

**THE BCS PROFESSIONAL EXAMINATION  
Diploma**

**April 2005**

**EXAMINERS' REPORT**

**The Internet & World Wide Web**

**General**

This paper required the candidate to attempt four questions from a choice of six. Some candidates answered 5 questions and a larger than expected number answered questions 1-4. The quality of answers was better than in previous years with fewer poor answers. Some candidates showed poor exam technique with problems including illegible handwriting and a failure to communicate in a concise and coherent manner.

**Question 1**

1. a) Define and explain the terms Internet and World Wide Web. **(6 marks)**
- b) Define what an IP address is and highlight the main differences between fixed and dynamic IP addressing. **(9 marks)**
- c) Differentiate between static and dynamic HTML and describe the benefits and disadvantages of each. **(10 marks)**

**Answer Pointers**

- (a)
- The candidate would be expected to define the Internet using terms such as “global”, “network”, “interconnection”, “infrastructure” giving access to “shared” “resources”.
  - The World Wide Web on the other hand is a method of using the Internet to share and distribute multimedia-enabled, electronic documents using hypertext linking
- (b)
- An IP address is the unique numeric address in the format NNN.NNN.NNN.NNN of every computer on the Internet, example to be included
  - Fixed – each machine has a permanent IP address (e.g. servers).
  - Dynamic – each machine is allocated an address from a pool when they connect (e.g. dialup accounts)
  - Comparison of features
- (c)
- Static web sites consist of:
    - pages that do not change unless the webmaster modifies the tags directly within the page.
    - Typically easier to develop but are very costly to maintain.
    - They also often fall short on content because most of the information is not updateable
    - Suited to information of general nature.
    - The result is that with the lack of content change it causes users to stop returning to the site on a regular basis.

- Dynamic web sites consist of:
  - HTML pages that are created on the web server before they are sent to the user.
  - Dynamic web sites are usually more expensive to develop but cheaper to maintain, often full of content and timely information.
  - Dynamic web sites are usually more popular because the information displayed is regularly updated and can be customized specifically for users.
  - Most dynamic web sites use a relational database management system (RDBMS) to create the dynamic content.
  - The content may change according to the geographic location of the user, time of day etc.
  - Technologies for producing it include cgi scripts, server side includes (ssi), javascript etc.
  - When capitalized, Dynamic HTML refers to new HTML extensions that will enable a Web page to react to user input without sending requests to the Web server. Microsoft and Netscape have submitted competing Dynamic HTML proposals to the Worldwide Web Consortium (W3C).
  
- Sites can include a combination of static and dynamic content. Information that does not change often is best created statically whereas information that changes often should be created dynamically. A web site that contains both static and dynamic content is usually the most cost-effective option in the long run.

### Examiner's Comments

Almost all candidates answered this question. Most candidates clearly stated the differences between the Internet and the WWW service running on it. A small number of candidates indicated incorrectly that the total addressable IP range was somehow different if using one scheme compared to the other. The main differences between fixed and dynamic IPs were well understood, but many candidates presented them in a verbose manner when a table would have been more appropriate. Most candidates were able to list some of the main attributes for static and dynamic HTML, but only a small number covered the likes of DHTML as an example.

### Question Two

2. You have been invited to give a talk at your local library about the underlying architecture of the Internet. For each of the following sub-topics, list the main points that you will include in your talk:
- a)* The Internet - a loose organisation of networks (5 marks)
  - b)* Hubs, Bridges and Routers (5 marks)
  - c)* Who funds the Internet? (5 marks)
  - d)* The roles of Internet Registrars and Internet Service Providers (5 marks)
  - e)* RFC, W3C & IETF (5 marks)

### Answer Pointers

Whilst a prescriptive answer is inappropriate, a good answer is likely to include:

- (a)
  - Internet is a collection of thousands of individual networks and organisations which cooperate with each other so that information can pass among them

- Networks found in private companies, universities, government agencies & ISPs.
  - Local networks join to form regional networks linked together by backbones
- (b)
- Hubs link groups of computers to each other
  - Bridges link LANs to each other
  - Routers examine packets to determine their destination and route them appropriately
- (c)
- Given its nature, no single group funds it
  - Funded by the organisations which own the networks included private companies universities and government agencies
  - ISPs derive funding by charging for Internet access
- (d)
- Internet Registrars are private companies responsible for registering Internet domains
  - ISPs provide access to the Internet usually via dial-up and broadband connections
  - May provide additional services such as email and web hosting
  - Many own their own networks and may supply backbone facilities
- (e)
- RFC are requests for comment which are the ways that procedures and standards are agreed
  - The World Wide Web Consortium (W3C) is the organisation responsible for drafting, circulating for review and modifying web standards.
  - IETF is the Internet Engineering Task Force and is responsible for overseeing how the Internet's TCP/IP protocols evolve

### Examiner's Comments

Many candidates avoided what was a straightforward question. Sections a-c were reasonably well done but few candidates demonstrated an understanding of Internet Registrars. Many candidates struggled in their answer to part e. One candidate defined the IETF as the Internet *Emergency* Task Force

### Question 3

3. a) What do the following acronyms stand for?
- |           |           |
|-----------|-----------|
| i) URL    | (2 marks) |
| ii) HTML  | (2 marks) |
| iii) HTTP | (2 marks) |
- b) Using an example, explain the elements which make up a URL. (6 marks)
- c) Write a simple web page to illustrate the main features of HTML. (6 marks)
- d) With reference to DNS and HTTP, explain what happens when a user types a URL into a web browser. (7 marks)

### Answer Pointers

- a)
- i) Uniform resource locator
  - ii) Hypertext mark-up language
  - iii) Hypertext transport/transfer protocol
- b) URL consists of transport protocol, hostname, filename and port  
e.g. <http://www.bcs.org.uk:8080/members/index.html>
- c)
- HTML is the mark-up language of the web
  - Defines format of the page
  - Tags are the instructions to the browser
  - Includes hyperlinks

```
<HTML>
<HEAD>
<TITLE> A simple page</TITLE>
</HEAD>
<BODY>
    Tags such as <P> <IMG> <A HREF..> here
</BODY>
</HTML>
```

- d)
- WWW works on the client server model
  - Web browser runs on the client, web server on the server!
  - When URL is typed, browser uses DNS to look up the IP address of the URL host
  - It then sends the URL request using HTTP to fetch the file
  - The server then responds and sends the requested page
  - HTTP defines the way the browser and server communicate with each other
  - Stateless protocol and is only open for the single transaction
  - Elements on the page such as graphics require separate requests (and transactions).

### Examiner's Comments

This was a very popular question. Most candidates were able to expand the acronyms. Many candidates ignored the port element of the URL and some gave poor examples, e.g. [www.microsoft.com](http://www.microsoft.com). Some candidates were unable to write a simple HTML page and many omitted basic elements such as hyperlinks. Few candidates were able to give a valid answer to part d. Although there was a general understanding of DNS and HTTP, their relationship and roles were frequently misunderstood.

#### Question 4

4. a) Define and explain the purpose of EACH of the following acronyms:
- ii) FTP
  - iii) DNS
  - iii) WAP
  - iv) PPP

(12 marks)

- b) There are a large number of available formats to choose from when delivering multimedia content on the Internet - including text, graphics, sound, animation and video. What are the issues that need to be addressed when multimedia content is delivered on the Internet? Which formats are you most likely to use for such delivery? Justify your choices.

(13 marks)

#### Answer Pointers

a)

- FTP – file transfer protocol - is a method of transferring files (often binary) over the Internet. It requires an FTP client which is often built into a web browser and an FTP server.
- DNS – domain name server - performs the resolution of an human friendly address such as www.bcs.org.uk into the corresponding IP address used to locate machines on the Internet.
- WAP - Wireless Application Protocol - is an open international standard for applications that use wireless communication, e.g. Internet access from a mobile phone. Discussion on the use of WML.
- PPP - Point-to-Point Protocol - the Internet standard for transmitting network layer datagrams (e.g. IP packets) over serial point-to-point links.

b)

- This question is fairly open. A wide range of formats could be mentioned. A likely breakdown of marks would be:
- Issues such as file size, download times and browser support
- Formats such as GIF, JPEG, FLASH / SHOCKWAVE, MP3, WAV, MIDI, MOV, PDF
- Should discuss in detail:
  - Compact file size commensurate with quality of the artefact and reasonable download time
  - Browser support

#### Examiner's Comments

This was a popular question for candidates. Most candidates were able to expand the acronyms, but the likes of WAP and PPP were less well explained. Some answers were long-winded where a set of key points would have been more suitable. In part b) the formats typically used to deliver multimedia were briefly discussed in most cases, but this could have been expanded upon. Aspects such as compression and the impact on quality could have been explained further.

### Question 5

5. As a freelance web designer, you have been invited by the Managing Director of a small business, manufacturing handmade furniture, to make a presentation to the Board of Directors on the benefits of having a website for their business and to outline how you would go about developing their Internet presence.
- a) Describe how a website might aid their business. **(6 marks)**
- b) Outline the key stages that you would go through in the development of their website. **(5 marks)**
- b) Discuss the technologies that would be used in the development of their website and the purpose of each. **(6 marks)**
- c) Describe the hosting options for their site and state, with justification, which hosting option you would recommend. **(8 marks)**

### Answer Pointers

a)

The student should give examples of how a website might aid the client's business including:

- Ability to market the company and the client's products globally through interactive product catalogue
- Ability to sell products through e-commerce - capability for taking orders and electronic payment.
- Improving customer relationship management through 24 / 7 customer support facility such as ability for customer to submit queries online anytime, such as when their purchased product will be finished and delivered, to which the company can respond during their normal business hours.

b)

Whilst much web site development is done ad hoc there are various stages that are common and the candidate's answer should be similar to and briefly elaborate on the following:

- Requirements analysis
- Storyboarding and design
- Coding
- Testing
- Maintenance

c)

The answer should show understanding of the technologies that would need to be applied to produce the website. For example:

- HTML (forms, tables, etc.): Basic layout
- GIF / JPEG images for navigation elements as well as photographs of the different products they manufacture
- Stylesheets: Advanced layout
- JavaScript: Data entry validation and some dynamic interface components
- ASP with underlying DBMS: Background data management
- Flash: Multimedia content and advanced user interaction

d)

Hosting options include:

- shared/virtual servers
- dedicated servers
- collocation servers.

Most likely recommendation is likely to be the shared/virtual server as it is cheaper and should be adequate for this small business.

### Examiner's Comments

Candidates were able to identify in part a) that marketing and advertising were likely to be greater as a result of a website and that it would be possible to sell on-line, but a smaller number mentioned the ability to interact with the furniture company. Most candidates mentioned the typical life-cycle in part b). A greater degree of candidates misinterpreted part c) and discussed the tools to develop a website and not the technologies expected to be present in a site. Most students were able to identify the main hosting options and concluded that shared hosting was the most appropriate for the small business.

### Question 6

6. (A)DSL Broadband, over a normal telephone line, is becoming a popular method of connecting to the Internet.

a) Explain, in no more than 100 words, how this method works. Use a diagram to illustrate your answer.

b) Compare and contrast the advantages and disadvantages of this method against the older "dial-up" connection method. **(6 marks)**

c) What are the security implications of running a broadband connection? **(6 marks)**

d) What methods can be used to combat these security implications? **(6 marks)**

### Answer Pointers

a)

- Uses ordinary telephone line to provide high speed Internet access
- Uses special "modem" – poorly named as no digital to analogue conversion is involved
- Divides phone line into three channels, one for receiving data, one for sending data and one for the telephone
- At the exchange, ADSL signal is filtered off and routed using BT network to ISP (UK – other countries may vary)
- At ISP the connection is made to the Internet

Method	Advantages	Disadvantages
Dial-up	Works without setup on any telephone line	Slow Requires a connection to be negotiated
ADSL broadband	Fast Always on Fixed IP allows servers to be run	Needs setup at the exchange More vulnerable to security attacks

Broadband is always on usually with a fixed IP address. This makes it an easier target than transient dialup connections with dynamic IP addresses

Forms of attack may include:

- Denial of service – the router/client computers are bombarded with requests which ties up so much bandwidth and processing power that they are unable to service legitimate requests.
- taking control of the router/client
- running malicious code
- Using it as a staging post to attack other computers on the Internet.
- Gaining access to sensitive or confidential information such as credit card details.
- Using open mail servers for spam email
- The spreading of viruses

Methods include:

- Firewalls implemented in software or hardware to control access to the services offered on the machines behind the firewall.
- Proper procedures for identification, authentication and access control
- Encryption of sensitive information
- Use of secure protocols such as https and ssl.
- Closing down non-essential services on computers e.g. sendmail on web servers
- Ensuring that the latest versions of software are used which contain the essential security patches
- Ensuring that software is correctly configured to prevent abuse e.g. preventing open mail relays
- Employing up to date virus scanning software
  
- Monitoring network activity

### **Examiner's Comments**

Few candidates answered this question. Many thought that the telephone line went to the ISP directly rather than to the local exchange. The advantages and disadvantages were well understood but many candidates presented them in a verbose manner when a simple table would have been more appropriate. Not all candidates emphasised the always on and fixed IP implications for security. Few were able to provide a comprehensive list of precautions.