

**THE BCS PROFESSIONAL EXAMINATION
Professional Graduate Diploma**

EXAMINERS' REPORT

April 2003

World Wide Web – beyond the Basics

General

This subject was examined for the first time this year. It was a popular choice with candidates – although a few seemed to think that their general knowledge of the Internet would be sufficient to provide them with answers to the questions (which is not the case at any level, let alone Professional Graduate Diploma). Several candidates need instruction in examination technique – they are providing answers running to several pages for part of a question worth 2 or 3 marks. Some candidates clearly had a detailed knowledge of the World Wide Web and this was reflected in an excellent performance.

1. (a) **Web sites serve different purposes. Identify FIVE distinct purposes.**
(5 marks)
- (b) **Describe the main stages of a Web development life cycle. How do these differ from the stages used in Software Engineering?**
(12 marks)
- (c) **Describe a strategy for testing and evaluating a Web site.**
(8 marks)

Answer Pointers

(a)

- Sell products
- Advertise products
- Inform and announce
- Provide access
- Offer services
- Create discussions
- Nurture communities

(5 marks)

(b)

- Site definition and planning
- Information architecture
- Site design
- Site construction
- Site marketing
- Tracking
- evaluation
- Maintenance

Comparison with waterfall model stages (or variants of it). Need to establish that a structured development method is essential as well as user participation, etc.

(12 marks)

(c)

- When to test
- Who is involved – users vs experts
- Where to test
- Heuristic evaluation- violation of design rules
- Reference to Nielsen's rules.
- Include local-host test
- server-side test
- client-side test

(8 marks)

Examiner's Guidance Notes

Part (a) was well done, however in part (b) many candidates failed to recognise that the question was about the model and the various stages that make up the model to represent the process. Very few candidates undertook comparisons with the waterfall model. Part (c) was about developing a coherent strategy and hence a template for the testing process.

2. (a) **Briefly describe each of the following terms:**

- **Dynamic HTML**
- **Cascading Style Sheet**
- **Document Object Model (DOM)**

(9 marks)

(b) **The code in Figure 1 shows an example of how to manipulate the DOM using JavaScript.**

(i) **Explain in detail the output and the code with reference to the object, methods and events of the DOM.**

(10 marks)

(ii) **Modify the code to enable another menu group to be generated and displayed.**

(3 marks)

(iii) **Modify the code from part (ii) to ensure that both menu groups cannot be active at the same time.**

(3 marks)

Figure 1

```
1. <HEAD>
2.   <META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=iso-8859- 1">
3.
4.   <TITLE>BCS-Beyond the WWW</TITLE>
5.
6.   <SCRIPT TYPE="text/javascript" LANGUAGE="javascript">
7.
8.
9.   function toggleMenu(currElem)
10.  {
11.    if(document.all)
12.    {
13.
14.    menuObj=eval("document.all." +currElem + ".style"); // IE syntax
```

```

15. menuObj.top=toggleVal(menuObj.top);
16. }
17.
18. else
19. {
20.
21. menuObj = eval("document." + currElem); // Netscape syntax
22. menuObj.top=toggleVal(menuObj.top)
23. }
24. }
25.
26. function toggleVal(inVal)
27. {
28. if(inVal == -5)
29. {
30. return -90;
31. }
32. return -5;
33. }
34.
35.
36. </SCRIPT>
37. <STYLE TYPE="TEXT/CSS">
38. .menu {position:absolute; font: 12px helvetica; width: 75px; background-color: #999999;
39. layer-background-color:#999999; color:#FFFFFF}
40.
41.
42. </STYLE>
43. </HEAD>
44. <BODY BGCOLOR=WHITE>
45. <SPAN ID="fileMenu" CLASS=menu
46. STYLE="left:20px; top:-90px"><BR>
47. <A HREF="javascript:window.open()">Open</A><br>
48. <A HREF="javascript:window.print()">Print</A><br>
49. <A HREF="javascript:history.back()">Back</A><br>
50. <A HREF="javascript:history.foward()">Forward</A><br>
51. <A HREF="javascript:window.close()">Close</A>
52. <HR>
53. <A HREF="#" onMouseOver = "javascript:toggleMenu('fileMenu')">File</A><br>
54. </SPAN>
55. </BODY>
56. </HTML>

```

Answer Pointers

- (a)Dynamic HTML
HTML delivers information in a static presentation without interactivity. DHTML is a combination of HTML, Style sheets and scripting languages such as JavaScript and VB to allow interactivity.

(3 marks)

- Cascading Style Sheet
CSS - Style sheets are best described as a type of design template. They allow greater control over layout and typography in web pages. As such they are a major feature of DHTML.

(3 marks)

- Document Object Model
DOM - The Document Object Model makes everything on a page into an object and provides a mechanism through which those elements can be manipulated by programmed scripts.

(3 marks)

- (b) (i) Candidate to explain the web page display, the interaction – how it would work, i.e. a menu appears/disappears when the mouse is over the file link. Reference should be made to the two functions and parameter passing as well as the DOM, etc. Browser difference should be commented upon.

(10 marks)

- (ii) Write the code to create another menu group paying attention to its placement.

(3 marks)

- (iii) Introduce a variable to control the display of menu groups, etc.

(3 marks)

COMPLETE code for (b) (i) – (iii):

```

1. <HEAD>
2.   <META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=iso-8859-1">
3.
4.   <TITLE>BCS-Beyond the WWW</TITLE>
5.
6.   <SCRIPT TYPE="text/javascript" LANGUAGE="javascript">
7.
8.
9.   function toggleMenu(currElem)
10.  {
11.    var menuObj;           // variable to control the display
12.    if(document.all)
13.    {
14.
15.      menuObj=eval("document.all." +currElem + ".style");
16.      oldTop = menuObj.pixelTop;           /capture current value
17.      document.all.searchMenu.style.pixelTop = -90;/* switch both menus off */
18.      document.all.fileMenu.style.pixelTop = -90;
19.
20.      menuObj.pixelTop=toggleVal(oldTop); /*process the menu group that that is active*/
21.    }
22.
23.    else /* Netscape version */
24.    {
25.
26.      menuObj = eval("document." + currElem);
27.      oldTop = menuObj.top;
28.      document.searchMenu.top = -90;
29.      document.fileMenu.top = -90;
30.      menuObj.top = toggleVal(oldTop)
31.    }
32.  }
33.
34.  function toggleVal(inVal)

```

```

35. {
36.   if(inVal == -5)
37.   {
38.     return -90;
39.   }
40.   return -5;
41. }
42.
43.
44. </SCRIPT>
45. <STYLE TYPE="TEXT/CSS">
46. .menu {position:absolute; font: 12px helvetica; width: 75px; background-color: #999999;
47. layer-background-color:#999999; color:#FFFFFF}
48.
49.
50. </STYLE>
51. </HEAD>
52. <BODY BGCOLOR=WHITE>
53. <SPAN ID="fileMenu" CLASS=menu
54. STYLE="left:20px; top:-90px"><BR>
55. <A HREF="javascript:window.open()">Open</A><br>
56. <A HREF="javascript:window.print()">Print</A><br>
57. <A HREF="javascript:history.back()">Back</A><br>
58. <A HREF="javascript:history.foward()">Forward</A><br>
59. <A HREF="javascript:window.close()">Close</A>
60. <HR>
61. <A HREF="#" onmouseover = "javascript:toggleMenu('fileMenu')">File</A><br>
62. </SPAN>
63.
64.
65.
66. <SPAN ID="searchMenu" CLASS=menu
67. STYLE="left:100px; top:-90px"><BR>
68. <A HREF="http://yahoo.com">Yahoo</A><BR>
69. <A HREF="http://lycos.com">Lycos</A><BR>
70. <A HREF="http://google.com">Google</A><BR>
71. <A HREF="http://hotbot.com">Hotbot</A><BR>
72. <A HREF="http://askjeeves.com">AskJeeves</A>
73. <HR>
74. <A HREF="#" onmouseover = "javascript:toggleMenu('searchMenu')">Search</A><br>
75. </SPAN>
76.
77.
78.
79.
80.
81. </BODY>
82. </HTML>

```

Examiner's Guidance Notes

Part (a) was well answered with the use of good examples to illustrate each element. Part (b) required the candidate to have knowledge of a scripting language and its use in manipulating the DOM. A diagram to illustrate the output would have been useful.

3. (a) **Briefly explain the purpose of each of the following:**
- Database Server
 - Proxy Server
 - Security Server
- (6 marks)**
- (b) **Scripts can be executed at the server end or at the client end for a Web application. When would it be appropriate to execute:**
- (i) at the server end; and
- (ii) at the client end?
- (6 marks)**
- (c) **What is CGI?** **(3 marks)**
- (d) **Compare and contrast different methods for getting user input from Web forms.** **(10 marks)**

Answer Pointers

- (a)
- A database server on the Internet refers to a Web-enabled database program that hosts and manages a database and allows users to access it through the Internet. (2 marks)
 - A proxy server sits between client Web browsers and a Web server to filter and cache Web content and improve network performance. Primary purpose is the security function to inspect incoming and outgoing traffic and determining what should be denied transmission, reception or access. (2 marks)
 - A security server integrates intranet and Internet firewalls and Web cache or proxy servers with the aim of making a Web-enabled enterprise safer, faster and more manageable. A security server provides user and server authentication and firewall functions of filtering incoming IP packets and preventing attacks. (2 marks)
- (b) (i)
- 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
- (ii)
- 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. (6 marks)
- (c) Common Gateway Interface is a web-based client/server data communication standard for interfacing applications with information servers such as HHTTP or web servers. CGI scripts can be written in a number of languages and reside on the server. (3 marks)

- (d) A form can be used on a web page to collect input data from the user. This data may be simply sent to the web page originator, used by a server based application to retrieve information requested by the user or to control the page(s) being browsed.

The types of form elements are:

- text (single line text field)
`<input type=text name="name" value="default_text">`
- password (as text field, but entry is echoed on screen as ****)
`<input type=password name="name" value="default_text">`
- text area (multiple line text field)
`<textarea name="name" rows=num_rows_deep cols=chars_wide>
default_text </textarea>`
- radio buttons (grouped - only one in a group can be selected)
`<input type=radio name="name" value="value_returned_if_selected">`
can also add `checked` to show selected by default
radio buttons in same group must have the same *name*
- check boxes (individually checked or not)
`<input type=checkbox name="name" value="value_returned_if_selected">`
can also add `checked` to show selected by default
- select list (select one from dropdown list)
`<select> <option>first_option <option>second_option ... </select>`
or (select many from dropdown list) `<select multiple> <option>first_option
<option>second_option ... </select>`
- hidden (not shown on screen at all, can be useful to identify form)
`<input type=hidden name="name" VALUE="value_returned">`
- Submit button (clicking causes form action to occur)
`<input type=submit value="text_on_button">`
- Reset button (clicking resets all fields on the form to empty or default values)
`<input type=reset value="text_on_button">`
- button (general button - can have a JavaScript action attached to it)
`<input type=button value="text_on_button">`

The data from a web page form can be:

e-mailed to a specified addressee

the form should contain the action parameter

`action="mailto:somebody@somewhere"`

Your browser must be set up to send e-mail and the e-mail body will contain the data in a coded form with for each field `name=value` pairs, separated by `&s`, where `name` is the name given to that element in the form and `value` is the value entered in that element when the form is submitted; also all spaces are replaced by `+s`

sent to a CGI program

a CGI (Common Gateway Interface) program is a program stored on the web server which will carry out some task such as interrogate a database using the details submitted on the form. The form action parameter will be

`action="http://server/path/cgiprogram.cgi"`

where `http://server/path/cgiprogram.cgi` is the URL of the required program.

CGI programs may be written in a variety of languages the commonest of which is Perl and require that the web server has been set up to allow CGI programs to be run.

Discuss the Get method and Post method and justify which one to use.

used by JavaScript

to control some action within the web page (eg a ready reckoner)

all the processing is done on the user's machine by JavaScript program code embedded in the web page HTML, normally without any additional downloading from the server.

(10 marks)

Examiner's Guidance Notes

Part (a) was answered well, although the lengths of the answers were disproportionate to the marks available. There were some excellent answers to part (b), but the majority of candidates could not give all of the reasons for where the scripts should be executed. The answers for part (d) tended to focus on the form objects which was only part of the answer. The main part was to discuss email and get and post methods for obtaining user input.

4. (a) **What is meant by the terms:**

- Security
- Privacy
- Authentication
- Encryption
- STRIDE

(8 marks)

- (b) You are asked to give advice on the authentication approach to be used by people accessing a web-site which holds a number of discussion documents. Individuals should be able to identify themselves and then be able to upload documents (texts and short articles) for others to browse through. What authentication approaches would you suggest? What are the security and privacy issues involved? What security policies might the web-site hosts establish?

(10 marks)

- (c) "A detailed knowledge of cryptography is essential for all serious web developers."
Discuss.

(7 marks)

Answer Pointers

(a) What is meant by the terms:

- Security - *methods and policies used to defend information or services from malicious attack or unauthorised access (1 mark)*
- Privacy – *methods and policies used to ensure and individual's rights to keep personal details private and accurate (1 mark)*

- Authentication – *determining who is requiring services by checking their credentials (1 mark)*
- Encryption – *cryptographic method used to conceal information in such a way that it can only be read by authorised users, typically based on ciphers, public/private key, hashes (1 mark)*
- STRIDE – *threat/attack model: Spoofing identity, tampering with data, repudiation, information disclosure, denial of service, elevation of privilege + explanation (4 marks)*

(8 marks)

(b) Authentication may be based on passwords. Passwords may be stored in a database and the database encrypted or alternatively used to generate a hash value. In the latter case the password is not stored anywhere so is more secure but cannot be resent to the user. The user will probably register with the site by e-mail or form. They will typically give a return e-mail so that their initial login account name and password can be passed back. Probably because of the nature of the site all documents will be archived so that new uploads are given a new document name/id. A number of security and privacy issues are inherent in the use of the web including the potential for abuse and the potential need to deny access to those who abuse it – hence clearly published policy statements. It is also possible that individuals may either deliberately or inadvertently contravene another’s rights including IPR, copyright or privacy.

(10 marks)

(c) Possibly not as long as the web developer knows how to use cryptographic functions. In fact the web developer should normally refrain from writing his or her own as he/she is very likely to get it wrong unless a first class computer science and excellent mathematician. For instance the web developer needs to know the differences between stream ciphers and block ciphers, the comparative bit protection offered by different keys and their speed of operation and overheads of various functions but they are unlikely to need to understand the precise algorithms employed.

(7 marks)

Examiner’s Guidance Notes

Candidates provided some very good answers for the factual parts of this question – parts (a) and (b). However, their answers for part (c) were much weaker. Although the answer ‘no’ was expected, this was not as important as the detailed reasoning which lead to that conclusion – it did not require a repeat of the information already presented in answering parts (a) and (b)!

5. (a) **Explain the concepts of business-to-business, business-to-consumer and consumer-to-consumer e-business. What are the hardware and software requirements to do business on the web? What are the current protocols and standards?**

(8 marks)

(b) **“E-commerce allows companies of any size to operate effectively in a world economy.” Discuss.**

(17 marks)

Answer Pointers

(a) Business-to-business: both are businesses passing order or other details probably using an XML format and some convention such as SOAP. This is likely to be an expected connection between organisations who work together but need not be (2

marks). Business-to-consumer: dependent on the business this may be like an electronic/virtual store with customers ordering goods and typically filling an electronic cart. Typically these sites are more user-oriented and 'colourful' (2 marks). Consumer-to-consumer: e.g. e-Bay where customers directly talk to each other to bid for or buy goods placed on the web for sale (2 marks). Need for a secure server (https) and specialist e-commerce software (2 marks).

(8 marks)

- (b) Once again there is no right answer. Candidates would be expected to deal with all the major areas associated with e-commerce with emphasis on efficiency of company operation and the differences between large, small and medium sized enterprises. This can be handled in many ways for example:

8 marks - Knowledge

- Technologies for e-commerce (e.g. IIS, ASP, SQL server, E-commerce server)
- Business-to-business and business-to-consumer e-commerce
- Operations and efficiency
- Promotion and advertising

9 marks –Argued Case

- Uses of e-commerce for selling, promotion, image etc.
- Advice for small, medium and large businesses
- Threats and rewards (e.g. SWOT analysis)
- Future technologies
- World economic trends

(17 marks)

Examiner's Guidance Notes

Once again, the 'bookwork' part (a) of this question produced some excellent answers and most candidates knew what was required of them. However, part (b) demanded discussion and application and only the best candidates produced coherent answers; candidates even failed to use the clues in part (a) to help them structure their answer.