

Course Assessment Specification

Information Systems Higher

The purpose of this document is to provide:

- ◆ details of the structure of the Question Paper for this Course
- ◆ details of the structure of the Practical Coursework task that contributes to this Course
- ◆ guidance to centres on how to use information gathered from the Question Paper and the Practical Coursework task in this Course to estimate candidate performance

PART 1

This part of the Course Assessment Specification details the structure of the Question Paper for this Course.

The Question Paper

- ◆ consists of three sections
- ◆ has a mark allocation of 140 marks
- ◆ has a time allocation of 2 hours 30 minutes

Section 1 - 30 marks

- ◆ consists of objective and short response questions
- ◆ samples across the content statements of the two mandatory units (*Relational Database Systems* and *Using Information*)
- ◆ approximately 20 marks will be for knowledge and understanding
- ◆ approximately 10 marks will be for problem solving
- ◆ the problem solving will be based in familiar contexts and be of a fairly straightforward nature
- ◆ candidates will be expected to tackle all questions in the section

Section 2 - 60 marks

- ◆ consists of questions requiring extended responses demonstrating structuring and reasoning
- ◆ questions have varying mark allocation and, therefore, do not have to be of the same length. Most questions will subdivide into a number of connected parts with the marks for each part clearly indicated
- ◆ questions will involve both knowledge and understanding and problem solving, and will be set in less familiar and more complex contexts than those in Section 1
- ◆ approximately 20 marks will be for knowledge and understanding
- ◆ approximately 40 marks will be for problem solving
- ◆ questions will sample across the content statements associated with the mandatory units (*Relational Database Systems* and *Using Information*)

- ◆ some questions, or parts of questions, will require integration of knowledge from the two mandatory Units
- ◆ candidates will be expected to tackle all questions in the section

Section 3 - 50 marks

- ◆ this section has three sub-sections, one for each of the optional Units (*Applied Multimedia*, *Expert Systems* and *The Internet*)
- ◆ candidates will be expected to tackle all the questions within **one** sub-section
- ◆ each sub-section consists of questions requiring extended responses demonstrating structuring and reasoning
- ◆ questions have varying mark allocation and, therefore, do not have to be of the same length. Most questions will subdivide into a number of connected parts with the marks for each part clearly indicated
- ◆ questions will involve both knowledge and understanding and problem solving, and will be set in less familiar and more complex contexts than those in Section 1
- ◆ approximately 17 marks will be for knowledge and understanding
- ◆ approximately 33 marks will be for problem solving
- ◆ questions in each sub-section will sample across the content statements associated with the appropriate optional Unit
- ◆ some questions, or parts of questions, will require integration of knowledge from the mandatory Units

PART 2

This part of the Course Assessment Specification details the structure of the Practical Coursework task in this Course.

- ◆ The Practical Coursework task has a mark allocation of 60 marks.
- ◆ There is no set time allocation, but the task has been designed to be completed by a typical candidate in 8–10 hours.

- ◆ The task provides the candidate with the opportunity to demonstrate and integrate practical skills and knowledge they have developed within the mandatory Units (*Relational Database Systems* and *Using Information*) in a more complex and less familiar context than is possible within the Units

- ◆ A new Practical Coursework task will be provided by SQA in autumn each year.
- ◆ The task is only valid for the session in which it is issued.

- ◆ The task may be undertaken in ‘open book’ conditions, but under supervision of the teacher/lecturer, to ensure that the work presented is the candidate’s own work.
- ◆ The task will be marked by the teacher/lecturer, using a marking scheme provided by SQA, but be subject to moderation.
- ◆ The marking scheme will provide a mark out of 60, which will be submitted directly to SQA without scaling.
- ◆ The teacher or lecturer may give the candidate hints and/or help if requested. Any such help should be reflected in the marks awarded.
- ◆ Once the task has been completed and marked, it should **not** be returned to the candidate for further work.

PART 3

This part of the Course Assessment Specification provides guidance on how to use assessment information gathered from the Question Paper and the Practical Coursework task to estimate candidate performance.

Component	Mark Range
Question Paper	0-140
Practical Coursework	0-60
Total Marks	0-200

The mark range for each component takes account of the weighting of each component.

In National Qualifications cut-off scores should be set at approximately 70% for Grade A and 50% for Grade C with Grade B falling midway.

For a total mark range of 0-200, the following gives an indication of the cut-off scores based on the candidate's **total** score.

Grade	Band	Mark Range
A	1	170-200
A	2	140-169
B	3	130-139
B	4	120-129
C	5	110-119
C	6	100-109
D	7	90-99
NA	8	80-89
NA	9	0-79

These cut-off scores may be lowered if Question Paper component turns out to be more demanding or raised if less demanding.

Worked example

- ◆ In a centre's own prelim, a candidate scores 88/140, and the candidate scores 37/60 in the Practical Coursework.
- ◆ The two marks are added together, giving a total of 125/200.
- ◆ The centre's view is that their own prelim is slightly less demanding than SQA examination.
- ◆ Using the mark range, a realistic estimate may be **band 5** rather than band 4.

IS/SQP241

**Information
Systems
Higher**

Time: 2 hours 30 mins

**NATIONAL
QUALIFICATIONS**

Specimen Question Paper
for use in and after 2006

Attempt **all** of Section I, **all** of Section II and **one** part of Section III.

Sections I and II — Attempt **all** questions.

Section III — This section has three parts:

Part A—Applied Multimedia

Part B—Expert Systems

Part C—The Internet.

Choose **one** part and attempt all of the questions in that part.

Read all questions carefully.

Write your answers in the answer book provided. Do not write on the question paper.

Write as neatly as possible.

SECTION I

Attempt ALL questions in this Section.

1. Below is a sample taken from a hotel booking database created from data in un-normalised form.

Customer Name	John Clarke
Customer Address	34 Gray Street, Glasgow
Customer Phone No	0141 666 7511
Hotel Name	Copthorne Hotel
Hotel Location	Aberdeen
Hotel Phone No.	01224 333424
Date	21/07/04

Customer Name	John Clarke
Customer Address	34 Gray Street, Glasgow
Customer Phone No	0141 666 7511
Hotel Name	Moat House
Hotel Location	Edinburgh
Hotel Phone No.	01224 333424
Date	23/07/04

- Describe **two** problems of inserting data into this database. 2
2. A characteristic of normalised data is that it allows for *referential integrity*. Define the term “referential integrity”. 2
3. Employees of a large multinational company are given a *meaningful identifier* consisting of their initials, a department code plus four random digits to make the identifier unique. For example, Janice Brown, who works in the Accounts Department has the identifier JBAC6942.
- Describe **two** problems associated with using this meaningful identifier as a primary key. 2
4. Give **two** reasons why a *surrogate key* might be used in a database. 2

5. Peter has set up a database to store information about all his CD albums. He uses the structure.

Album(number, title, artist, track).



Identify a *multi-valued attribute* from this structure and give a reason for your choice.

2

6. Explain why a text *data type* is the most appropriate for storing a telephone number.

2

7. The following is an extract from a local youth club's staff database.

<i>Staff ID</i>	<i>Surname</i>	<i>Forename</i>	<i>Photograph</i>	<i>First Aider</i>
67575	Buchan	Hilary		<input checked="" type="checkbox"/>
46565	Thomson	Peter		<input type="checkbox"/>

Identify suitable data types for the fields Photograph and First Aider.

2

8. State the *cardinality* of each of the following relationships.

(a) Date of birth and person

(b) Actor and film

2

	<i>Marks</i>
9. Define the term <i>Information System</i> .	1
10. Explain the difference between <i>information</i> and <i>knowledge</i> . Use an example to illustrate your answer.	2
11. For each of the following examples state whether the information is <i>internal</i> or <i>external</i> and whether it is <i>formal</i> or <i>informal</i> .	
(a) A head teacher's diary	
(b) A despatch note for a computer being delivered to a customer	
(c) An answering machine message saying that a pupil will be absent today	
(d) A note on an employee's desk from a colleague suggesting a lunch date.	4
12. List two factors which affect the quality of information.	2
13. Name one type of general purpose software package that could be part of a decision support system. Describe a feature of this package which supports this purpose.	2
14. Identify one factor that would have to be considered in a decision to upgrade a company's computer hardware. Justify your answer.	2
15. Which of the following organisations does not have to comply with the Freedom of Information (Scotland) Act 2002?	
(a) A local authority	
(b) A hospital	
(c) A company	
(d) A university	1
	(30)

[END OF SECTION I]

SECTION II

Attempt **all** questions in this section.

SECTION II

Attempt ALL questions in this Section.

16. Members of Strathcraig Youth Club take part in many activities. Each member can take part in as many activities as they wish but for each activity they have to indicate the level, beginner, intermediate or advanced, at which they wish to participate. Each activity takes place on a single evening at a single venue and has a single leader. Each leader is responsible for only one activity.

Data about members and their activities is stored manually on record cards at present.

Member Card

Member Number:	01243
Member Name:	Matthew Black
Member Address:	125 Main Street
Member Telephone:	0237 677719

Member Number:	00945
Member Name:	Cassandra McGregor
Member Address:	13b Westland Way
Member Telephone:	0237 677719

Activity Card

Strathcraig Youth Club		
Activity: Hockey Evening: Thursday		
Venue: High School Astroturf Cost: 10.		
Leader: Anne Gordon		
Leader Telephone: 0122 90213		
Name	Level	Paid
A Grant	Intermediate	No
J Smith	Intermediate	Yes
W Cochrane	Beginner	Yes
K Lee	Advanced	Yes

Strathcraig Youth Club		
Activity: Swimming Evening: Monday		
Venue: Community Pool Cost: £15.00		
Leader: John Chen		
Leader Telephone: 0122 90213		
Name	Level	Paid
L Stenton	Beginner	Yes
J Smith	Beginner	Yes
W McDonald	Advanced	No
K Martin	Intermediate	No

16. (continued)

(a) Data from these cards can be represented in un-normalised form as:

member_no

member_name

member_address

member_telephone

activity

evening

venue

cost

leader

leader_telephone

member_level

paid

- | | |
|--|---|
| (i) Explain why member_no would be a suitable key for this data. | 1 |
| (ii) Transform this un-normalised data to first normal form by removing repeating groups. | 3 |
| (iii) Identify all primary and foreign keys. | 3 |
| (b) (i) Transform this first normal form to second normal form by removing partial dependencies. | 4 |
| (ii) Identify all primary and foreign keys. | 2 |
| (c) (i) Transform this second normal form to third normal form by removing non-key dependencies. | 3 |
| (ii) Identify all primary and foreign keys. | 2 |

17. Inverdon Cottage Hospital has set up a doctors' appointment system using a relational database.

The data is held in the following tables.

Patient	Doctor	Appointment	Ward
<u>Patient No</u>	<u>Doctor No</u>	<u>Patient No*</u>	<u>Ward No</u>
Patient Name	Doctor Name	<u>Doctor No*</u>	Ward Name
Bed No	Consulting Room	<u>Date</u>	Ward Telephone
Ward No*	Doctor Telephone	Time	

- (a) State the relationships which exist between the entities to allow this report to be produced.

3

Ward No	13	Date	24/06/2004
Ward No	12	Date	24/06/2004
Ward No	11	Date	24/06/2004
Patient Name	Bed No	Doctor Name	Time
Kirkpatrick H	21	Gormlay	11.00
Anderson J	15	Carmichael	11.30
Garfield J	17	Renwick	11.30
Buchanan S	19	Gormlay	11.30
Richards F	12	Gormlay	12.00
Evans K	18	Carmichael	12.00

- (b) With reference to a Relational Database Management System (RDBMS) application package with which you are familiar, describe fully how the features of the package are used to extract and present the report for Ward 11.

9

18. Strathmore Suites Ltd is a company which deals with rented accommodation throughout Scotland. All customer and rental information is stored centrally in a computerised database at the main office in Glasgow. The office also contains a number of networked computers with access to this database. Sales representatives at the office can access the database to show potential customers high quality images and virtual tours of the available apartments. The company is to open a branch office in Manchester for 15 staff and is considering requests from employees to work from home.

- (a) Discuss the factors relating to topology, hardware and communications which the company should consider in their network strategy for the new Manchester office. 6
- (b) Describe the security implications which should be considered if the company is to allow employees to access the company network from home. 3
- (c) Recommend a security strategy that the company should adopt before allowing employees to access the company network from home. 6

19. Cute Kids Clothing produces outfits for young children. It has six factories located throughout the UK. The company has the following staff structure.

Job Title	Job Description
Managing Director	Overall executive control of the business
Sales Representative	Sells company's products to clothing outlets
Sales Manager	Manager of a team of sales representatives
Factory Manager	In charge of local production
Shift Leader	Responsible for production workers and day-to-day matters
Personnel Officer	Responsible for recruitment, staff welfare and pay

- (a) For the job titles listed in the table above identify:
- (i) **one** where the level is operational;
- (ii) **one** where the level is tactical;
- (iii) **one** where the level is strategic. 3
- (b) For the **three** jobs you have selected in part (a) give **one** example of a typical decision that would be made at this level and **one** piece of information that would be needed in order to make this decision. 6
- (c) Cute Kids Clothing employs a team of people to develop a website to market its products. A style sheet is used to ensure consistency in the appearance of the Web pages.
- Identify **three** elements of a Web page which may be affected by the application of a style sheet. 3
- (d) The website team uses project management software to plan and monitor the progress of the website project. Identify **three** features of project management software that allow them to do this. 3

(60)

[END OF SECTION II]

SECTION III

Section III—This section has three parts

Part A—Applied Multimedia Pages 11–13

Part B—Expert Systems Pages 14–17

Part C—The Internet Pages 18–21


Choose **one** part and attempt **all** of the questions in that part.

SECTION III

Part A – Applied Multimedia

Attempt ALL questions in this part.

20. A group of senior secondary pupils are planning to create a multimedia product to help local primary pupils learn French.
- (a) How could the senior pupils ensure that the content of their product would be suitable for primary pupils? 2
 - (b) Explain how the senior pupils could use storyboards to help with the production of their product. 3
 - (c) The pupils plan to use an authoring package. Name and describe the **two** categories of authoring package. 3
 - (d) Once the product has been developed it has to be tested before being given to the primary school. Recommend an appropriate test strategy for this multimedia product. Justify your answer. 2
 - (e) Old computers have been donated to the primary school from a local business. These machines have a lower specification than that required for the product. How could the multimedia product be adapted to cope with:
 - (i) smaller monitors with low graphics resolution; 2
 - (ii) slower processors, less memory and a lower capacity hard disk? 2

21. DutchDream is a travel company specialising in tours to Amsterdam. It is currently developing a website to provide interested customers with detailed information about the places they visit on their tours. The finished product will include photographs, short video clips of places of historical interest, as well as a soundtrack in either English or Dutch.
- (a) Compare the relative advantages of using the World Wide Web instead of a CD-ROM for the delivery of this information. 2
- (b) The developers have located several other websites which provide excellent material on areas they also wish to include. How could they also use this information without breaching copyright? 2
- (c) A graphics package has been used to create a new company logo for the website.
- (i) The logo could be saved using a GIF or JPEG file format. Evaluate the suitability of these file formats for the purpose intended. 4
- 
- (ii) When the logo is inserted into the home page, its edges appear jagged. Name a feature available in a graphics package which could help minimise this effect, and describe how it manages to do this. 2
- (d) The company could choose to have streamed or downloadable audio clips. Which would be the most suitable method? Justify your choice. 2
22. EasyWeb is a local company specialising in creating websites for business customers. It now employs five members of staff. The staff work well as a team, each specialising in different areas.
- (a) Whose job would it be to produce the project brief? 1
- (b) Describe **three** aspects which would have to be considered when drawing up a requirements specification. 3
- (c) Who would be responsible for the creation of the user interface, and what should be done to ensure that the interface could deal with both expert and beginner users? 2
- (d) Describe **two** developments in software that help company employees develop a quality multimedia experience for their customers. 2
- (e) Describe **two** navigational aids that could be used in a website, to prevent a user getting “lost in hyperspace”. 2

23. Multimedia products can contain text, graphics, video and sound. Media specialists ensure that these elements are used properly in products that they develop.
- (a) Graphics included in a completed product may not look the same on different machines. Why is this and what can be done to solve the problem? 3
- (b) Describe a situation where a media specialist may prefer to save a graphic in TIFF format rather than JPEG. 2
- (c) Graphics in a multimedia product may have *dithering* applied. What is meant by the term “dithering” and why this is required? 2
- (d) Look carefully at the two text headings shown below.

AVALANCHE

Figure 1

AVALANCHE

Figure 2

- (i) What technique has been applied to Figure 1 in order to get Figure 2?
- (ii) Explain why this technique may have to be applied to text. 2

24. The Copyright, Designs and Patents Act was introduced in 1988.
- (a) Give **three** examples of how copyright can be infringed using digital media. 3
- (b) Describe **one** technique that may be used to protect copyrighted graphics from unauthorised use. 2
- (50)

SECTION III

Part B – Expert Systems

Attempt ALL questions in this part.

25. Large hospitals use a range of information systems including *executive information systems*, *relational database management systems* and *expert systems*.
- (a) Distinguish between an “executive information system” and an “expert system”. Give an example to illustrate your answer. 2
- (b) The MYCIN expert system was developed for use within hospitals. Describe the MYCIN expert system in terms of its category, domain and main characteristics. 4
26. A national parcel delivery company has a range of vehicles which includes motorcycles, light vans, trucks and articulated lorries. Drivers make journeys 24 hours a day and 7 days a week. The company uses a relational database to store information about drivers and vehicles they are qualified to drive. The information is used to help allocate drivers to journeys. This process has proved to be time consuming and liable to errors so the company are considering developing an expert system to assist with this task.
- (a) Describe **two** benefits to the company of the use of an expert system for this task. 2
- (b) Describe **two** factors which the company should take into account when deciding whether or not to proceed with developing the expert system. 2
- (c) Compare a Relational Database Management System (RDBMS) and an Expert System in terms of representation and extraction of data. 2
- (d) The following predicates represent statements about vehicles and drivers.

Predicate	Statement
hgv(bus)	a bus is a heavy goods vehicle (HGV)
hgv(artic_lorry)	an articulated lorry is a HGV
licence(john, hgv)	John has a licence to drive a HGV
can_drive(john, light_van)	John can drive a light van

Represent the following statements using predicate logic.

- (i) John can drive a light van and a motorcycle. 1
- (ii) Anyone who can drive an articulated lorry can drive a truck. 2
- (e) Explain how expert systems techniques can extend the capabilities of a relational database. 2

27. Making scones requires a certain degree of expertise. Scones are made from flour, margarine, milk and sugar, and must be baked in a hot oven. Scones can easily go wrong if the wrong type of flour is used, if too much milk is added, or if the oven is too hot or not hot enough. This information is shown in the following expert system rules.

IF the scone is flat AND
 the scone is sticky

THEN the flour was the wrong type (0.6).

IF the scone is flat AND
 the scone is sticky AND
 the scone is pale

THEN too much milk was added (0.8).

IF the scone is flat AND
 the scone is NOT pale

THEN the oven was too hot (0.8).

IF the scone is flat AND
 the scone is pale

THEN the oven was not hot enough (0.6).

Suppose the following facts are known with the certainty factors given:

The scone is flat 0.6

The scone is pale 0.7

The scone is sticky 0.4

- (a) Calculate the certainty of the conclusion that the flour was the wrong type. Show your working. 2
- (b) Which conclusion will be drawn from the given facts? Explain your answer. 3
- (c) This expert system uses forward chaining rules. In a forward chaining expert system
- (i) explain what is meant by a *conflict set*; 1
- (ii) explain how a conflict set is identified; 2
- (iii) describe how the *recency* conflict resolution strategy works. 2

28. The following paragraph outlines a limited domain of knowledge about cloud formations. This knowledge is to be represented by an expert system using an expert system shell. A user of the expert system should be given advice about the chances of rain.

A	Clouds form at three levels—high, medium and low levels. The lower a cloud, the darker is its colour. Thus high level clouds are white, medium level clouds are grey and low level clouds are almost black.
B	Cirrus clouds are examples of high level clouds. They are wispy clouds that indicate that it will rain soon.
C	Altostratus is a medium level cloud that forms a thick layer blocking out the sun though rain is unlikely.
D	Nimbostratus is a low level cloud that forms a flat, featureless layer and frequently produces rain.
E	Cumulus clouds can be high, medium or low level clouds that have the appearance of pieces of cotton wool and if they are thick enough then they will produce showers.

- (a) Represent the knowledge contained in paragraph A above, to conclude a cloud's level given its colour. 3
- (b) In paragraphs B–D, identify two words which indicate uncertainty in the conclusion. 2
- (c) Represent the knowledge in paragraphs C and D, to give the conclusion “it will rain”. Your rules should refer to your answer to (a), and include an appropriate certainty factor. 4
- (d) Describe the nature of the uncertainty in paragraph E. 1
29. Consider a forward chaining expert system containing the following rule base, where the letters A to H represent facts which are known or can be concluded.
- 1 If A and D then E.
 - 2 If A and B then G.
 - 3 If A and C then E.
 - 4 If A and E then F.
 - 5 If A and B and C then D.
 - 6 If A and C and D then H.
- Suppose the working memory contains the facts A, B and C, added in that order.
- (a) Which rules exist in the conflict set? 1
- (b) Which rule will fire using a *first-come-first-served* (also known as *rule ordering*) conflict resolution strategy? 1
- (c) Which rule will fire using the “*specificity*” conflict resolution strategy? 1
- (d) After a rule has fired, what is the effect of the “*refractoriness*” strategy? 1

30. A printer has three status lights (red, orange, green) which can be used to help diagnose problems with the printer. The on-line help includes a troubleshooting guide in the form of an expert system.

The following backward chaining rules represent advice to “replace toner”, “clear paper jam”, “call service engineer”, and “check paper tray”.

Advice is replace toner
 IF orange light lit
 AND NOT red light lit
 AND NOT green light lit.

Advice is clear paper jam
 IF NOT orange light lit
 AND red light lit
 AND NOT green light lit.

Advice is call service engineer
 IF orange light lit
 AND red light lit
 AND NOT green light lit.

Advice is check paper tray
 IF NOT orange light lit
 AND NOT red light lit
 AND green light lit.

- (a) (i) What is the first question asked by the expert system? 1
- (ii) The user asks why the question is being asked. Describe how the expert system explains its reasoning in terms of a *rule tree*. 2
- (b) The expert system gives the advice to “clear paper jam”. With reference to a rule tree, describe the *justification* the expert system would give for this advice. 2
- (c) Represent the rules above in the form of a *decision tree*. 4
- (50)**

SECTION III

Part C – The Internet

Attempt ALL questions in this part.

31. There are a number of organisations which govern the operation of the Internet, namely, the Internet Engineering Task Force (IETF), the Internet Assigned Numbers Authority (IANA) and the World Wide Web Consortium (W3C).

Describe the role of **one** of these.

1

32. One aspect of the operation of the Internet is the registration of domain names.

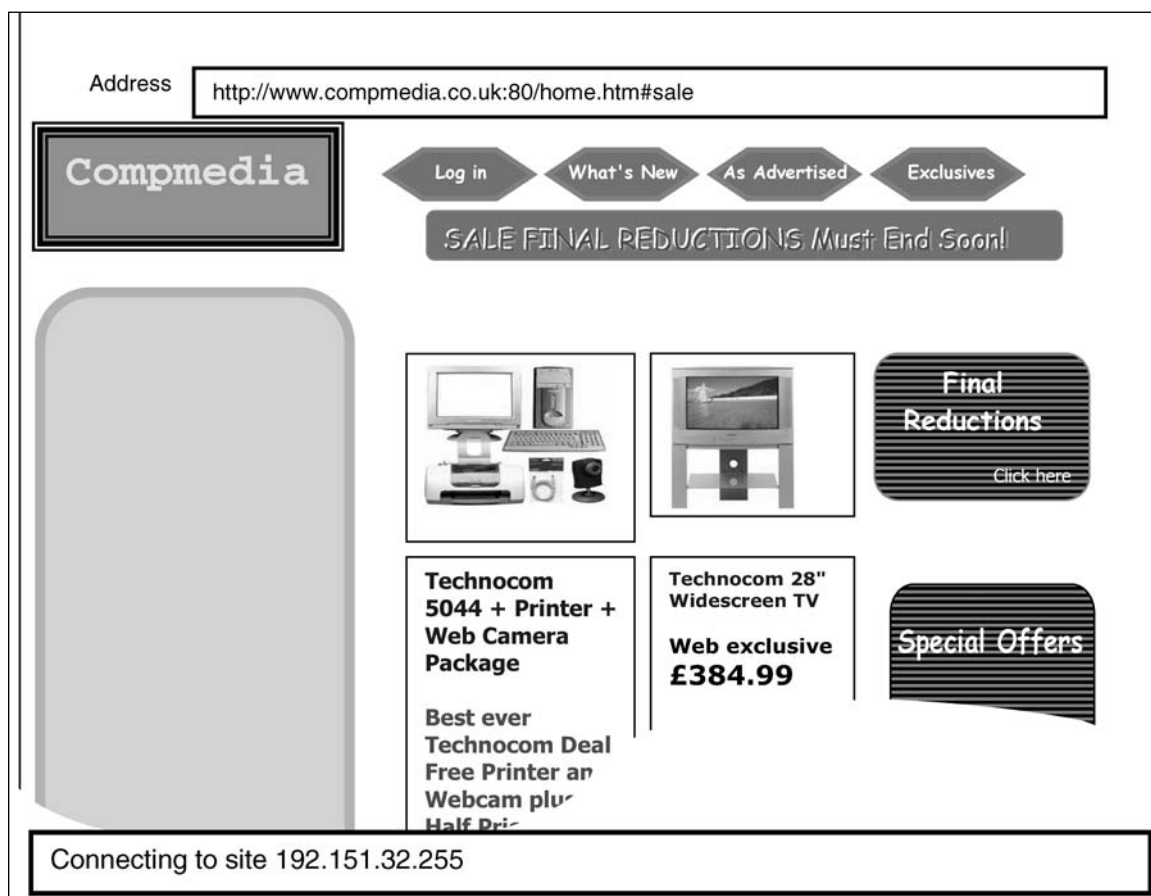
(a) Describe the purpose of a domain name.

1

(b) Name the organisation that is responsible for the registration of .uk domain names.

1


33. The extract of the Web page shown below is from a website which allows users to purchase goods.



- (a) Name the five parts of a URL. Identify these parts from the URL on this web page. 5
- (b) Explain how the Domain Name Server (DNS) protocol allows the Web page to be located and displayed in the browser. 3
- (c) The status bar contains the text 192.151.32.255.
- (i) Explain the purpose of an IP address.
- (ii) The binary form of this IP address is shown below.
- 11000000.10010111.00100000.11111111
- Explain how the IP address would be used if this were a class C IP address. 3
- (d) The IP version 6 protocol is due to replace the current protocol. Explain why this is necessary. 3
- (e) Discuss the extent to which the presentation of a website affects its credibility. Use an example from the Web page above to illustrate your answer. 3

34. Alison is about to purchase some goods from this website. The website designers considered two possible methods of obtaining customers' credit card details for payment.
- (a) Identify and describe suitable encryption technologies for
- (i) sending details by e-mail
 - (ii) customers entering details directly onto a Web form. 4
- (b) Compare the suitability of each of the encryption technologies you have identified in (a). 4
- (c) Although the company has taken security measures to protect the transmission and storage of customer data, the network manager has reported an incident where an Internet user has gained unauthorised access to the company network.
- Discuss the difficulties in locating and prosecuting the unauthorised user. 3
- (d) When Alison enters the delivery address she leaves the postcode field blank. A check is carried out to ensure all details have been entered. This check is performed by client side scripting.
- (i) Explain why client-side scripting is used to perform this check. 1
 - (ii) Identify **one** check that would be performed using server-side scripting. Explain your answer. 2
- (e) When Alison has entered all the necessary information to purchase the goods she clicks on submit. The data is transmitted to the computer hosting the website. Explain how routers and routing tables are used in the transmission of this data. 3
- (f) When Alison visits the page the following day to check her order, her name appears at the top of the Web page.
- (i) Identify a function of the browser that allows this to happen. 1
 - (ii) Describe how it is used in this case. 2

35. Below is an extract from Braeside Golf Club's home page with links to the Gents, Ladies and Juniors sections. The HTML code used to produce the page is illustrated below the extract.

	Braeside Golf Club
Gents	
Ladies	
Juniors	

```

1 <table>
2   <tr>
3     <td></td>
4
5   </tr>
6
7     <td><a href="Gents.htm">Gents</a><br>
8         <a href="Ladies.htm">Ladies</a><br>
9         <a href="Junior.htm">Junior</a>
10    </td>
11
12
13 </table>

```

- (a) Complete the HTML code required in row 4 to display "Braeside Golf Club" as a heading. 3
- (b) Complete the HTML code required in row 11 to display the image stored in the file "logo.jpg". 2
- (c) Complete the HTML code missing in rows 6 and 12. 2
- (d) Explain the function of the
 tag in rows 7 and 8. 1
- (e) The user wishes to widen the left hand column to 200 hundred pixels. Identify the row that needs to be changed and rewrite the code to make this change. 2

(50)

[END OF SECTION III]

[END OF SPECIMEN QUESTION PAPER]

IS/SQP241

Information
Systems
Higher
Specimen Marking Instructions
for use in and after 2006

NATIONAL
QUALIFICATIONS

Sample Answers

SECTION I

Relational Database Systems

1. Problems of insertion anomaly:
 - providing more information than is necessary ie adding customer information again every time customer books a hotel
 - this additional information is already present in the database therefore there is data duplication
 - there is always the problem of errors when typing in the same customer details when the customer makes more than one booking

(any two bullets for 2 marks)
2. *Referential Integrity* is where data can only be inserted into a field in one table if it already exists (*1 mark*) in another table (*1 mark*).
3. The identifier would have to change if the person changes name (*1 mark*) or department (*1 mark*).
4. to uniquely identify records in a table
to avoid using a compound key
because there is no other means of uniquely identifying each record

(any 2 for 2 marks)
5. Artist OR track (*1 mark*)
A CD can have many artists (*1 mark*) OR many tracks (*1 mark*)
6. A telephone number contains a leading zero and a space/brackets/hyphen
The number will not be used for calculations

(2 marks for 2 points made)
7. Photograph: object or link (*1 mark*)
First Aider: Boolean (*1 mark*)
8. (a) one-to-many (*1 mark*)

 (b) many-to-many (*1 mark*)

Using Information

9. A system which processes data to produce information. *(1 mark)*
10. Information is processed data (with structure or meaning)
Knowledge is derived from information, ie using the information to make decisions.
(1 mark)
Example to illustrate *(1 mark)*
11. (a) internal, formal; *(1 mark)*
(b) external, formal; *(1 mark)*
(c) external, informal;*(1 mark)*
(d) internal, informal. *(1 mark)*
12. Any two of: relevance, accuracy, completeness, reliability, timing, level of detail, presentation, availability *(2 marks)*
13. Spreadsheet OR database *(1 mark)*
Spreadsheets have forecasting capability (What..If)
Database queries can generate summary information *(1 mark)*
14. Descriptions of two of: future proofing; compatibility; legacy systems *(2 marks)*
15. A company *(1 mark)*

SECTION II

Databases

16. (a) (i) member_no would be a good primary key as it is a surrogate key so will be designed to be unique - *1 mark for indication of uniqueness*

(ii) and (iii)

1NF

member_no

member_name

member_address

member_telephone *1 mark*

0 marks for primary key (carried over from above)

activity

evening

venue

cost

leader_name

leader_telephone

member_level

paid

member_no*

2 marks for all attributes, 1 if member_no omitted

2 marks for full concatenated key, 1 mark if any part omitted

1 mark for member_no as foreign key

- (b) (i) and (ii)

2NF

member_no

member_name

member_address

member_telephone

0 marks for carry forward from above

activity*

member_no*

member_level

paid

2 marks, minus 1 for any mistake

1 mark for activity as foreign key

activity

evening

cost

venue

leader_name

leader_telephone

2 marks, minus 1 for any mistake

1 mark for activity as primary key

16. (c) (i) and (ii)
3NF
member_no
member_name
member_address
member_telephone *0 marks for carry forward from above*
- activity*
member_no*
member_level *0 marks for carry forward from above*
paid
- activity
evening
cost
venue *2 marks, minus 1 for any mistake*
leader_name* *1 mark for leader_name as foreign key*
- leader_name
leader_telephone *1 mark for correct*
1 mark for leader_name as primary key

17. (a) Relationships are as follows:
1 patient M appointments *(1 mark)*
1 doctor M appointments *(1 mark)*
1 ward M patients *(1 mark)*

(b) **Access Solution**

In Access, a query *(1 mark)* would be used to extract the following attributes from the following entities.

Attribute	Entity
Ward No	Ward or Patient
Date	Appointment
Patient Name	Patient
Bed No	Patient
Doctor Name	Doctor
Time	Appointment

(3 marks for all 6, 2 marks for 5, 1 mark for 4)

A report would be created based on the query. *(1 mark)*

The information is then sorted first of all on Time *(1 mark)* in ascending order *(1 mark)* and then on Bed No *(1 mark)* in ascending order *(1 mark)*.

(c) **FileMaker Pro Solution**

If only one ward is required then a method would be

- (i) Insert the fields Ward No from Patient file into the Appointments file. **(1 mark)**
- (ii) Create a New Layout in the Appointments file **(1 mark)** of type Columnar report **(1 mark)**
- (iii) Add fields from following files.

Field	File
Patient Name	Patient
Bed No	Patient
Doctor Name	Doctor
Time	Appointment

(2 marks for 4 correct, 1 for 2 or 3 correct)

- (iv) Search for correct ward and date. **(1 mark)**
- (v) Sort results by Time (ascending) and Bed No (ascending). **(3 marks)**

OR

- (i) Insert the fields Ward No from Patient file into the Appointments file. **(1 mark)**
- (ii) Create a New Layout in the Appointments file **(1 mark)** of type Columnar report **(1 mark)**.
- (iii) Add fields from following files.

Field	File
Patient Name	Patient
Bed No	Patient
Doctor Name	Doctor
Time	Appointment

(2 marks for all correct, 1 mark for 2 or 3)

- (iv) Create a summary part when sorted by Ward No with page break after each 1 occurrence. **(1 mark)**
- (v) Sort by Ward No (Ascending), Time (Ascending) and Bed No (Ascending). **(3 marks)**

Using Information

18. (a) Topology: WAN, LAN topology, star, bus, ring, distributed network
Hardware: structured cabling, hub switches, routers, network cards, file servers, network adaptors (cards)
Communications: leased line, dial up, ISDN, broadband, satellite, wireless

(Must include at least one factor from each of topology, hardware and communications)

Sample answer

The company will need to establish a wide area network to link the Manchester office with the main office in Glasgow. This link could be a dial-up line, an ISDN or ADSL link, a leased line, radio or satellite link.

The Manchester office would require a local area network to be installed. This would probably use the same configuration as the Glasgow office, in terms of topology and hardware. The topology may be a star, bus or ring, or could be considered part of a distributed topology with the Glasgow office. Any topology used would require the installation of structured cabling, and the use of hubs and/or switches, although the connection to the desktop could be wireless. A router would be required to link the Manchester office with the Glasgow office.

Each computer in the Manchester office would require a network interface card, and probably a local server to provide file and print services, although web and email services may be provided by the main server in Glasgow.

Marks are awarded for the quality of response. A good response will include discussion and comparison of WAN communication options, suitable LAN topologies, and a range of hardware components (network card, structured cabling, hubs/switches/routers).

A poor response would include mention of terms, but without descriptions, comparisons or relevance to the scenario. (maximum 2 marks)

- (b) Security issues

Risk of unauthorised access to data, viruses, transmission of personal and confidential data, protection of data on server

Sample answer

There is a risk of unauthorised access to the company's network and the data stored on it, including personal data relating to customers and staff, and a risk of data being intercepted in transmission. There is also a risk of virus infection of the main network computers from the home computer.

Marks are awarded for the quality of response. A good response will describe at least two security implications in some detail. A poor response will mention implications without descriptions or relevance to the scenario.

(c) Security Strategy

Access rights, hierarchy of passwords, regular changing of passwords, careful choice of passwords, encryption, firewalls, dial back, network auditing and monitoring, anti-virus software

Sample answer

Each employee should be required to use a password to access the company network, whether in the office or from home. Further passwords should be required for access to sensitive data, such as customer or employee data. The company should ensure that staff choose passwords carefully, and do not use obvious passwords which could be easily guessed. Furthermore passwords should be changed on a regular basis to help keep these secure.

Dial-back could be used to ensure that employees are only able to access the network from their computers at home. A firewall can be installed on the network to block unauthorised access to the network.

Encryption should be used for the transmission of data to maintain its security and privacy.

Employees should install anti-virus software on their computers at home and ensure it is kept up to date.

The IT manager should use network monitoring and auditing software to help identify any unauthorised access to the network.

Marks are awarded for the quality of response. A good response will describe at least four factors to consider in adopting a security strategy. Good detail will be given for these factors. A poor response will mention factors without descriptions or relevance to the scenario.

- 19.** (a) (i) Operational: Sales rep; shift leader
- (ii) Tactical: Sales manager; factory manager; personnel office
- (iii) Strategic: managing director

19. (b)

Job	Level	Decision	Information needed
Sales Rep	Operational	Whether to offer customer credit	Credit rating of customer; cost
Sales Rep	Operational	Itinerary for day's visits	Mileage; customers' availability
Shift Leader	Operational	Job assignment	Staff skills level; production plan
Shift Leader	Operational	Adjustment of machinery	Quality analysis of previous batch
Sales Manager	Tactical	Pricing of clothes	Sales/price analysis over past 3 years; pricing strategy of competitors
Sales Manager	Tactical	Whether to increase level of regular customer discounts	Customers' purchases histories; analysis of lost customers
Sales Manager	Tactical	Setting targets for each sales rep	Sales targets for the area
Factory Manager	Tactical	Whether to re-instate a night shift	Staffing costs; product demand
Factory Manager	Tactical	Whether to computerise a particular process	Costs; effectiveness of new system used elsewhere
Factory Manager	Tactical	How many items to produce	Production targets
Managing Director	Strategic	Opening a new factory	Market research; sales and profit forecasts
Managing Director	Strategic	Closing a factory	Productivity figures, transportation costs, predicted sales figures
Managing Director	Strategic	Diversify into new area such as children's toys	Potential set and production costs, current and future state of the toy market

(c) Headings, sub headings, body text, table cells, paragraphs, links
(any 3 for 3 marks)

(d) Ability to add or modify tasks, start or end date or resources available
Calculate project completion time
Schedule tasks to find critical path or best performance time
Assign resources to tasks
Print in graphical format (eg Gantt or PERT chart)
Calculate resource requirements
(any 3 for 3 marks)

SECTION III

Applied Multimedia

20. (a) Checking content (analysis stage, so not testing)
- obtain checklist of vocabulary from class teacher
 - check reading level of questions
 - need to know IT experience of primary pupils
- 2 marks*
- (b) Storyboards are used to
- show suitable design of user interface
 - show the sequence of all media elements
 - show any layering sequencing or animation paths
- 3 marks*
- (c) Authoring packages
- icon based and scripting
 - icon based – user links together multimedia elements in a flow chart indicating the sequence
 - scripting – user writes sections of code called scripts to carry out a task
- 3 marks*
- (d) Test Strategy
- eg screen testing or usability testing
 - justify answer
- 2 marks*
- (e) (i) reduce resolution of graphics choose clearer typeface, increase font size, other suitable
- 2 marks*
- (ii) delete unnecessary graphics, reduce resolution of graphics, reduce quality or amount of (or delete) sound/video components
- 2 marks*

21. (a) Suitability of storage medium (compare)
- meets needs of wider target audience whereas CD would have to be sent out to all interested
 - suitable for storing product content, 650 Mb CD may limit amount of video that can be displayed
 - should mention capacity, transfer rate, ease of update
- 2 marks*
- (b) Seek permission from the original author to comply with CDP Act or provide a link to the useful site, acknowledge author
- 2 marks*
- (i) JPEG, common compression for still pictures (can vary 2:1 to 30:1), use if >256 colours, progressive options
- 2 marks*
- GIF, supports animation, transparency, interlacing options available, poor quality for photos or high colour images (less than 256 colours)
- 2 marks*
- (ii) Anti-aliasing
- partially fills the pixels along the edge of the selected shape, making them semi-transparent. Smoother edge.
- 1 mark*
- 1 mark*
- (d) Reduce Video file size.
- reduce the number of frames displayed each second
 - reduce the window size video displayed in
 - reduce quality by adjusting resolution
- 2 marks*
22. (a) project manager
- 1 mark*
- (b) Requirements Specification
- detail of all navigation and interactivity features
 - details of range of constructs included eg repetition
 - details of media elements and associated interactivity
- 3 marks*
- (c) multimedia designer
- keyboard shortcuts for expert users, easy reversal of actions, simple errors, consistency etc for beginners
- 2 marks*
- (d) Software
- advanced package features – fonts, styles, formatting
 - special effects, software to capture speech, music
 - degree of AI interaction possible
- 2 marks*
- (e) Description of any 2 navigational aids
- backtracking, highlighting, history, bookmarks, breadcrumbs
- 2 marks*

23. (a) Graphics
- gamma correction
 - graphics vary depending on monitors colour curve
 - gamma value included with the graphics, rendering software adjusts the RGB sliders automatically
- 3 marks*
- (b) File Format
- TIFF stores large bit maps in high colour format without loss of quality, uncompressed, mostly used by professional artists (printing quality)
 - JPEG, common photographic format
- 2 marks*
- (c) Dithering
- limited colours on graphics card
 - substitute combination of colours for a colour that cannot be produced
- 2 marks*
- (d) (i) kerning *1 mark*
- (ii) large space between certain letter combinations eg A,V,W *1 mark*
24. (a) **Copyright** Infringement
- copy text or graphics off website and use without permission
 - alteration of original work in some way
 - perform or use work in performance in public
 - distribute multiple copies of copyrighted work over the Internet
 - etc
- 3 marks*
- (b) Digital watermarks
- Digital signature can be embedded into graphic.
Program detects watermark if image processed and detects copyright infringement.
- 2 marks*

Expert Systems

25. (a) An EIS provides summary information based on data stored in databases, spreadsheets, etc, while allowing managers to “drill down” levels of detail as required eg a waiting list summary could be inspected to find the areas of the hospital which were performing above or below expectations. **(1 mark)**

Expert systems support decision making by applying rules to draw conclusions based on a set of facts eg doctors could obtain advice from an expert system regarding a medical diagnosis. **(1 mark)**

- (b) Category: classification **(1 mark)**
Domain: bacterial blood infections **(1 mark)**
Characteristics: used backward chaining, used certainty factors to indicate certainty of conclusions **(2 marks)**

26. (a) Expertise available whenever required, expertise is preserved even if human expert leaves the company. Other possible answers. **(2 marks)**

- (b) Cost, availability of human expert(s), timescale **(any 2 for 2 marks)**

- (c) A RDBMS stores data in the form of records and fields **(1 mark)** while an ES stores facts and rules. Facts in an ES correspond to records in a RDBMS. **(1 mark)**

In a RDBMS, data is extracted by performing queries, which can select certain records and fields for display, sort records in order, and perform calculations.

In an ES, rules are applied to the data (facts) to draw logical conclusions which are presented as advice to the user. **(1 mark)**

- (d) (i) $\text{can_drive}(\text{john, light_van}) \wedge \text{can_drive}(\text{john, motorcycle})$
(1 mark)
(ii) $\forall x: \text{can_drive}(x, \text{artic_lorry}) \rightarrow \text{can_drive}(x, \text{truck})$
(1 mark correct use of variable, 1 mark correct implication)

- (e) The records in a database table, or results of a query, can be imported into an ES as a set of facts. **(1 mark)** The ES can apply rules contained in its knowledge base to these facts to derive new knowledge. Such a system is known as a deductive database. **(1 mark)**

27. (a) $0.6 \times \min(0.6, 0.4) = 0.6 \times 0.4$ (1 mark) = 0.24 (1 mark)
- (b) The oven was not hot enough (1 mark)
 The CF of this conclusion is 0.36 ($0.6 \times \min(0.6, 0.7)$) (1 mark)
 This CF is higher than the CF of the other rules (1 mark)
- (c) (i) A set of rules which may fire at any one time (because their left hand sides match the facts currently in the working memory). (1 mark)
- (ii) The RETE algorithm is used (1 mark) to maintain a list of rules whose left hand sides match the facts currently in the working memory. (1 mark)
- (iii) Rules whose left hand sides contain conditions based on the most recent facts entered into working memory will fire (1 mark) before rules whose LHS are based on less recent facts. (1 mark)
28. (a) Level is high IF colour is white (1 mark)
 Level is medium IF colour is grey (1 mark)
 Level is low IF colour is black (1 mark)
- (b) unlikely, frequently (2 marks)
- (c) It will rain IF
 Cloud is altocumulus AND
 Appearance is a thick layer blocking out the sun.
 CF 0.2
 (1 mark for rule, 1 mark for CF less than 25%)
- It will rain IF
 Cloud is nimbostratus AND
 Appearance is flat, featureless layer.
 CF 0.75
 (1 mark for rule, 1 mark for CF between 60% and 90%)
- (d) “enough”—not clear how thick the cloud must be. (1 mark)
29. (a) 2, 3, 5 (1 mark)
- (b) 2 (1 mark)
- (c) 5 (1 mark)
- (d) The rule is removed from the conflict set so that it cannot be fired again immediately in the next cycle. (1 mark)

30. (a) (i) Is the orange light lit? *(1 mark)*
- (ii) The system looks up the rule tree to the hypothesis which it is attempting to satisfy *(1 mark)*, in this case “Advice is replace toner”. *(1 mark)*
- (b) The system would look down the rule tree from the hypothesis to the conditions which supported it *(1 mark)*. The rule which had been used would be displayed along with the user’s answers *(1 mark)*.
- (c)

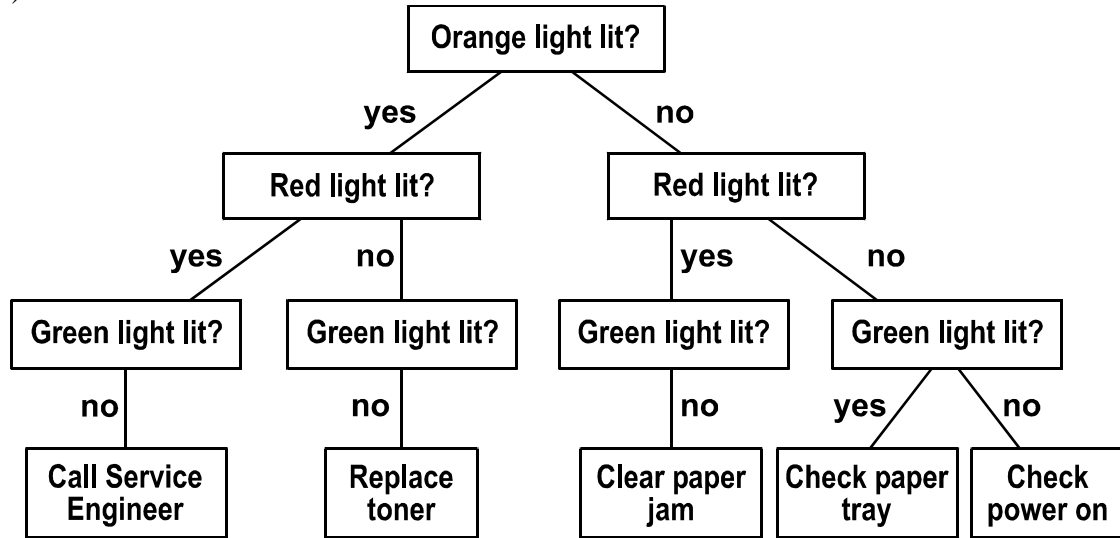


Figure 1

(1 mark)

(1 mark)

(1 mark)

(1 mark)

The Internet

31. IETF: deals with infrastructure and protocols
IANA: deals with top-level domain names and (class-A?) IP addresses
W3C: deals with protocols and standards relating to the web
(any one for 1 mark)
32. (a) to provide a unique text identifier for an IP address *(1 mark)*

(b) Nominet *(1 mark)*
33. (a) Protocol: http *(1 mark)*
Domain name: www.compmedia.co.uk *(1 mark)*
Port: 80 *(1 mark)*
Pathname: home.htm *(1 mark)*
Anchor: #sale *(1 mark)*
- (b) The domain name is passed to the nearest DNS server in order to resolve the domain name to an IP address. *(1 mark)*
If it is unable to do so, the DNS server refers the domain name to the next DNS server in the hierarchy, until the IP address can be found. *(1 mark)*
When the IP address has been found, the URL is requested from the host, and the packet returned to the client. *(1 mark)*
- (c) (i) To uniquely identify a host on the Internet. *(1 mark)*

(ii) The first 24 bits represent the network IP address *(1 mark)*, while the last 8 bits represent the subnet address of individual computers within the network *(1 mark)*.
- (d) IP v4 addresses are limited in number to 2^{32} hosts (32 bit addresses) *(1 mark)*.
IP v6 addresses are 128 bit *(1 mark)*, allowing for many more hosts *(1 mark)*.
- (e) *(2 marks for discussion. 1 mark for example)*
34. (a) (i) E-mail: public key encryption (eg PGP or equivalent) may be used to encode the content of the e-mail message. *(2 marks)*

(ii) Web: Secure Sockets (SSL), https?? (or equivalent) may be used to encrypt data submitted through the form before transmission. *(2 marks)*
- (b) Comparison: SSL is more effective and efficient for the customer and company because it is automatic *(1 mark)*, whereas PGP requires the company to communicate the public key *(1 mark)*, the customer to perform the encryption, and the company to then decrypt the message *(1 mark)*. Customers may not know how to do this, and there is a greater risk of customer details being sent unencrypted by mistake *(1 mark)*.

- (c) It is difficult to locate the offender as the offender could be from anywhere in the world (*1 mark*). Very difficult to trace the actual computer from where the offence was committed (*1 mark*). If the IP address from where the offence was committed is traced to a country outside the UK, it may not be subject to UK legislation (*1 mark*).
- (d) (i) The check would be carried out before transmission of the data/to lessen the load on the server. (*1 mark*)
- (ii) Validation of expiry date. (*1 mark*)
Needs to be checked against card details held on database. (*1 mark*)
- Other possible answers.
- (e) The packet contains the destination IP address. The packet is sent to the first router (*1 mark*) which will decide the best available route for the packet (*1 mark*) based on information in the routing table (*1 mark*).
- (f) (i) Cookies. (*1 mark*)
- (ii) Her name is stored within a cookie file stored on the computer hard disk (*1 mark*). When she re-visits the site, the cookie file is checked for a name and the name displayed (*1 mark*).

35. (a) `<td>(1 mark)<h1 align="center">Braeside Golf Club`
`(1 mark)</h1></td>(1 mark)`
(other valid heading tags are acceptable)
- (b) `<td>(1 mark) (1 mark)</td>`
- (c) `6: <tr> (1 mark) 12: </tr>(1 mark)`
- (d) A line break. (*1 mark*)
- (e) Either rows 3 or 7 (*1 mark*): `<td width="200"> (1 mark)`

[END OF SPECIMEN MARKING INSTRUCTIONS]