BCS HIGHER EDUCATION QUALIFICATIONS
BCS level 5 Diploma in IT

April 2010

EXAMINERS' REPORT

PRINCIPLES OF INTERNET TECHNOLOGIES

Examiners' General Comments
Answers to Section B questions were generally short and appeared to have been rushed. This observation, combined with the profile of attempted questions across both sections, suggests that students were not particularly planned in their approach to the examination, possibly simply working through all questions in order and not leaving sufficient time for later questions.

A1 a) i) Explain the role of a router in the management of Internet traffic.
(5 marks)

ii) Explain the differences between dynamic and static routing.
(5 marks)

iii) Using a diagram for each, show the difference between unicast, broadcast, anycast and multicast. Which would most commonly be encountered on the Internet?
(5 marks)

b) Define the term *client-server architecture* and give **three** examples of its use on the Internet.
(5 marks)

c) Outline the role of protocols as applied to the Internet and name **three** protocols frequently used on the Internet.
(5 marks)

Answer Pointers

a) i) The role of a router is to ensure that packets arrive at the correct destination. The router examines the header of incoming packets and checks the destination against a routing table before forwarding them to their destination.
ii) In static routing, the routing table has specific paths to specific destinations which don't change according to network traffic. Dynamic routing allows packets to have multiple routes to a destination according to network conditions. The routing table is built dynamically by routing protocols which change according to network traffic and conditions.
iii) Diagrams should illustrate:
unicast – packet to a single node
broadcast – packet to all nodes
anycast – packet to any one out of a group of nodes
multicast – packet to a group of interested nodes.

Unicast dominates the Internet.

b) Client/server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfils the request.

Examples include Web, email, ftp, telnet, dhcp etc.

c) A protocol is a set of rules or convention which is used by computers to communicate with each other across a network.

Examples include tcp, ip, dhcp, http, ftp, smtp, pop3, imap etc.

Examiners' Guidance Notes

This question was attempted by approx 70% of candidates but only half of those achieved a pass mark. The role of a router was not well understood and many candidates wrote instead about the router function of combined ADSL modem/routers. There was confusion about dynamic and static routing and a worrying number of candidates wrote about dynamic and static allocation of IP addresses. Sections B and C were better answered.

A2 a) For each of the following, state what the acronym stands for AND briefly explain its purpose:

i) HTML
ii) CSS
iii) W3C
iv) URL
v) HTTP

(10 marks)

b) There are a number of protocols that play a part in email. Some were designed specifically for email and others are generic Internet protocols. Name **two** email-specific protocols and **two** generic Internet protocols and explain their roles in the context of conventional (non-webmail) email.

(8 marks)

c) i) Explain how the Domain Name System allows computers to contact each other to exchange email or display web pages.

(4 marks)

ii) State **three** distinct causes of DNS errors.

(3 marks)

Answer Pointers

a)

i) Hypertext Markup Language is the language for describing the structure of Web pages.
ii) Cascading Style Sheets is a language for describing the presentation of Web pages.
iii) The World Wide Web Consortium (W3C) is an international community that develops standards to ensure the long-term growth of the Web.
iv) A Uniform Resource Locator (URL) is a compact string representation of the location for a resource that is available via the Internet.
v) The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems.
(Source: www.w3.org)

b) Email specific:

POP3 – final delivery of mail to email client
IMAP - final delivery of mail to email client

SMTP- sending and relaying of email

Generic Internet:

TCP - responsible for reliable delivery of packets
IP – responsible for the addressing

c)
i)

- DNS performs address resolution
- Hierarchy
- Local name servers
- Root domain servers
- Primary/secondary name servers

ii) URL doesn't exist, query times out, local domain server is down/uncontactable…

Examiners' Guidance Notes

This question was attempted by almost all candidates and most achieved a pass mark. Part a) was generally well answered although not all candidates could explain CSS. In part b) there was good knowledge of email specific protocols but less so of generic protocols. Some candidates referred to protocols such as ftp and http even though they have nothing to do with email. In part c) the functioning of DNS remained a mystery for many candidates and some confused DNS errors with web server errors.

A3 a) i) What is web accessibility as defined by the W3C?

(2 marks)

ii) Why is web accessibility important?

(2 marks)

iii) Outline **three** things that can be done to improve the accessibility of websites.

(6 marks)

b) i) Explain the role of a web crawler (spider).

(4 marks)

ii) State **three** types of information that might be indexed by indexing software.

(3 marks)

iii) Explain why two different search engines may return different results when given the same search terms.

(2 marks)

c) For each of the following, state what the acronym stands for and give an example of its use:

i) FTP
ii) Telnet
iii) DHCP

(6 marks)

Answer Pointers

a) i) Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive,

understand, navigate, and interact with the Web, and that they can contribute to the Web. Web accessibility also benefits others, including older people with changing abilities due to aging.
ii) The Web is an increasingly important resource in many aspects of life: education, employment, government, commerce, health care, recreation, and more. It is essential that the Web be accessible in order to provide equal access and equal opportunity to people with disabilities. An accessible Web can also help people with disabilities more actively participate in society.
iii) 1.Images & animations: Use the alt attribute to describe the function of each visual.
2.Image maps. Use the client-side map and text for hotspots.
3.Multimedia. Provide captioning and transcripts of audio, and descriptions of video.
4.Hypertext links. Use text that makes sense when read out of context. For example, avoid "click here."
5.Page organization. Use headings, lists, and consistent structure. Use CSS for layout and style where possible.
6.Graphs & charts. Summarize or use the longdesc attribute.
7.Scripts, applets, & plug-ins. Provide alternative content in case active features are inaccessible or unsupported.
8.Frames. Use the noframes element and meaningful titles.
9.Tables. Make line-by-line reading sensible. Summarize.
10.Check your work. Validate. Use tools, checklist, and guidelines at http://www.w3.org/TR/WCAG

b) i) A web crawler is an automated program or script, which browses the World Wide Web in a methodical, automated manner in order to create an index of pages. It identifies the URLs in a page and adds them to a list of pages to visit.
ii) keywords, size of document, word length, title, headings.
iii)They may have a different weighting for the relative importance of the elements of the search terms. The indexes depend on the way that the web crawlers have searched the web, which will obviously differ from site to site. Some sites pay to have their site listed.

c) File transfer protocol is for transferring files over the Internet
Teletype network is used for remote login
Dynamic host configuration protocol is used for the dynamic allocation of network configuration information such as IP addresses, default gateway etc.

Examiners' Guidance Notes
This question was attempted by nearly all candidates of whom two-thirds passed. There was some misunderstanding of web accessibility and candidates wrote about Internet access methods and measures to increase speed. A worrying number of candidates did not understand the role of a web crawler. Some really believed that they only searched the web at the point of a user submitting a request. Part c) was generally well-answered, although a few candidates thought that telnet was associated with VoIP.

B4 a) What do the following terms stand for and what is the purpose of each?
i) XML
ii) XSLT

iii) PHP
iv) DOM

(8 Marks)

b) Identify the languages and standards used to produce a **static** website.
(2 marks)

c) Identify the languages and standards used to produce a **dynamic** website.
(4 marks)

d) How does an AJAX website differ from other types of dynamic websites?
(3 marks)

e) Identify the purpose of the following text and list the elements that make it up:
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
(8 marks)

Answer Pointers

a) i) Extensible Markup Language: A W3C specified markup language that enables the storage, deliver and processing of documents across the web.
ii) Extensible Stylesheet Language Transformations: A W3c specified language used to transform one XML document into another.
iii) PHP Hypertext preprocessor: An open scripting language designed to allow the creating of dynamic web pages, that can be used on both the client and server sides.
iv) Document Object Model: A W3C common interface/data model that allows different languages and platforms to process web documents and the elements they represent.

b) (X)HTML and CSS.

c) (X)HTML, CSS, Client-side scripting (e.g. JavaScript) and possibly server-side scripting (e.g. PHP) and database (e.g. MySQL).

d) Asynchronous JavaScript and XML website are usually highly interactive web applications that can update the presentation of part of a document without the need to refresh the entire document. AJAX websites achieve this by making us of the XMLHttpRequest object.

e) A Document Type Declaration associates the document it is declared within with a Document type Definition (DTD), to help ensure correct interpretation by a web browser or other processor.
root-element: !DOCTYPE html,
DTD type identifier: PUBLIC,
Formal Public Identifier: "-//W3C//DTD XHTML 1.0 Transitional//EN".
DTD uniform resource identifier:
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd"

Examiners' Guidance Notes

This question was attempted by approximately one-third of candidates and the majority struggled with it. While candidates were generally aware of XML and XSLT and to some

extent the DOM, they were less knowledgeable regarding the role of PHP. They also struggled to distinguish between static and dynamic websites, although many had a good awareness of the nature of AJAX-based websites, if not the underlying mechanisms. Few understood anatomy of the DOCTYPE tag.

B5 a) Identify **three** common Internet security risks and explain the measures that can be taken against each.

(9 marks)

b) In the context of Internet security:
   i) What does TLS mean and what is its purpose?
   ii) What does SSL mean and what is its purpose?
   iii) How do TLS and SSL relate to each other?

(6 marks)

c) In relation to Internet security and NAT:
   i) What does the term NAT stand for?
   ii) How might NAT help with Internet security?
   iii) How effective is NAT for Internet security?
   iv) What is network masquerading?
   v) What is Port forwarding?

(10 marks)

Answer Pointers

a) SPAM: SPAM filtering and brief description
Phishing: Phishing detection software and good user training and brief description
Virus: Anti-virus software and brief description

b) Transport Layer Security: Transport layer level cryptographic security system that allows secure private data communication across the web
Secure Sockets layer: Also, a Transport layer level cryptographic security system that allows secure private data communication across the web

The important points here is awareness that they are very similar and that TLS is an evolution based on SSL 3.0.

c) i) Network Address Translation
ii) By hiding the internal IP addresses of the nodes on a network and by restricting bi-directional communications from outside the network.
iii) Not particularly, they are not fundamentally intended for network security and are easily circumvented.
iv) A technique that hides a networks' address space behind a single IP address
v) A techniques that allows external network traffic to pass through a specified port to reach a specific node on the hidden internal network's address space.

Examiners' Guidance Notes

This question was attempted by approximately two-thirds of candidates of whom just over half passed. Candidates were well versed in Internet security risks and the measures that can be taken to reduce them. While some candidates were aware of SSL, most were unaware of what TLS was or of how the two relate to each other. Candidates were generally more knowledgeable as to what a NAT was but most overrated its role in security and only a few knew what masquerading and port forwarding were.

B6 a) i) What is domain name registration?
ii) Why is domain name registration required?
iii) What is the process for registering a domain name?

(6 marks)

b) In the context of website hosting, what is meant by the following:
i) Web hosting service;
ii) Reseller hosting;
iii) Dedicated hosting;
iv) Uptime; and
v) cPanel?

(10 marks)

c) A good quality hosting service would provide access to which languages and services?

(4 marks)

d) Consider the following XML markup:

```
1   <?xml version="1.0" encoding="ISO-8859-1"?>
2   <people>
3       <person>
4           <title>Mr</title>
5           <firstname>Bob</firstname>
6           <familyname>Dylan</familyname>
7           <year born>1941</year born>
8       </person>
9       <person>
10          <title>Ms</title>
11          <firstname>Ada<firstname>
12          <familyname>Lovelace</familyname>
13          <yearborn>1852</yearborn>
14      </person>
15  </People>
```

i) Identify **three** errors in the XML markup above.

ii) Add a field to store the “occupation” of each person (in the example markup this is “songwriter” and “computer programmer” respectively).

(5 marks)

Answer Pointers

a) i) The process of assigning a domain name to an owner,
ii) To controls ownership and provide websites with a more meaningful identifier,
iii) Identify desirable domain name that has not been taken and use a domain name registrar to purchase the domain name and assign it to you.

b) i) A service provided by a company that provides server space and services to allow an individual or organisation to place material on the Internet, typically a website,
ii) A Web hosting service that allows the customer to resell hosting services to others,
iii) A Web hosting service where the client is provided with a dedicated server and typically has full administrator access to the server,
iv) How long the server has been operating correctly for, a measure of service reliability,

v) A control panel a customer can use to managing many aspects of the hosted services.

c) e.g. Apache, IIS, Exchange, IMAP, POP3, MySQL, PHP, Java, etc.

d) i) Line 7: space between “year” and “born” in both tags
Line 11: missing “/” in closing tag
Line 1 and 15: mismatch between “people” and “People” due to lettercase
ii) <occupation>Songwriter</occupation>
<occupation>Computer Programmer</occupation>

Examiners’ Guidance Notes

This question was attempted by just under half of candidates. Candidates generally knew what domain registration referred to and the process for registering a domain but many did not understand the true purpose of domain name registration. Most candidates had a good understanding of web hosting in its various forms but were less confident regarding uptime and cPanel, although many still got these correct. Many understood the attributes of a good hosting service, although some students misinterpreted the use of the word “language” as which national language rather than web authoring language. Many candidates were strong on PHP authoring skills, which was interesting given they were uncertain regarding its role in question B4.a.iii.