

THE BCS PROFESSIONAL EXAMINATION
Professional Graduate Diploma

April 2004

EXAMINERS' REPORT

World Wide Web – Beyond the Basics

General Comments

This was the second time that this subject has been examined and it continued to be popular. The general standard ranged from outstandingly good to candidates that had no understanding of the subject.

As with last year, a significant group of candidates wrote far too much - often taking two or more pages to make a simple point worth two or three marks.

Coherency was lacking in a number of scripts with repetition and deviation from the answer.

Handwriting was a particular issue, with some scripts bordering on illegibility.

The general level of preparation still appears to be inadequate, with some students demonstrating very limited knowledge, especially of more contemporary and current topics.

At this level, this examination aims to be a combination of not only knowledge and recall of theoretical concepts, but also of application of these concepts to real-life situations (including the use of relevant examples, where appropriate).

Question 1

- a) i) Draw a diagram to complete the missing sections A, B and C indicated in Figure 2 overleaf to illustrate the output of this file when it is first loaded in a browser window. (You should state what browser you are assuming use of.) (3 marks)



- A – The title bar as detailed above
- B – The main page as detailed above
- C – Any sensible description of the status (including but not limited to stating that the bar is blank, reads “Done” etc)

ii) Represent this document in terms of a hierarchy of DOM elements as either a diagram or list. (5 marks)

- window
(other items related to window such as `self`, `parent`, `top`, `frames[]`, `location`, `history`, and `screen` are correct, but largely irrelevant to this question)
- document
- `document.links[0]` (-> `page1.html`)
- `document.links[1]` (-> `page2.html`)
- `document.links[2]` (-> `http://validator.w3.org/check/referer`)
- `document.images[0]` (`http://www.w3.org/Icons/valid-html401`)
- `document.menu1` (first named span menu)
- `document.menu2` (second named span menu)

b) i) Describe what will happen on screen when the user clicks any one of the links. (3 marks)

The associated menu group would be displayed on screen, beginning on the line directly underneath the link just clicked, and indented by 20px.

ii) Having clicked one link, the user clicks another distinct link. What will happen? (3 marks)

The associated menu group would be displayed on screen, directly underneath the link just clicked, and indented by 20px, in addition to the previous one being displayed under its related link (as described above)

iii) Having clicked one link, the user then clicks the same link a second time. What will happen? (3 marks)

Hide the previously displayed menu group.

c) Modify the code:

i) to enable another menu group to be generated and displayed. (2 marks)

Line 49 (or somewhere else sensible):

```
<h3>
  <a href="page3.html" onClick="return toggleMenu('menu3')"> Whatever</a>
</h3>
<span id="menu3" class="menu">
  Foo
  Bar<br>
  Baz<br>
</span>
```

ii) to ensure that at most one menu group can be active at any time. (6 marks)

There are many solutions – this is just one.

Change the function definitions in the <head> to the following:

```
<script type="text/javascript" language="javascript">

function closeMenu(currMenu){
    // Close the current menu
    thisMenu = eval("document.all."+currMenu+".style");
    thisMenu.display = "none";
    return true;
}

function openMenu(currMenu){
    // Close all the other menus
    menu1.style.display = "none";
    menu2.style.display = "none";

    // Open only the selected menu
    thisMenu = eval("document.all."+currMenu+".style");
    thisMenu.display = "block";
    return true;
}

function toggleMenu(currMenu){
    if(document.all){
        thisMenu = eval("document.all."+currMenu+".style");

        if(thisMenu.display == "block"){
            closeMenu(currMenu);
        }
        else {
            openMenu(currMenu);
        }

        return false;
    }
    else {
        return true;
    }
}
</script>
```

Total: 25 marks

Examiners' Guidance Notes

Only one-fifth of the candidates attempted this question.

Part a): Candidates spent a disproportionate amount of time in making their diagrams extremely detailed and precise, when the question asked was straightforward and only attracted 3 marks. The knowledge of the DOM was generally poor, as reflected in the marks awarded.

Part b): The question *specifically* asks for the physical outcome of the actions, rather than a description of how the code performs this task.

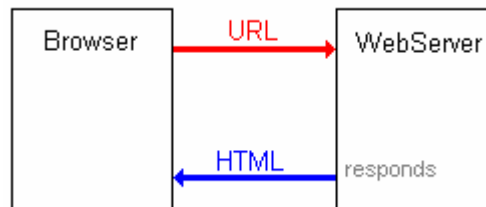
Part c): The first section was extremely well answered, but candidates often fell down on the second section.

Question 2

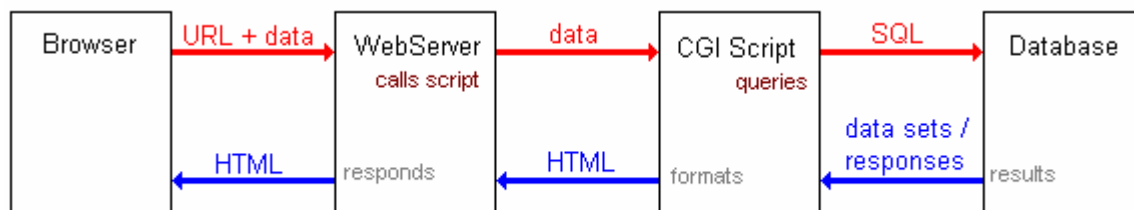
- a) With the aid of a diagram, briefly explain the architecture for:
- serving static web pages across the WWW; and
 - serving dynamic database-driven web pages across the WWW.

(5 marks)

Static:



Dynamic:



- b) Scripts can be executed at the server end or the client end for a Web application. When would it be appropriate to execute at:
- the server end;
 - the client end?
- (Illustrate your answers with suitable real-life examples.)

(5 marks)

Server End:

- Serving customised content based on information you know about the user.
- Need to include output from a legacy application or database transaction or search processing

Client end:

- Interaction with user's environment
- Need to change the appearance of the web page as the user interacts with it.
- Prevent round-trips to the server by validating form input before submitting.

- c) What is the purpose of CGI?

(3 marks)

Common Gateway Interface is a web-based client/server data communication standard for interfacing applications with information servers such as HTTP or web servers. CGI scripts can be written in a number of languages and reside on the server.

- d) When developing a B2C web site, what server technologies should be used to support interaction from say Perl, ASP, PHP, Coldfusion, etc.? You should provide a full justification for your choice of technology.

(6 marks)

This is an open-ended question. Any choice of technology will suffice provided justified on grounds of economics, ease-of-use/learning, efficiency, integration, popularity,

resource-base (e.g. Perldoc), community (newsgroup support) or other sensible justifications.

e) i) Compare and contrast the POST and GET methods for obtaining data from a web form. (3 marks)

- GET appends the search data to the URL
- GET will therefore show sensitive data in the server logs
- GET has a limit of size of data
- POST sends the data as a separate data package
- POST results cannot be bookmarked (as data is separate)
- Targeting an HTML page with Javascript, GET is the only choice if you want to use the data.

ii) List THREE actions a form can perform when submitted. (3 marks)

- mailto
- Javascript
- CGI or other web page

Total: 25 marks

Examiners' Guidance Notes

On the whole, this question (attempted by nearly three-quarters of the candidates) was answered very well. However some candidates failed to provide diagrams when specifically asked to do so.

Part c): There appears to be some confusion on the *purpose* of CGI, with some candidates suggesting it may be a piece of software/hardware!

Part d): Some candidates gave a good technical description or a good functional/business-oriented description of the site, but few managed to link the two together.

Part e): The majority of answers were excellent, but a few believed POST was only to send and GET was only to receive!

Question 3

a) i) Give FOUR reasons for protecting data.

(4 marks)

One mark for each *good* reason (up to 4 marks). Some reasons include:

- preventing disclosure of sensitive information
- preventing alteration of data
- preventing destruction of data
- data may be private to an individual
- preventing fraud
- encouraging a sense of safety for end-users
- legal issues

ii) What are the implications of keeping data safe?

(3 marks)

- End-user confidence in use of online transactions
- Reliable data is useful for business decisions
- Reduced possibility of fraud
- Ensuring privacy

b) Considering the three elements (client, network, server) involved in a web transaction over a conventional wired network, state FIVE security risks to confidential data and, for each risk identified, outline a possible solution.

(10 marks)

One mark given for each risk (up to 5marks)

One mark given for each solution (up to 5 marks)

Client-end:

- Hardware Keylogging – Maintain physical security
- Trojaned software - run up-to-date virus checker, or Tripwire
- Forged Emails e.g. as recently pretending to be from Barclays or Microsoft – Common sense

Network:

- Sniffing – Encryption, detection of “sniffers”
- Retransmission – Encryption with timestamping or unique IDs
- Spoofing/Masquerading – Host authentication (perhaps by Public Key)
- Man-in-the-middle – as above
- Tampering of data – encryption with checksumming

Server-end:

- Server compromise (leading to database disclosure) – authentication, keeping software up-to-date, regular password changing, minimum access privileges, logs, intrusion detection, firewalling, port sentry etc.
- Trojan – Virus checking, port scanning of self
- Denial of Service – Firewall/router configuration

c) What additional risks do wireless network connections (such as 802.11b) bring to the WWW, over and above those existing on conventional network connections? Outline possible solutions.

(8 marks)

For 802.11, risks include:

- All conventional network-based attacks with the added disadvantage that there is no need to physically access network cabling
- “Warchalking” to discover wireless hotspots
- Connecting to networks without authorisation
- Monitoring wireless traffic

Possible solutions:

- MAC authentication
- Not broadcasting SSID
- WEP encryption (but be aware of limitations)
- Wireless “honeypots” to catch abusers
- Physical Security

For other mobile devices, risks (and solutions) include :

- Theft or loss – Physical security & authentication
- Atmospheric conditions interrupting service - Redundancy

Total: 25 marks

Examiners’ Guidance Notes

This was the most popular question on the paper. It is worth noting that questions on contemporary topics such as security should *always* be answered in the context of recent events and technologies, which will naturally change year on year.

Part a): Generally, candidates were able to name some valid reasons, but most candidates did not understand what the implications of keeping data safe are, and chose instead to outline *solutions*, which was not what the question asked.

Part b): Whilst the candidates showed a very good knowledge of security (typically in terms of the STRIDE model), most candidates neglected to identify where the security risk would be found, and how to prevent or mitigate the problems. Additionally, the vague word “hacker” and “hacking” was often used to mean anything from packet sniffing to server compromise, without differentiation. Some candidates also believed that a firewall was a solution to *any* security issue!

Part c): Typically this was answered extremely poorly, with very few candidates choosing to refer to the more widespread and documented 802.11 (as hinted at in the question), preferring instead to discuss mobile telephony, often in vague terms. Identified risks tended therefore to be limited, and candidates could often not provide even outline solutions to their identified problems.

Question 4

- a) Illustrating your answer with real life examples, describe how the advent of broadband and interactive television and the “always-on” ethos have transformed the way people buy, sell and support items. (10 marks)

One mark for each good point made – up to a maximum of 5 marks if no relevant examples were given. Good points include:

- Increased speed and reliability of broadband
- Increased availability of WWW access due to interactive TV
- Access to more suppliers including overseas
- Easy comparison of price (including www.kelkoo.com etc)
- User feedback can give indications of quality (e.g. www.amazon.com)
- Downloading goods instead of buying physically (e.g. iTunes)
- Patches, Upgrades and support (windowsupdate)
- Ticketless air travel (BA)
- Ordering at any time of day or night
- Virtual showroom cutting premises costs
- Messaging services to recommend goods to friends instantly
- Streaming media to your machine (instead of receiving VHS etc)
- Spam issues
- 24/7 support using email, messageboards, web searches etc.

- b) There are many mechanisms (both on and offline) for paying for online goods and services. List FOUR of these methods, along with the advantages and disadvantages of each method. (8 marks)

One mark awarded for each distinct method (and a further two half-marks for identifying at least one sensible advantage and disadvantage of each method)

- “Real-time” Credit Card processing
 - + Quick
 - + Instant feedback
 - Fraudulent use of details by vendor
- Cheque in post
 - + No risk of disclosure over network/server compromise
 - Possible “lost in post”
 - Slow
- Payment services PayPal/NoChex
 - + No transmission of financial details to untrusted suppliers (only to the payment services company)
 - Commission
- Bank Credit transfer (BACS)
 - + Tracking
 - Disclosure of bank account details
- Credit Card over Telephone
 - + No risk of disclosure over network/server
 - Order must be delayed until payment received
 - Administration of collating offline credit card processes with online orders

- Credit Card sent via network for later manual processing
 - + Credit card details sent with order details
 - Order must be delayed until payment processed
 - Administration of collating offline credit card processes with online orders
 - Inferior to real-time processing
- c) What has been the impact of growth in electronic transactions (e-banking, e-commerce, e-payment) and online technologies in relation to the concept of a cashless society? (7 marks)

An open-ended question.

The necessity of the Web being cashless due to no physical contact leads to confidence with credit card and other cashless transactions. Instant feedback from e-commerce and e-banking leads to consumers choosing to work online. Wages being deposited with BACS, bill paying online, use of direct debit.

References to Mondex (or other e-cash pilots), credit card culture, travel ticket schemes such as Oyster (allowing online renewal), online congestion charge payments, online grocery shopping (Waitrose/Ocado) or other real-life cashless environments.

Negative aspects include the fact that consumers may still have reservations about fraud, most people in the world are *not* online, and there are still many areas where cash is needed (e.g. paying for small goods and services such as a window cleaner)

Total: 25 marks

Examiners' Guidance Notes

This was a popular question and yet was typically poorly answered. The general issue is that open-ended questions should contain appropriate real life examples, and that candidates would be well advised to plan out a concise answer, rather than a convoluted and largely irrelevant answer.

Part a): Typically candidates did not give any real-life examples, as specifically requested in the question, and often candidates would give a simple technical description of *what* broadband is, instead of *how* it has influenced e-commerce.

Part b): Generally very well answered, but some candidates believed SSL to be a payment method, and others stating debit and credit card as separate answers (but of course from a transactional point of view they are extremely similar).

Part c): Most candidates were unable to engage sensibly with this part of the question, instead choosing to reiterate the advantages Broadband has made to e-commerce from part (a). The point should also be made that *cashless* does not mean the same as *valueless*, or free!

Question 5

- a) i) Explain what the term accessibility means, and why it is important for providers of information (e.g. government departments) to address the issues. (7 marks)

Important issues as from W3C's WAI (paraphrased):

"Web accessibility means access to the Web by everyone, regardless of disability.

Web accessibility includes:

- *Web sites and applications [...]*
- *Web browsers and media players [...]*
- *Web authoring tools, and evolving Web technologies [...]*

There are several reasons why Web accessibility is important:

- *use of the Web is spreading rapidly into all areas of society;*
- *there are barriers on the Web for many types of disabilities;*
- *millions of people have disabilities that affect access to the Web;*
- *some Web sites are required to be accessible;*
- *Web accessibility also has carry-over benefits for other users.*

[...]

Types of disability:

- *Visual [...]*
- *Hearing [...]*
- *Physical, Speech [...]*
- *Cognitive, Neurological [...]"* (<http://www.w3.org/Talks/WAI-Intro/>)

In addition to those reasons detailed above, there are also legal requirements in the UK and USA (amongst other countries) against discrimination, including discrimination due to disability (Disability Discrimination Act, SENDA in the UK, Americans with disabilities Act in the USA).

A successful case was made in Australia in 2000 against Sydney Olympics for failing to adapt their web site to cope with the needs of disabled users.

There are also other pressures: bodies such as the RNIB put pressure on government/companies to adapt web resources for accessibility.

- ii) The Web is a source of entertainment almost as much as it is of information. How significant is accessibility as an issue for providers of entertainment or leisure? (5 marks)

This is a relatively open question. The answer is that in all instances, it is important to **consider** the concept of accessibility, and with that regard, it is significant for providers of leisure or entertainment. With regards to actually implementing it, either answer ("yes it is important" or "no it is not important") could be considered correct providing that:

- If the answer is "no", the area or scope of items considered in the argument refers to home leisure or entertainment items such as games where accessibility could not reasonably be implemented due to the nature of the item (e.g. a game relying on physical dexterity such as "Operation").
- a proper justification is given to back up the argument, and that no purely value-judgements are made
- That no statements are made that appear to contravene accessibility laws, guidelines or test-cases.

An answer achieving full marks would be expected to recognise the cases where it is important (such as on websites providing information, or a service), and when it is less important.

b) i) What is meant by the terms:

- HTML validation; and
- CSS validation?

(5 marks)

- HTML validation refers to the process of ensuring that HTML pages well-formed – that is, it meets the specification outlined in the W3C documentation. This will mean that not only all tags exist in the specification, but that the structure is correct, and any mandatory parameters are present. Also that all characters used are valid in the character set chosen (and that special characters such as “>” or “&” are properly escaped). Currently, HTML (and XHTML) can be validated as “transitional” or “strict”.
- CSS validation refers to the process of ensuring that cascading style sheets are well-formed. Note that CSS validation relies on the HTML pages in which the style sheets are used being valid

ii) How can web authors ensure their pages conform to standards?

(4 marks)

Web pages can be validated by submitting the page to an online validator (such as validator.w3.org for HTML) – either by uploading the file to the server, or by submitting the web address (if it has been published). The validator will then return a page either stating conformance with the standard being validated, or returning the errors. Alternatively, an offline validator can be used. Validated HTML pages are entitled to use the “valid HTML” icon provided by the W3C.

iii) What are the implications of:

- Web developers breaking or ignoring standards?
- Web browsers breaking or ignoring standards?

(4 marks)

Developers ignoring standards:

- Sites which do not display properly in other browsers
- Sites which “break” when newer versions of a browser is released (i.e. no insurance of backwards compatibility)
- Non-accessible web sites (unusable in screen readers for blind users etc)

Browsers ignoring standards:

- Proprietary elements which do not exist in all user-agents (e.g. <marquee> or <blink>)
- Potential of sloppy HTML authoring by developers (“the code works in Browser X, it must be correct”)
- Incorrect rendering of standards-correct HTML

Total: 25 marks

Examiners’ Guidance Notes

In general, answers to this question were extremely poor. There was a wide division between the candidates who knew about the W3C, HTML standards and accessibility issues (and who typically were able to answer this question extremely well), and those who knew nothing at all about these, with very few in-between. One aspect to note is that while definition of accessibility was generally quite good, few candidates successfully discussed why it is important for information providers to address these issues. Common fallacies were to discuss usability *guidelines* (such as Nielsen), security access control to resources, or believing that web standard infringements were punishable by law. Furthermore, validation (in a standards context) does not refer to the checking of form data by Javascript, and testing web pages in different browsers is not an appropriate way of ensuring compliance with web standards!