

# X216/12/01

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NATIONAL QUALIFICATIONS 2014

FRIDAY, 2 MAY  
9.00 AM – 11.30 AM

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  
Part B Expert Systems  
Part C The Internet

Page 13 Questions 14 to 17  
Page 16 Questions 18 to 21  
Page 18 Questions 22 to 25

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. A health centre uses a single table database. Below is a record from this database. The primary key, Patient No, is created from the patient's initials and date of birth.

<b>Patient No</b>	HR270985
<b>Name</b>	Helen Robertson
<b>Address</b>	23 Gordon Road Perth PG3 6TY
<b>Date of Birth</b>	27/09/1985
<b>Doctor's Name</b>	Dr Ritchie
<b>Doctor's Tel No</b>	0845 5678348
<b>Doctor's Room</b>	5

- (a) Describe **one** data insertion problem with this database design. 2
- (b) State **two** problems with using the meaningful identifier, Patient No, as a primary key. 2
- (c) Explain why storing the address as a single attribute is not good database design. 2
2. Describe how to transform data from *second normal form* to *third normal form*. 2
3. Define the terms:
- (a) *Compound key* 2
- (b) *Multi-valued attribute*. 2

SECTION I (continued)

Marks

4. Two entities, STUDENT and COURSE, are identified in the design of a college database. Anya, Ben, Carol and Dimitri are students. Leisure, Mathematics and Navigation are courses.

Anya takes Leisure and Navigation.

Carol takes Mathematics.

Dimitri takes Leisure and Mathematics.

- (a) Draw an *entity occurrence* model to illustrate the relationship between STUDENT and COURSE. 2
- (b) State the *cardinality* of the relationship between STUDENT and COURSE. 1

5. Explain each of the terms.

- Metadata
- Data
- Information
- Knowledge

4

6.



- (a) The above information has been categorised as *sampled* and *secondary*. Justify each categorisation. 2
- (b) Information can also be categorised according to its *Form*.

State **three** Form categories.

2

[Turn over

**SECTION I (continued)**

*Marks*

7. Natesh is in a pension scheme. A formula in a spreadsheet calculates the total pension based on Natesh’s monthly payment as shown below.

	A	B
1	Monthly payment	£179
2	Total Pension	£196,000

Natesh wants to find the monthly payment required to give a total pension of £250,000.

- (a) State the feature of spreadsheet software that can be used. **1**
- (b) State the **three** entries that Natesh would make in the boxes labelled X, Y and Z. **3**

<i>Set</i>	X
<i>To value</i>	Y
<i>By changing</i>	Z

8. Describe **one** aspect of the *Freedom of Information (Scotland) Act (2002)*. **2**
9. Draw a diagram to represent a *topology* that could be used in a WAN. **1**
- (30)**

[END OF SECTION I]

**[Turn over for SECTION II on Page six**

## SECTION II

**Attempt ALL questions in this section.**

10. CustomCut Kitchens is a small firm which supplies and fits kitchen furniture. It buys the parts from a variety of suppliers and assembles the units in a local factory. There is a standard parts list so that each employee knows which parts are required for each unit. Part of this list is shown below.

CustomCut Kitchens		Parts List Page 4			
<b>Product number</b>	WU135		<b>Description</b>	Wall Unit	
	Part code	Type	Quantity	Part price (£)	Parts total (£)
	ZZ12	Door	1	12.60	12.60
	ZH23	Hinge	2	3.50	7.00
	4BB1	Handle	1	1.75	1.75
	V600	Frame	1	24.00	24.00
<b>Product number</b>	WU136		<b>Description</b>	Wall Unit	
	Part code	Type	Quantity	Part price (£)	Parts total (£)
	V601	Frame	1	44.00	44.00
	KN99	Door	2	12.00	24.00
	FF34	Hinge	6	2.00	12.00
	4BB1	Handle	2	1.75	3.50
<b>Product number</b>	BU136		<b>Description</b>	Base Unit	
	Part code	Type	Quantity	Part price (£)	Parts total (£)
	V601	Frame	1	44.00	44.00
	ZZ12	Door	2	12.60	25.20
	FF34	Hinge	4	2.00	8.00
	5CD6	Handle	2	2.30	4.60

## SECTION II (continued)

Marks

## 10. (continued)

Each week the factory manager sends an Order request form to the office so that the parts needed can be ordered from suppliers. Each part has a standard order quantity which must be ordered. A sample form is shown below.

CustomCut Kitchens		Order Request		
Part code	Supplier code	Supplier	Supplier address	Standard order quantity
V601	KS32	Condor Carpentry	Unit 14, East Industrial Estate, Northbank	12
FF34	KS45	Aston Doorfittings	Southern Way, Doonbrae	100
5CS6	KS45	Aston Doorfittings	Southern Way, Doonbrae	50
ZZ12	KS19	Doors'R'Us	White Street, Doonbrae	25
KN99	KS32	Condor Carpentry	Unit 14, East Industrial Estate, Northbank	25

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

Product number

Description

Part code

Type

Quantity

Part price

Supplier code

Supplier

Supplier address

Standard order quantity.

Using Product number as the primary key, transform this un-normalised data to third normal form.

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

17

[Turn over

**SECTION II (continued)**

11. Inverdon Insurance has several branches throughout the country, each with several salespersons. A sales recording system has been set up using a relational database. The data is held in several tables as shown in the data dictionary below.

Entity	Attribute	Key	Data Type/Size	Unique	Required	Validation
Branch	Branch no	PK	Integer	Y	Y	0 to 999999
	Branch address		Text (30)	N	Y	
	Branch town		Text (30)	N	Y	
	Branch postcode		Text (8)	Y	Y	
Customer	Customer no	PK	Integer	Y	Y	0 to 999999
	Customer name		Text (30)	N	Y	
	Customer address		Text (30)	N	Y	
	Customer town		Text (30)	N	Y	
	Customer postcode		Text (8)	N	Y	
Sale	Customer no	PK/FK	Integer	N	Y	Lookup from Customer
	SalesID	PK/FK	Text (8)	N	Y	Lookup from Sales person
	Date	PK	Date	N	Y	After 01/01/2002
	Amount		Real	N	Y	>0
Sales person	SalesID	PK	Text (8)	Y	Y	
	Sales name		Text (30)	N	Y	
	Branch no	FK	Integer	N	Y	Lookup from Branch

*Marks*

(a) Draw an *entity relationship* diagram to represent this data model. 6

(b) It was suggested that the Branch postcode and Customer postcode could be used as primary keys in the Branch and Customer tables.

State whether this would affect the *entity integrity* of:

- the Branch entity;
- the Customer entity.

Justify each answer. 4

(c) With reference to the data dictionary, explain why *referential integrity* exists in the relationship involving SalesID. 3



SECTION II (continued)

Marks

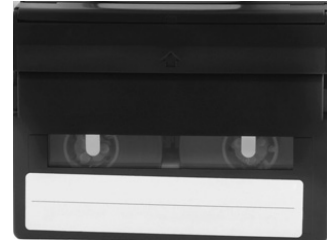
12. Charles Armstrong, the IT director of a chain of retailers, made the following statement in the magazine, "Business News":

"Due to our extensive use of *data processing systems*, we are now using *data mining* software."

- (a) Describe the roles of data processing systems and data mining within an organisation. 5

Charles goes on to say in the magazine article:

"We still use magnetic tape daily for backup and to maintain an archive. Last September, we suffered a major data loss but we managed recovery within 12 hours of the crash, thanks mainly to our excellent version control labelling."



- (b) State **three** pieces of information that should be included on a *version control* label. 3

- (c) Describe how an *archive* is maintained. 2

- (d) State which tapes would be required to carry out a *recovery* after a data loss. 2

[Turn over

## SECTION II (continued)

13. Wolfgang has produced a research paper and has given a copy to his university tutor for comments. The paper has 95 pages organised under 12 headings. The first 4 pages are shown below.

# Rocket Science in the 21<sup>st</sup> Century

By

W. Muller

## Introduction

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Existing Knowledge

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## Background

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SECTION II (continued)

Marks

13. (continued)

The tutor has suggested to Wolfgang that he should address the following areas.

- Ease of locating information
- Consistency in appearance
- Pagination
- Incorporation of graphics

- (a) For each of these areas, describe a feature of word processing software that Wolfgang could use. 8
- (b) In order to deal with the tutor’s suggestions, Wolfgang is evaluating new word processing software in terms of *functionality* and *data migration*.
- (i) Describe how Wolfgang would assess the functionality and data migration capability of this new software. 2
- (ii) Identify **two** other criteria used to evaluate software. 2
- (c) In his profile on a social networking site, Wolfgang claims he is a “good global citizen” in his use of ICT. He also makes a comment that the impact of global information systems is damaging society.
- (i) Describe **one** example of behaviour associated with good global citizenship in the use of ICT. 2
- (ii) Give **one** example of how global information systems could damage society. 2
- (iii) Name and describe **one** example of legislation that could apply to Wolfgang’s use of social networking. 2
- (60)**

[END OF SECTION II]

[Turn over

### SECTION III

Attempt ONE sub-section of Section III

<b>Part A</b>	<b>Applied Multimedia</b>	<b>Page 13</b>	<b>Questions 14 to 17</b>
<b>Part B</b>	<b>Expert Systems</b>	<b>Page 16</b>	<b>Questions 18 to 21</b>
<b>Part C</b>	<b>The Internet</b>	<b>Page 18</b>	<b>Questions 22 to 25</b>

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

## Part A—Applied Multimedia

## Attempt all questions.

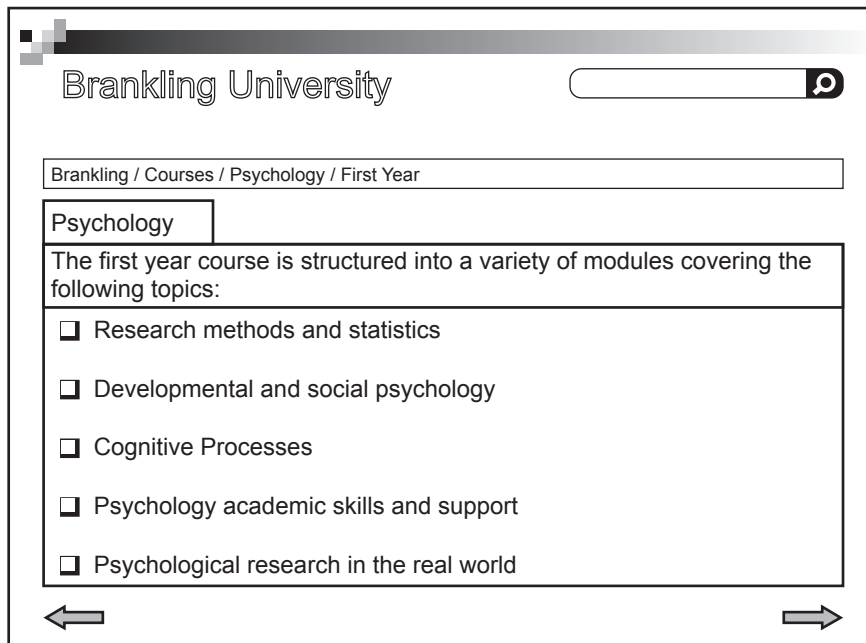
14. A gaming development company is ready to release details of its latest adventure game. The pre-launch publicity material includes a series of promotional trailers and demo games.
- (a) The company has made use of *collaborative working*.
- (i) Explain what is meant by collaborative working. 2
- (ii) Give an example of a multimedia application that could aid collaborative working and describe how it could benefit the company. 2
- (b) The company has to decide whether to release the pre-launch publicity material as a download or on a DVD.
- With reference to **two** appropriate comparison criteria, compare the suitability of using the WWW with using a DVD-ROM for delivering this publicity material. 4
15. Ample Apps has been commissioned by the director of a chain of pizza restaurants to develop an application to help them promote their business. The dedicated app can be downloaded by customers onto their smartphones. This allows the restaurant chain to target customers with information about special offers.
- (a) The development team from Ample Apps has drawn up a *requirements specification* for the development project.
- (i) Explain why the requirements specification is important to both Ample Apps and the restaurant chain director. 2
- (ii) State **two** items found in a requirements specification and give an example of each from the information above. 4
- (b) Ample Apps employs a *multimedia designer* within the development team.
- (i) Describe the role of the multimedia designer in the creation of the pizza app. 2
- (ii) State **one** other position within the development team, and describe their role in the creation of this app. 2
- (c) The final stages in the development of the app is testing. Name and describe **two** types of testing that should be carried out by the development team. 4

[Turn over

**Part A—Applied Multimedia (continued)**

16. Brankling University offers a distance learning course in Psychology. Student materials in the form of multimedia presentations are available to download from the University website.

A sample screen from the student materials is shown below.



- (a) From the sample screen above, name and describe **two** methods that have been used to avoid students becoming “*lost in hyperspace*”. 4
- (b) The multimedia presentations are delivered as a *stand-alone application*. Describe what is meant by a stand-alone application. 2
- (c) Accessibility (disabilities) is one of the criteria that can be used to critically evaluate a multimedia application. 2  
State **two** other criteria used to evaluate a multimedia application. 2
- (d) Using **two** characteristics which affect the quality of information, comment on the information on the sample screen above and give a justification for your comment. 4

## Part A—Applied Multimedia (continued)

17. CLM Sports Village offers a range of activity holidays to school groups. Schools can opt for a 3, 5 or 7 day activity programme. They wish to create a website to advertise their business.

**Home Page**

The home page of the CLM website has to attract attention, so a large photograph of one of the activities is to be displayed over the top half of the page. The CLM Sports logo should appear in the bottom left hand corner and there should be hyperlinks to the three main sections as well as a Contact Us page. Users can only return to the home page at the end of each section.

**Section 1**

The first section will consist of one page of information about the Sports Village. This page details the location, accommodation and meals provided.

**Section 2**

The second section will have three pages of information that follow on from each other. They will outline what is involved in each of the activities on offer at the Sports Village.

**Section 3**

The third section will display information about the different activity programmes and their costs. This information is to be displayed on a single page.

- (a) Create an *outline storyboard* for the home page of the website. 3
- (b) The *detailed storyboard* contains additional information including file type.
- (i) State a suitable file type, giving a reason for your answer, for
- (A) the large photograph. 2
- (B) the CLM Sports logo. 2
- (ii) State **three** further pieces of information that should be included in the *detailed storyboard* for the home page. 3
- (c) (i) Draw the *navigation structure* of the website. 4
- (ii) Name the type of navigational structure you drew in (c) part (i), giving a reason for your answer. 2
- (50)**

[END OF SECTION III—PART A]

## Part B—Expert Systems

Attempt all questions.

18. Nigel has a keen interest in local seabirds. His expertise was used to create a “seabird” expert system. Some species of gull can be difficult to distinguish. Here is the information from Nigel about three species that might be sighted around the Scottish coast.

*“A Caspian gull has a large white tip on the primary feather and a long slender beak. The Herring gull and the Yellow-legged gull have primary feathers with small white spots. The legs are pinkish on a Herring gull and custard yellow on a Yellow-legged gull. The Caspian gull has a pale pink to pale yellow legs. There is a prominent red spot on a Yellow-legged gull’s beak. The Herring gull has a thick yellow beak.”*



- (a) (i) Use this information to create a *factor table* for the three species of gull. 4
- (ii) Create **three** *backward chaining* rules for gulls based on the above information. 5
- (iii) Describe how a backward chaining inference engine would identify a gull using rules for Caspian, Herring and Yellow-legged gulls. 3
- (iv) After a consultation with the “seabird” expert system, the advice “It is a Herring gull” is generated. The expert system can display justification for this advice.
- State how the *inference engine* can generate justifications and illustrate how this justification would be generated. 4
- (b) An incorrect classification by the “seabird” expert system could be the result of either an error introduced during the development of the expert system or a problem during a consultation.
- (i) Apart from programming errors, describe **two** ways an error could have been introduced during the development of the “seabird” expert system and suggest how each type of error should have been avoided. 4
- (ii) Describe **one** problem users face when responding to questions during a consultation with the “seabird” expert system. Suggest how the expert system could be re-designed to deal with these problems. 4
- (c) State **one** benefit and **one** limitation of an expert system. 2



**Part B—Expert Systems (continued)**

19. Morag has booked a flight abroad. She has been given some information for a trouble-free journey.
- (a) “If she loses her passport or she forgets her tickets then she will not be allowed to board the flight.”  
Represent the three statements using symbols and express this advice using *propositional logic*. 3
- (b) “Morag is a vegetarian. Vegetarians are given a pasta dish on this flight.”  
Express this advice using two lines of *predicate logic*. 4
- (c) Using **two** of the characteristics which affect the *quality of information*, comment on either piece of information and give a justification for your comment. 4
- Early developments in expert systems include *DENDRAL*, *PROSPECTOR*, *MYCIN* and *INTERNIST*.
20. (a) State **three** facts about the INTERNIST expert system. 3
- (b) When critically evaluating an expert system, there are certain features, including *quality of reasoning*, which you would include in an evaluation. State **four** other features you would include in an evaluation. 4
21. The *RETE algorithm* is used to form the *conflict set* in a *forward chaining inference engine*.
- (a) Explain what is meant by a conflict set. 2
- (b) Describe how the RETE algorithm increases the speed at which a conflict set is formed. 2
- (c) Describe how *context limiting* can help in *conflict resolution*. 2
- (50)**

[END OF SECTION III—PART B]

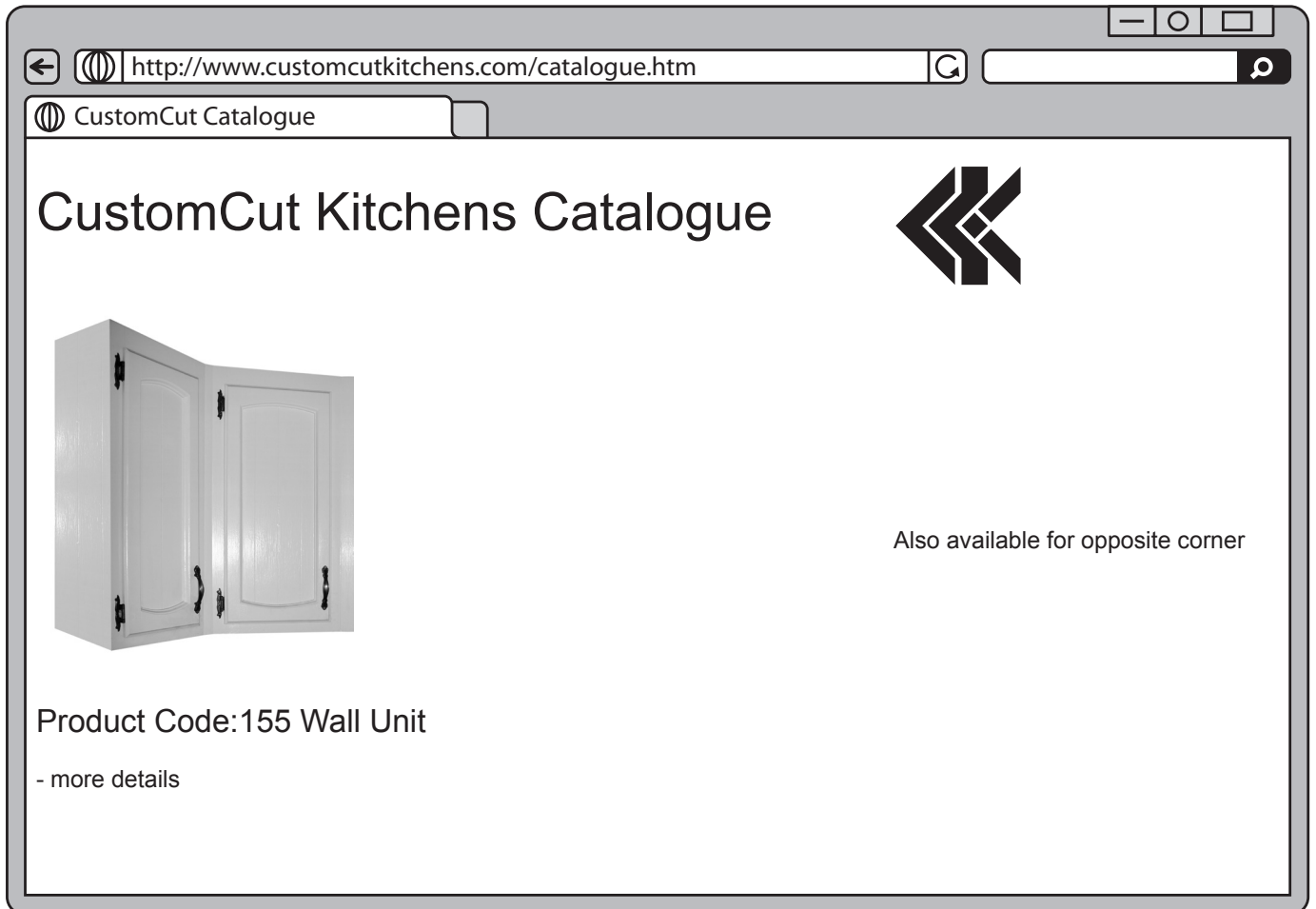
**[Turn over**

## SECTION III

### Part C—The Internet

Attempt all questions.

22. CustomCut Kitchens is developing an online catalogue. Part of a page from the online catalogue is shown below.



Part of the HTML code used to produce this page is shown on *Page nineteen*.

SECTION III

Part C—The Internet (continued)

Marks

22. (continued)

(a) State suitable entries for each of the missing values A to E. 5

1. <head>
2. <title>   A   </title>
3. <link rel="stylesheet" href="CustomCutCSS"
4. type="text/css">
5. <style>
6. h3 {font-family: Arial,Helvetica,sans-serif;}
7. </style>
8. </head>
9. <body>
10. <table width=100%; border="   B   ">
11. <tbody>
12. <tr>
13. <td><h1>CustomCut Kitchens Catalogue</h1></td>
14. <td><img width=91; height=84;   C   ="CClogo"   D   = "Kitchen logo.png"></td>
15. </tr>
16. <tr>
17. <td><h3>Product Code:155 Wall Unit</h3>- more details</td>
18. <td text-align: center>Also available for opposite corner</td>
19. </tr>
20. <   E   >

(b) Describe the effect of the attribute “width=100%” in line 10. 1

(c) Further information about this product is available on another web page which is stored as WU155.html.

<td><h3>Product Code:155 Wall Unit</h3>- more details</td>

Rewrite the highlighted section of line 17 above to show the changes which must be made to allow users to click on the text “- more details” to display this page. 5

*Cascading Style Sheets* can be implemented as external style sheets, internal style sheets or inline styles.

(d) State which line of the HTML code uses formatting from 1

- (i) an external style sheet 1
- (ii) an internal style sheet 1
- (iii) an inline style. 1

(e) Describe **two** benefits and **two** drawbacks of using an inline style. 4

SECTION III

Marks

Part C—The Internet (continued)

23. An *IP address* is a label assigned to each device on a network which uses IP for communication.
- (a) Describe the structure of an IP address. 2
- (b) IP addresses were originally divided into 3 classes, *Class A*, *Class B* and *Class C*.  
Assign each of the five statements below to a Class A, Class B or Class C address.
1. Range of first octet 128 to 191
  2. Number of hosts = 254
  3. Number of networks = 2,097,152
  4. Range of first octet = 192 to 224
  5. Allocated to large companies and organisations 5
- (c) The IT department of an organisation has put in place an IP *subnet mask* of 255.255.255.128.
- (i) State how many subnets would be created with this subnet mask. 1
  - (ii) State **two** possible benefits to the organisation of using a subnet mask. 2
24. An example of a personal resource on the Internet is a personal website. For each of the following, state the type of *Internet resource* and give **one** other example of that type of resource.
- (a) Airline reservation website. 2
- (b) Virtual reference library. 2

SECTION III

Part C—The Internet (continued)

Marks

25. Clicksoft is a software company which has developed Clickweb, a *web authoring package*, which is available for purchase online. John is buying Clickweb and is shown the following web page after making payment.



- (a) Clicking the download link directs the browser to the following URL:

**A** ftp://download.clicksoft.org.uk **B** /authoring/clickweb.htm: **C** 20

- Name parts A, B and C of this URL. 3
- (b) Using **two** characteristics which affect the quality of information, comment on the information on the sample screen above and give a justification for your comment. 4
- (c) Evaluate this web page in terms of *browser compatibility*. 2
- (d) A web page can be created using a web authoring package or writing HTML code directly. Compare these two methods in terms of
- (i) *Page layout design*. 2
  - (ii) *Download efficiency*. 2
- (e) Describe **one** benefit to a developer of using a package like Clickweb which offers “direct upload”. 1
- (f) As part of their website security, Clicksoft makes use of a *firewall* and *secure sockets*. Describe how each of these ensures security. 4

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

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## ACKNOWLEDGEMENTS

Question 12 – 36704467 Shutterstock.com

Question 13 – 80855845 Shutterstock.com

Question 18 – 38476981 Shutterstock.com

Question 22 – 2794890 Shutterstock.com

Question 25 – 5577724 Shutterstock.com