations responsible for various aspects of the Internet. State the organisations labelled A to D. 4

Task	Organisation Responsible
1. Dealing with Internet standards eg latest version of IP	A
2. Allocating domain names in the UK	B
3. Dealing with standards in HTML and XML	C
4. Allocating IP addresses	D

27. Describe how *packet switching*, *routers* and *routing tables* are involved in the transfer of data across the Internet. 8
28. After making an online booking with Sunshine Holidays, Joy McGregor chooses to receive her booking confirmation by e-mail.

Sunshine Holidays

Thank you for your recent enquiry
Details of your holiday will be sent to

Enter e-mail address:

Re-enter e-mail address:

Credit card payments are secure with us!

- (a) Explain why customers are asked to enter an e-mail address twice on this screen and identify whether this process of double entry relates to data security, data integrity or data privacy. 2
- (b) Describe how Sunshine Holidays could ensure that the customer credit card details are transmitted securely. 2
- (c) Describe how *site usage tracking* would help Sunshine Holidays increase sales. 2
- (d) Describe how *client-side scripting* could be used on this web page. 2

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

ACKNOWLEDGEMENT

Question 16 – Gert Vrey/shutterstock.com