

X216/301

NATIONAL
QUALIFICATIONS
2008

MONDAY, 19 MAY
9.00 AM – 11.30AM

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 8
Page 11
Page 16

Questions 18 to 20
Questions 21 to 25
Questions 26 to 29

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

Attempt ALL questions in this section.

1. A shop's database has been created from data in un-normalised form. The diagram below shows 4 records from a table in the database.

Item Number	Item Description	Item Price	Supplier	Supplier Address	Supplier Telephone
12123	Canvas	£5.99	Fabriceeze	21 Castle Street	03214 665447
12234	Fine Brushes	£5.99	Colour Solutions	32 Fort Street	03118 876540
13224	Oil Paints	£35.99	Colour Solutions	32 Fort Street	03118 876540
23441	Spray Paints	£12.99	Colour Solutions	32 Fort Street	03118 876540

- (a) Choose a suitable primary key for this table. Give **one** reason for your choice. 2
- (b) Describe **one** problem with deleting an item from this table. 2
2. Explain what is meant by a *Boolean* data type. 2
3. Explain what is meant by *referential integrity* with regard to foreign keys. 3
4. State the *cardinality* of each of the following relationships.
- (a) Recording Artist and MP3 playlist 1
- (b) Hospital Ward and Patient 1
5. State **one** characteristic of data in first normal form. 2
6. State **one** reason why a *surrogate key* would be used in a table. 2

SECTION I (continued)

- | | |
|---|--------|
| 7. Explain the term <i>metadata</i> . | 2 |
| 8. Below is a part of a statement given by a driver involved in a road accident:
"I was doing just under 30 miles per hour along High Road when the car skidded on the ice and hit the wall."
State the category of this information according to its
(a) <i>source</i> and
(b) <i>form</i> . | 2
2 |
| 9. Explain the purpose of a <i>decision support system</i> . | 2 |
| 10. State two areas of Web content covered by the Copyright, Designs and Patents Act 1988. | 2 |
| 11. Ahmed has a problem using his project management software.
State two means by which Ahmed could obtain <i>user support</i> for this software. | 2 |
| 12. Explain how online stores such as Amazon make use of <i>data mining</i> to promote sales. | 3 |
| | (30) |

[END OF SECTION I]

[Turn over

SECTION II

Attempt ALL questions in this section.

13. Northbank High School stores details of pupils' attainment.

An example is shown below.

Pupil Name	Tom Jones	Pupil ID	12132
Form Class	5C		
Form Teacher	Mr Lee	Telephone	143
Course Code	Subject	Level	Grade
5MAA1	Maths	Higher	C
FRC12	French	Intermediate 2	A
5EN12	English	Higher	B
SR11	RE	School-based	Ungraded
SP22	PE	School-based	Ungraded
DI332	PE	Higher	B

Details of Form Classes are also stored.

Form class	1A
Form teacher	Ms Simpson
Room	G13
Telephone	132

Form class	5C
Form teacher	Mr Lee
Room	A22
Telephone	143

Form class	3D
Form teacher	Mr Macgregor
Room	G14
Telephone	132

Form class	1D
Form teacher	Ms Mahdi
Room	D9
Telephone	261

This data can be represented in un-normalised form as

Pupil ID

Pupil name

Form class

Form teacher

Room

Telephone

Course code

Subject

Level

Grade

Using pupil ID 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

SECTION II (continued)

Marks

14. 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 the following tables.

Branch	Customer	Sale	Salesperson
<u>Branch number</u>	<u>Customer number</u>	<u>Customer number*</u>	<u>Sales ID</u>
Address	Customer name	<u>Sales ID*</u>	Sales name
Telephone number	Customer address	<u>Date</u>	Branch number*
	Customer telephone	Amount	

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

6

Each month a report is produced to show the sales for each salesperson. The report for salesperson D Wilson for May is shown below:

Date	Customer	Amount
07/05/07	AcmeArtefacts	£450.00
08/05/07	Deco Designs	£250.00
15/05/07	Allied National	£1258.75
...
...
31/05/07	Logotek	£216.34
	Total	£5237.11

- (b) (i) Name the tables and fields which would be used to produce this report.
- (ii) State **two** features of the RDBMS which would be used to calculate and display the total for this salesperson.

5

2

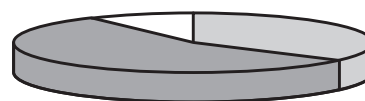
[Turn over

SECTION II (continued)

15. A monthly report is produced by several employees creating and editing sections of the document and then sending these to an editor over a Local Area Network.

- (a) (i) Name a suitable *topology* for this Local Area Network and draw a diagram of this topology. 2
- (ii) Describe how using a *stylesheet* ensures that the monthly reports conform to a house style. 2
- (iii) The monthly report contains charts. State which feature of the application software has been used to position the chart within the paragraph as shown below. 2

Many questionnaires were collected to produce statistics to study the progress of our healthy eating campaign. The survey was carried out during the final week of March in each participating centre. The results make interesting reading and will be included in our submission for further funding. I have included a pie chart to illustrate the main points.



- (b) Examples of four different fonts used in the report are shown below.

Arial Century Tahoma Times

Identify **two types** of font that are shown above. 2

- (c) (i) State the purpose of a *header* in a document. 2
- (ii) Describe how *pagination* could be used to improve the presentation of a multi-page document. 2

16. The ways in which shops and customers interact with each other have changed with the development of the Internet.

- (a) Describe **two** changes to the relationship between shops and customers brought about by the Internet. 4
- (b) Governments may block certain Internet content that they deem inappropriate. Describe **two** implications of this action. 4

17. Lachlan is preparing for an interview for the job of network security manager at First Place Ltd. The company has 4 warehouses supplying 40 branches throughout the country. A stock control system is used to manage daily supplies to each branch. As part of the interview he will be asked about a security strategy for the company's organisational information system.

- (a) State **five** areas concerning security strategies that Lachlan should be prepared to discuss in his interview. 5
- (b) Describe a suitable backup strategy for First Place Ltd. Your answer should describe:
- a storage method
 - a recovery method
 - a rotation method.
- 5

(60)

[END OF SECTION II]

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SECTION III

Attempt ONE sub-section of Section III

Part A	Applied Multimedia	Page 8	Questions 18 to 20
Part B	Expert Systems	Page 11	Questions 21 to 25
Part C	The Internet	Page 16	Questions 26 to 29

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

[Turn over

SECTION III

Part A—Applied Multimedia

Attempt all questions.

Marks

18. A council has received funding to enable it to create a multimedia project providing information to members of the community about recent local developments. Community groups will be involved in the creation of a DVD-ROM to showcase developments in their own areas.

- (a) *Budget* and *timescale* are two items contained in a *contractual requirements specification*.

State **three** other items found in a contractual requirements specification and give an example of each from the paragraph above.

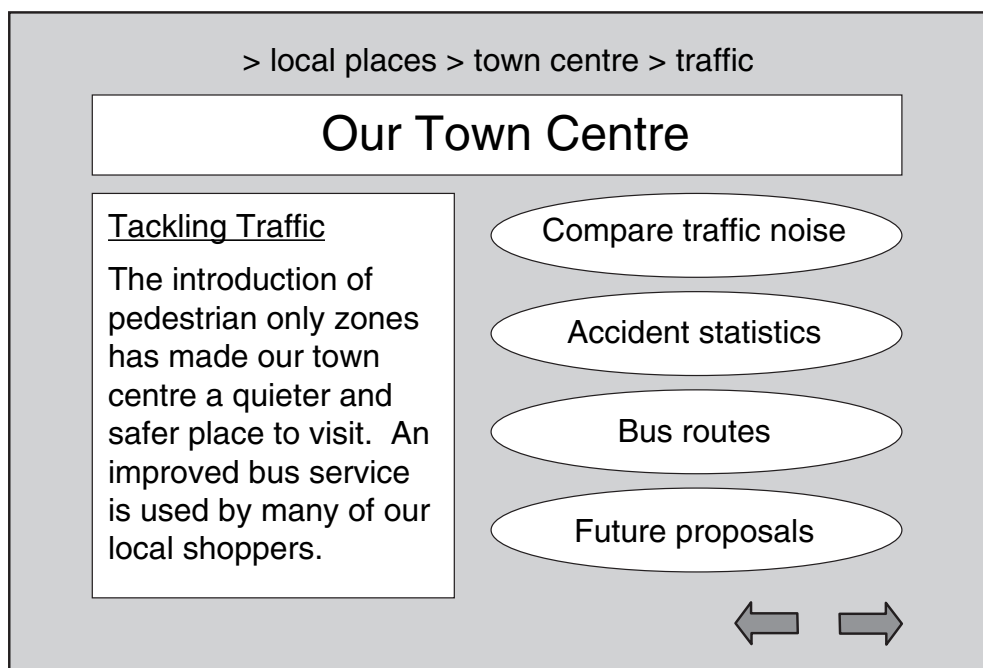
6

- (b) The World Wide Web was originally considered as a suitable delivery medium instead of a DVD-ROM.

State **one** advantage and **one** disadvantage that a DVD-ROM has compared to the World Wide Web for showcasing recent local developments.

2

A sample screen from the DVD-ROM is shown below.



- (c) Identify and describe **two** methods that have been used in the sample screen to avoid users becoming “lost in hyperspace”.

6

- (d) Once completed, the product will be tested.

- (i) Describe the *screen testing* that would be carried out on the sample screen.

2

- (ii) State **one** form of testing that would normally be carried out by persons outside the development team.

1

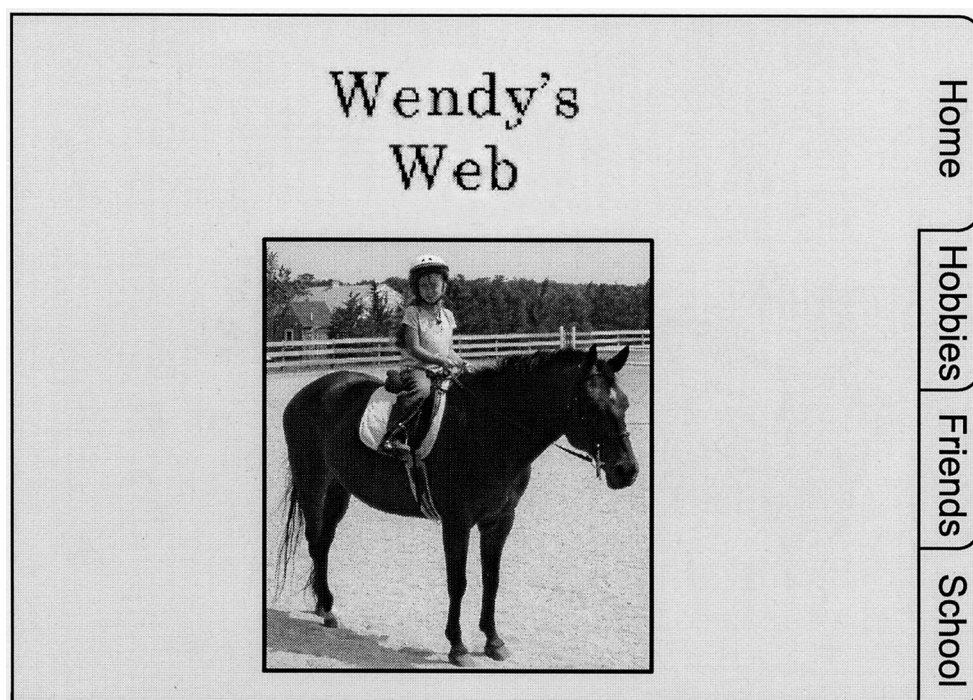
- (e) MP3 and MIDI are two audio file types. An audio clip of traffic noise is to be included. State a suitable audio file type and justify your choice.

3

SECTION III

Part A—Applied Multimedia (continued)

19. The home page for a school pupil's website is shown below.



- (a) A metaphor has been used in the design of this site.
- (i) Explain what is meant by a *metaphor* in multimedia. 2
 - (ii) Describe the metaphor used in this case. 2
- (b) Wendy has included a scanned colour photograph on her home page. The photograph has been stored as a JPEG.
- (i) Give **one** reason for choosing JPEG as a file type rather than TIFF in this case. 2
 - (ii) A GIF file type could also have been used, but this would have created a problem with *colour depth*.
 - (A) A GIF file type has a lower colour depth than a JPEG. Describe **one** problem associated with using a lower colour depth to display photographs. 2
 - (B) Dithering can be used to improve the appearance of images with a low colour depth. Explain what is meant by *dithering*. 2
- (c) Describe how the homepage could be improved by the use of:
- (i) *kerning*; 2
 - (ii) *anti-aliasing*. 2

SECTION III

Part A—Applied Multimedia (continued)

20. MecTrain is a company offering training to business users. It specialises in the use of multimedia for e-commerce. One of the training courses is based around a sample website selling a selection of jewellery. The website contains two sections: one where users can browse the catalogue of jewellery items and the other where users can make purchases online.

Jewellery Catalogue

Over 1000 items in stock. Lowest prices guaranteed.

1. Browse the Catalogue to find the Item Number.

Gold Silver Platinum

2. If you know the Item Number then:

Purchase NOW

Figure 1: Screenshot of catalogue

Item No AC327

Description: 18” curb linked gold chain

Quantity 1

Step 2 of 5

Figure 2: Screenshot from on-line purchases

The diagrams above show a screen from the jewellery catalogue and a screen from the on-line purchases section, where the user enters the Item No and Quantity.

- (a) State the type of user interface used in *Figure 2* shown above. 1
- (b) The website uses a database to store details of its customers, jewellery items and orders. When a customer enters in the Item No the description automatically appears. 3
- Explain how the description is retrieved from the database. 3
- (c) The sample website uses a hybrid navigational structure. 4
- (i) Justify the choice of structure for this website. 4
- (ii) Draw a simple graphical representation of this structure. 3
- (d) Describe how multimedia can be used to enhance *e-commerce*. 2
- (e) Part of the training course focused on the use of *digital watermarks*. 2
- (i) What is a digital watermark? 1
- (ii) State the main purpose of using a digital watermark. 2
- (50)

[END OF SECTION III—PART A]

SECTION III

Part B—Expert Systems

Attempt all questions.

21. MBV Car Repairs operates a number of garages in the UK. The company uses a car fault diagnostic expert system to identify faults with car engines.
- (a) Describe **two** benefits to MBV Car Repairs of the use of this expert system. 4
- (b) Describe **one** social implication of using this expert system. 2
- A customer brought in his sports car for repair. The engineers used the expert system to diagnose the problem with the car and, based on the advice given, they carried out the repair. However, the customer brought the car back the next day complaining that the car was still not operating correctly.
- (c) (i) State **two** stages of the development process of this expert system where an error could have occurred. 2
- (ii) For each stage in (c)(i) describe how the error could have occurred in this situation. 4
22. Expert systems are widely used in organisations along with other information systems.
- (a) Compare the use of expert systems within an organisation with that of a *management information system*, with reference to decision making. 4
- (b) Distinguish between an expert system and a relational database in terms of how data is represented. 4

[Turn over

Part B—Expert Systems (continued)

23. Colin and Sofie are fashion image consultants. They have been commissioned by an international jeans retailer to help construct an expert system. The expert system will advise customers on the style of jeans to buy.

The following rules represent advice on what type of jeans to buy if you have long legs:

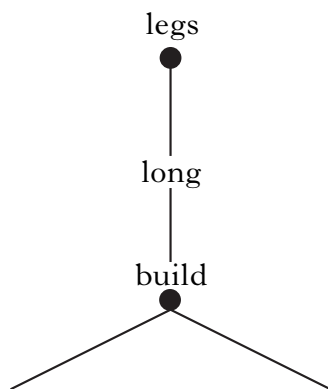
IF legs are long
AND build IS regular
AND wearing boots IS yes
THEN advice IS to buy bootcut jeans.

IF legs are long
AND build IS regular
AND wearing boots IS no
THEN advice IS to buy square cut jeans.

IF legs are long
AND build IS slim
AND wearing boots IS yes
THEN advice IS to buy bootcut jeans.

IF legs are long
AND build IS slim
AND wearing boots IS no
THEN advice IS to buy slimfit jeans.

Here is the start of the *decision tree* to represent the rules above.



- (a) Copy and complete the *decision tree* to represent the rules above 6
- (b) Describe **one** advantage of using a decision tree to represent knowledge in an expert system. 2
- (c) The expert system has to be expanded to cater for short leg lengths. Add to the list of rules to represent the following knowledge:
- “The loose fit jeans are suitable for those with slim or regular build and suit the short leg length; they would not be worn with boots.” 4

Part B—Expert Systems (continued)

24. Consider a *forward chaining* expert system containing the following rule base, where the letters G to R represent facts which are known or can be concluded.

- 1 If G and H then P.
- 2 If G then K.
- 3 If H and J then L.
- 4 If G and H and L then M.
- 5 If H and N then R.

Suppose the working memory contains facts G, H and J added in that order.

- (a) (i) List the rules that exist in the conflict set. 3
- (ii) Using *recency* conflict resolution strategy, state which rule would be fired first. 2
- (iii) Explain why conflict resolution strategies are required. 2
- (b) The following rule was added to the expert system. Represent this rule using propositional logic. 3
- If G and not L then N

[Turn over

SECTION III

Marks

Part B—Expert Systems (continued)

25. PHYSIO-24 is an expert system designed to diagnose sports injuries. Symptoms of the injury are requested from the user. The input is evaluated through a set of rules with certainty factors.

A simplified sample of rules for an injured foot is shown below.

IF pain is on ball of foot
AND bending toes is painful
THEN patient is suffering from loss of padding on sole (0.7)

IF pain is on heel
AND pain is up leg
THEN patient is suffering from damaged Achilles tendon (0.9)

IF pain is on heel
AND bending toes is painful
THEN patient has heel spur (0.7)

The following facts are known with certainty factors given:

The pain is on ball of foot	0.5
Bending toes is painful	0.8
Pain is up leg	0.5
Pain is on heel	0.8

- (a) (i) Calculate the certainty of the conclusion that the patient is suffering from loss of padding on sole. Show your working. 2
- (ii) Identify the conclusion drawn from the given facts. Explain your answer. 4
- (b)

“Severe pain and swelling on the ankle indicate that it is very likely that the ankle is broken.”

The following rule is added to the expert system to represent the knowledge above:

IF pain is on ankle
AND swelling is yes
THEN patient is suffering from a broken ankle

State a certainty factor for this rule and explain your answer.

2
(50)

[END OF SECTION III—PART B]

[Turn over for SECTION III Part C—The Internet on *Page sixteen*

SECTION III

Part C—The Internet

Attempt all questions.

Marks

26. Below is an extract from Northbank Sports Centre's home page with links to details of Gold Star, Silver Star and Junior memberships.

Northbank Sports Centre	
Types of Membership	Description
Gold Star Member	Access all areas any time. Click for details
Silver Star Member	Off-peak access only. Click for details
Junior Member	Under 16 years of age. Click for details

The HTML code used to produce this extract is shown below.

1. <h1>Northbank Sports Centre</h1>
2. <table width="100%" border="1">
3. <tr>
4. <td>Types of Membership </td>
5. <td>Description</td>
6. </tr>
7. <tr>
8. <td>Gold StarMember</td>
9. <td>Access all areas any time.Click for details</td>
10. </tr>
11. <tr>
12. <td>Silver StarMember</td>
13. <td>Off-peak access only.Click for details</td>
14. </tr>
15. <tr>
16. <td>JuniorMember</td>
17. <td>Under 16 years of age.Click for details</td>
18. </tr>
19. </table>

- (a) Explain the function of the width=100% attribute in line 2. 2
- (b) Explain the function of the tag in rows 8, 12 and 16. 2
- (c) Rows 13 and 17 both use the href attribute of the <a> tag as shown below.

Line 13	href="#Smember"
Line 17	href="Juniormember.html"

Explain the difference in the way the href attribute is used in each of these lines.

4

Part C—The Internet (continued)

26. (continued)

The club secretary does not like the look of the page and would prefer the designer to change to the layout shown below.

Northbank Sports Centre	
Types of Membership	Description
Gold Star Member	Access all areas at any time. Click for details
Silver Star Member	Off-peak access only. Click for details
Junior Member	Under 16 years of age. Click for details

(d) Rewrite the HTML code in each of the following lines to make the required changes.

- | | |
|--------------|---|
| (i) line 1 | 1 |
| (ii) line 2 | 2 |
| (iii) line 4 | 2 |

(e) The updated web page is stored on the designer's computer. Describe how the designer would make this page available on the WWW. 3

27. Donna is setting up her laptop as part of her home network. One of the configuration screens she has completed looks like this:

TCP/IP Settings	
Manual	<input checked="" type="checkbox"/> Automatic <input type="checkbox"/>
IP Address	<input type="text" value="192.168.0.132"/>
Subnet mask	<input type="text" value="255.255.255.0"/>
Gateway address	<input type="text" value="192.168.0.1"/>

(a) TCP/IP is a set of communication protocols. Explain what is meant by a protocol. 2

(b) Describe the function of each of the following protocols

- | | |
|---------|---|
| (i) TCP | 2 |
| (ii) IP | 2 |

(c) The IP address 192.168.0.132 is a Class C address. Describe the difference between a Class A address and a Class C address in terms of the number of hosts and networks supported. 4

SECTION III

Marks

Part C—The Internet (continued)

28. Keith is developing a website for a friend's online computer store using php. Part of a page from the site which allows users to select items for purchase is shown below.

Click&Get Online Computer Store Today is: 26/5/08

Items meeting your requirements:

Item Number	Description	Number in Stock	Price	Add to Shopping Cart
CG1332	80GB External Drive more ...	4	£65.99	<input type="checkbox"/>
CG435	80GB Portable Hard Drive more ...	1	£72.49	<input type="checkbox"/>
CG212	120GB External Drive more ...	12	£125.00	<input type="checkbox"/>

[Proceed to secure checkout](#)

- (a) (i) Why would *php* be a suitable means of producing this website? 4
- (ii) An image of the 120 GB External Drive is stored as CG212.jpg in a folder called images. State the URL which would be used to access this file. 4
- (b) Describe the quality of the information shown above in terms of *level of detail*. 3
- (c) Describe how the use of Secure Sockets Layer (SSL) ensures the security of data transmitted to the secure checkout area of the website. 3
- (d) Click&Get makes use of *site usage tracking*.
- (i) Explain what is meant by site usage tracking. 2
- (ii) Describe **one** way in which Keith could implement site usage tracking on this website. 2
- (iii) Describe **one** use Click&Get could make of the information generated by site usage tracking. 2

SECTION III

Marks

Part C—The Internet (continued)

29. There are several organisations which contribute to the operation of the Internet. State which organisation would be most relevant in the following cases giving a reason for each answer.

- | | |
|--|-------------|
| (a) A team of people developing a new web browser. | 2 |
| (b) An Internet Service Provider (ISP) wishing to greatly expand the number of users it can support. | 2 |
| | (50) |

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

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