

X216/301

NATIONAL
QUALIFICATIONS
2010

THURSDAY, 20 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

Page 12

Questions 18 to 20

Part B Expert Systems

Page 15

Questions 21 to 23

Part C The Internet

Page 18

Questions 24 to 26

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. The Scottish Tennis Association stores details about players and clubs in a single table. Below is a record from this table. “Player no” is the primary key.

Player no	10124
Name	Donald Gryffe
Date of birth	5th May 1995
Rating	4.2
Tennis club	Newlloyd
Club address	22 Granton Place, Paisley
Club telephone	01234 987654

- (a) Describe **one** data insertion problem with this database design. 2
- (b) State **two** *domain constraints* that could apply to the Rating attribute. 2
2. Golf handicaps are a measure of a golfer’s ability and are constantly adjusted. Kenneth Cruise has a golf handicap of 12. His golf club list him as KC12, his initials followed by his current handicap.
State **two** problems of using this *meaningful identifier* as a primary key. 2
3. Describe how data is transformed from *first normal form* to *second normal form*. 2
4. (a) Explain what is meant by an *Object* data type. 2
- (b) Give an example of a *Boolean* data value. 1
5. “Keep-In-Fashion” sells clothes online. For any given order the following attributes are stored: Order number; Date; Customer number; Item code.
- (a) Identify the multi-valued attribute from the four attributes above and give a reason for your choice. 2
- (b) Entities exist for Customer, Order and Item. State the *cardinality* of each of the following relationships.
- (i) Customer and Order 1
- (ii) Item and Order 1

SECTION I (continued)

6. Explain the difference between the *cost* and *value* of information. 2
7. State the type of *organisational information system* which will process large volumes of operational data quickly. 1
8. An *Executive Information System* (EIS) is used to support the decision making process within an organisation.
State the **level** of information produced by an EIS. Justify your answer. 2
9. A company director would like to save documents to a folder on the local area network (LAN). He is concerned that his folder could be accessed by other company workers.
- (a) State the management strategy that deals with unauthorised access of data. 1
- (b) Describe **one** method that could be used to protect folders on a LAN from unauthorised access. 2
10. Word Processing packages can use a wide selection of fonts.
Using any appropriate character, illustrate the difference between *serif* and *sans serif* fonts. 2
11. Explain why *text wrapping* is a useful feature in desktop publishing software. 2

[Turn over]

SECTION I (continued)

12. A bank customer wishes to take out a loan to purchase a new car. He has calculated an example of a payment amount including interest using spreadsheet software. Cell B4 contains a formula.

	A	B
1		
2	Loan Amount	£12,000
3	Number of Months	36
4	Monthly Payments	£347.39

- (a) Explain why the contents of cell B3 could be considered as either data or information.

2

- (b) The customer can afford a maximum of £300 per month.

State a feature of spreadsheet software that would allow the customer to find the required number of monthly payments.

1

(30)

[END OF SECTION I]

[Turn over for SECTION II on *Page six*

SECTION II

Attempt ALL questions in this section.

13. Inspire Conference Centre hires rooms to local businesses for meetings and functions. All rooms provide similar facilities and the price changes only according to the capacity. Data is currently stored in the following way.

Customer Name	Woods Electrical
Address	27 High Street
Contact	K Lindsay
Customer Telephone	01411 267314

Room	Date	Time
A1	12/05/2009	<input checked="" type="radio"/> am <input type="radio"/> pm
A1	12/05/2009	<input type="radio"/> am <input checked="" type="radio"/> pm
C6	19/12/2009	<input type="radio"/> am <input checked="" type="radio"/> pm
C7	19/12/2009	<input type="radio"/> am <input checked="" type="radio"/> pm
A4	22/02/2010	<input checked="" type="radio"/> am <input type="radio"/> pm
A2	22/02/2010	<input checked="" type="radio"/> am <input type="radio"/> pm
C3	14/03/2010	<input type="radio"/> am <input checked="" type="radio"/> pm

Inspire Conference Centre Room Information

Room	Room Telephone	Capacity	Price
A1	131	80	£240
A4	145	80	£240
A2	332	60	£175
C6	612	60	£175
A3	132	40	£125
C3	144	30	£125

SECTION II (continued)

13. (continued)

This data can be represented in un-normalised form as

Customer name

Customer address

Customer contact

Customer telephone

Room

Date

Time

Room telephone

Capacity

Price

Using Customer name 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

[Turn over

SECTION II (continued)

14. Teachers at Northcraig High School organise several trips throughout the year. Teachers may organise more than one trip in a year and pupils may book more than one trip. A relational database has been set up to record pupil payments. The entities and attributes are as follows:

PUPIL(Pupil ID, Name, Form class*)

TRIP(Trip ID, Trip Leader, Destination, Date, Cost)

PAYMENT(Pupil ID*, Trip ID*, Payment date, Amount)

FORM CLASS(Form class, Form teacher)

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

- (b) The data dictionary shown below represents the Payment entity. It has a number of missing entries which are highlighted as A, B and C.

State a suitable entry for each of the **three** missing values. 3

Attribute	Data Type	Validation	Required	Key
Pupil ID	Integer	Lookup from Pupil table	Y	PK/FK
Trip ID	Text	B	Y	PK/FK
Payment Date	A		Y	
Amount	Real	C	Y	

- (c) Extracts of data from the Pupil and Form Class tables are shown below. Both tables have been sorted on Form Class.

Form Class	Form Teacher
2C1	Miss Ogg
2C2	Ms Locke
2D1	Mr Ali
2D2	Mr Caldwell
2E1	Mrs Robb
2E2	Miss Curran

Pupil ID	Name	Form Class
12324	Brown, Tom	2C1
13453	Day, June	2C1
14356	North, Luke	2D3
16675	Norder, Laura	2E2

State whether *referential integrity* has been implemented in these tables. Justify your answer. 4

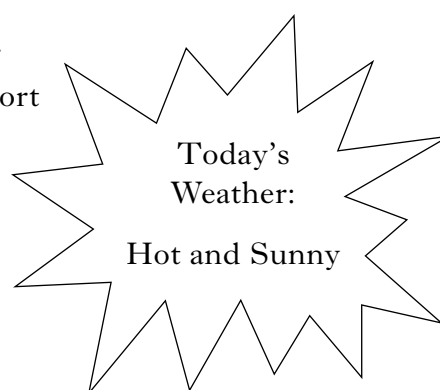
SECTION II (continued)

15. Laura has been searching the World Wide Web for information to help her choose where to go on holiday. Here is some information she found about a resort in the Algarve on a travel advisory website.

Golden Beach Club is situated in the sunny Algarve—Europe's sunniest spot where you will find the finest beaches and the best hotels, facilities and restaurants.

The resort provides a full entertainment programme, a bus service to the old town of Albufeira and a 24 hour reception. On-site facilities include two swimming pools, a jacuzzi, sauna, bar, restaurant and barbecue terrace.

Customer feedback has consistently rated this resort as excellent.



Facilities	😊😊😊😊
Family Friendly	😊😊😊😊
Food Quality	😊😊😊😊
Cleanliness	😊😊😊😊😊

- (a) Information can be categorised in terms of its *use*. The information on the website is for decision making and could be useful to help Laura decide where to go on her next holiday.

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

Heading	Category
Use	Decision making
Nature	Formal

8

- (b) Comment on the quality of the customer feedback section in terms of its *reliability*.

2

[Turn over]

SECTION II (continued)

16. McCready, Kovaks & Co., a local firm of accountants, is upgrading from stand-alone computers to a network system. Before changing to the new system, the firm has considered a *network strategy* and an *upgrade strategy*.
- (a) *Future proofing* and the maintenance of *legacy systems* are key features of an upgrade strategy.
Discuss the importance of these **two** key features. 4
- (b) State **four** aspects of a network strategy that the firm should have considered. 4
- (c) McCready, Kovaks & Co. has a responsibility to their employees under health and safety regulations for those working with computer equipment. State **two** measures which the firm should take to comply with these regulations. 2
17. Sanjeet works as an accountant for McCready, Kovaks & Co. and spends a good deal of time out of the office visiting clients. Sanjeet uses a smart phone which has personal information management software installed.
- (a) State **two** features of personal information management software and describe how Sanjeet would make use of them. 4
- (b) State **one** piece of current legislation which has implications for Sanjeet in his use of personal information management software and state the feature of the software where this legislation would apply. 2
- (c) Describe the economic implications that the increased use of ICT would have on McCready, Kovaks & Co. 4
- (60)**

[END OF SECTION II]

SECTION III

Attempt ONE sub-section of Section III

Part A	Applied Multimedia	Page 12	Questions 18 to 20
Part B	Expert Systems	Page 15	Questions 21 to 23
Part C	The Internet	Page 18	Questions 24 to 26

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

SECTION III

Part A—Applied Multimedia

Attempt all questions.

18. ZoneOut is a company which develops games software aimed at the home entertainment market. Over the years, computer gaming has continued to increase in popularity and develop in complexity.

(a) A computer game could be delivered using a CD-ROM or a DVD-ROM.

(i) With reference to **one** appropriate comparison criteria, compare the suitability of these two delivery media. 3

(ii) State **one** other comparison criteria. 1

(b) One of the company's media specialists is responsible for the creation of the characters used in the game. The character drawings are saved as TIFF files. In order to be used in an animated game sequence, the TIFF files have to be converted to GIF making use of *dithering*.

Explain this use of TIFF and dithering. 4

(c) Multi-player games allow many users to compete against each other across the Internet. Background music and realistic sound effects enhance the users' experience.

(i) State a suitable audio file type for the games' sound effects and justify your choice. 3

(ii) The games' background music could be streamed or downloaded as the users play the games. Describe **one** advantage and **one** disadvantage of using streamed audio in this scenario. 4

(d) ZoneOut must ensure that its games are fully tested before final release. Describe how *usability testing* is carried out. 2

(e) A *copyright licence* and *user documentation* are enclosed within the game package when purchased.

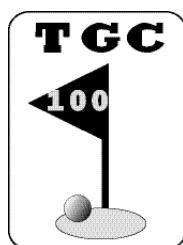
(i) State **two** pieces of information that should be contained within the user documentation. 2

(ii) Describe **one** way in which a game user could be in breach of the copyright licence. 2

SECTION III

Part A—Applied Multimedia (continued)

19. The committee members of Torphanan Golf Club wish to create a multimedia product to celebrate their centenary year. They have created a new club logo especially for the event, as shown below.



This product should be ready for August 2010 and will allow visitors and members of the golf club to view a selection of photographs and textual information about the history of the club.

A local design company has been commissioned to carry out the development. The company project manager has been supplied with the *project brief* by the golf club secretary.

- (a) The project manager uses the project brief to help draw up the *requirements specification*.
- (i) Describe the difference in purpose between a project brief and a requirements specification. 2
 - (ii) State **two** items found in a requirements specification and give an example of each from the information above. 4
- (b) The development team is ready to create a sample home page for the golf club. This page should include a title “Centenary Year”, the new logo and links to three separate sections.
- The “Golf Course” section will display a set of photographs showing the development of the course over the years. These should follow on one after the other.
 - The “Players” section will provide statistics about all the past club champions.
 - The final section will outline the history of the club in a textual report.

At the end of each section the user should be returned to the home page.

- (i) Create an *outline storyboard* for the sample home page. Your diagram should clearly show the information required. 3
- (ii) State **three** additional pieces of information that should be included in the *detailed storyboard* for the home page. 3
- (iii) State the navigational structure to be used in this product. Justify your answer. 3

SECTION III

Part A—Applied Multimedia (continued)

19. (continued)

(c) A *multimedia designer* and a *multimedia programmer* are two key personnel within the development team. Describe their roles in the creation of the centenary multimedia product.

4

(d) The product will be created using *authoring software*. The use of timelines is an advanced feature of this type of software. Describe how timelines could be used in the development of this product.

2

20. Michael has to create a multimedia presentation as part of his school project. The teacher has told pupils that the title for the presentation has to be “My Favourite Holiday”, but it has been left up to them what information is to be included. The completed presentation should fit onto a CD so that it can be viewed on the class computer at the end of term.

(a) Describe how Michael could ensure a consistent style throughout his presentation.

2

Michael has decided to include video clips from his holiday to Florida in his presentation.

(b) Compression techniques have to be used on the video clips before they can be incorporated into the presentation.

(i) State **one** video standard which uses compression.

1

(ii) Explain why using a standard file format would be useful in this case.

1

(c) Apart from compression, state **one** method that Michael could use to reduce the video file size and describe the effect it would have on Michael’s presentation.

2

(d) The teacher maintains that the pupils will gain knowledge from viewing these presentations. Define the term “knowledge”.

2

(50)

[END OF SECTION III—PART A]

SECTION III

Part B—Expert Systems

Attempt all questions.

21. Moira is a lepidopterist which means she is an expert on caterpillars. She makes notes about caterpillars she finds on her walks.



- A Tuesday 2:00 pm—Type: Cousin German. I had just finished my packed lunch and it was starting to rain when I noticed one on the heather. It was a typical reddish-brown colour with the usual pale dorsal line down its back.
- B Tuesday 4:30 pm—Type: Small Underwing. I was carefully checking a bearberry plant when I spotted this one. It had a bold dorsal line and was a purplish-grey colour.
- C Thursday 10:00 am—Type: Maple Prominent. It was sunny today. This was the normal green with the darker dorsal line. It was on a willow bush next to the path.

Moira wants to use the information in her notes to create an expert system to help classify caterpillars.

- (a) (i) Derive **three** attribute-value pairs for a Cousin German caterpillar from paragraph A. 3
- (ii) Create a factor table based on the attribute-value pairs from part (i) or otherwise. Complete this factor table for the three types of caterpillar mentioned in paragraphs A, B and C. 4
- (iii) Using your factor table in part (ii) or otherwise, create rules for the Cousin German, the Small Underwing and the Maple Prominent. 6
- (b) Describe **two** reasons to justify the creation of this expert system to classify caterpillars. 4

An expert system is created from Moira's notes. A user discovered that his Pale Clouded Yellow specimen is incorrectly classified by the expert system as a Maple Prominent. This could have been caused by either of the following.

- Even experts like Moira can sometimes confuse these two types of caterpillar.
 - Users sometimes enter inaccurate data.
- (c) With reference to the stages of development, state **two** other possible reasons for this incorrect classification. 4

[Turn over

SECTION III

Part B—Expert Systems (continued)

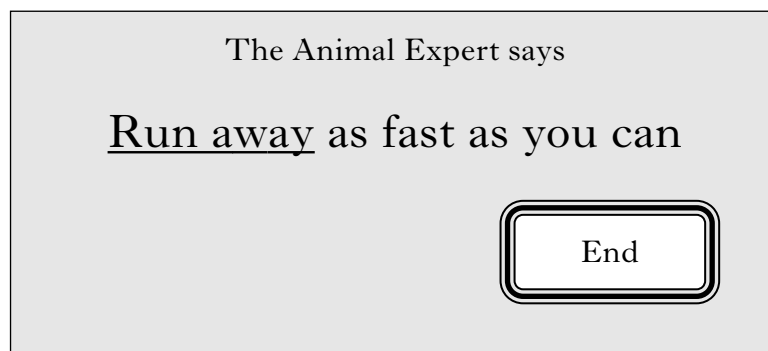
22. Consider an expert system where the following facts are known, each with a given certainty factor.

fast	CF 60%
carnivore	CF 80%
awake	CF 30%

The following rule is fired:

IF fast AND carnivore AND awake THEN dangerous CF 90%

- (a) Calculate a certainty factor for the conclusion “dangerous”. 2
- (b) Describe the change to the expert system after this rule is fired. 3
- (c) State the purpose of the *RETE algorithm* and the type of inference engine where it is used. 4
- (d) Following a consultation, the expert system produces the following advice.



- (i) Comment on this advice in terms of *level of detail* and *nature* and justify each comment. 4
- (ii) Critically evaluate the quality of the user interface as shown in this sample screen. 3
- (iii) A tourist has an accident as a result of relying on the advice given by the expert system. Describe **one** ethical implication of relying on the advice of an expert system. 2
- (e) The following rule is to be added to the knowledge base:
- IF camera AND NOT dangerous THEN photograph
- Represent this rule using propositional logic. 3

SECTION III**Part B—Expert Systems (continued)**

23. Expert systems began to be developed in the 1960s. They now have applications in many fields.

(a) The ONCOCIN expert system was developed in 1981. State the domain, category and main characteristics for this “classical” expert system.

4

(b) Compare an expert system with a database in terms of how information is extracted.

4**(50)**

[END OF SECTION III—PART B]

[Turn over

SECTION III

Part C—The Internet

Attempt all questions.

24. ZoneOut Games manufactures and sells computer games. The company website is to be expanded to give details of games currently under development. A draft version of one of the pages is shown below.



Part of the HTML code used to produce this page is as follows:

1. <head>
- 2.
- 3.
- 4.
5. <title>ZoneOut Games In Development</title>
6. </head>
7. <body>
8. <h1>ZoneOut Games</h1>
- 9.
10. <h3>In Development</h3>
11. <h3> TurboThunder</h3>
12. <table width: 100%; border="1">
13. <tr>
14. <td>Road racer (more)</td>
15. <td>due date 23/6/2010</td>
16. </tr>
17. </table>
18. </body>

- (a) Write the HTML code in line 9 to display the company logo scaled to 70 pixels high by 120 pixels wide. The image is stored with the file name Zologo.jpg. You should include the alt attribute in your code.

SECTION III

Part C—The Internet (continued)

24. (continued)

- (b) Further information about the game TurboThunder is available on another web page which is stored as tthunder.html. Line 14 should include the HTML code to allow users to click on the word “more” to display this page.

Write HTML code for a new line 14 to allow this to happen.

4

- (c) Steve is a website developer for ZoneOut Games. He would like to be able to easily add sound to his website and believes a <sound> HTML tag would be a good idea.

State which Internet organisation Steve should contact with his idea. Give a reason for your answer.

3

- (d) *Cascading Style Sheets (CSS)* is a method of implementing uniformity of layout across multiple webpages.

Describe how the use of external CSS can save a web developer time in the creation and maintenance of a website.

4

- (e) A later draft of the ZoneOut Games webpage has the following internal style sheet included:

2. <style>
3. h1 {text-align:center}
4. </style>

and line 8 has been altered to

```
<h1 style= “text-align: right”>ZoneOut</h1>
```

- (i) Lesley says “The heading ‘ZoneOut’ will now appear in the centre of the page”.

Paula says “The heading ‘ZoneOut’ will now appear at the right of the page”.

State who is correct and justify your choice.

4

- (ii) Write additional lines to the internal style sheet between lines 3 and 4 so that all headings, such as In Development or TurboThunder, are displayed in red Arial font.

4

25. Data transmission over the Internet makes use of *packet switching*.

Describe what is meant by a *packet* and how packet switching is used to route a packet of data over the Internet.

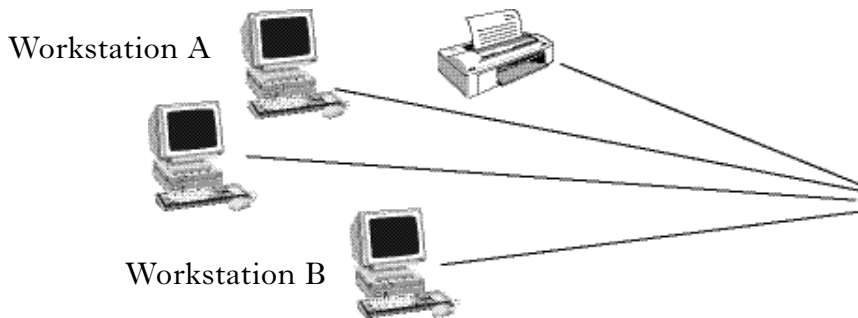
5

[Turn over for Question 26 on Page twenty

SECTION III

Part C—The Internet (continued)

26. Angelika is a network manager for a British company which designs and sells posters. The company has 104 workstations and other devices connected to a single Local Area Network with no subnetting. The diagram below represents part of the network.



One of Angelika's tasks at work is allocating IP addresses to devices on the network.

- (a) State suitable Class C IP addresses for Workstation A and Workstation B. 4

The company sells most of its posters through its website.

- (b) Websites more commonly make use of domain names rather than IP addresses.
- (i) Explain why domain names are used instead of IP addresses by most websites. 2
 - (ii) State a suitable domain name for Angelika's company. 2
 - (iii) Describe how the domain name is used to display the web page in a customer's browser. 4
- (c) Angelika makes use of TELNET at work.
- (i) What is TELNET? 2
 - (ii) Explain why the company does not allow TELNET access from outside the local area network. 2
- (d) In order to purchase goods, the company requests credit card details from the customers who have the choice of e-mailing their credit card details or completing an online form.
- (i) Describe **two** advantages of using *client side scripting* for validating the form. 2
 - (ii) Describe how the company could make use of a relational database management system. 2

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]