THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 5 Diploma in IT

April 2008

EXAMINERS' REPORT

Internet & WWW

QUESTION 1

a)   http://www.bcs.org.uk/index.html is a typical URL. Define the acronym URL and explain the significance of the various elements in this example.

(5 marks)

b)   i)   Why are IP addresses central to the functioning of the Internet?

(2 marks)

ii)   Explain the difference between static and dynamic IP addresses and indicate when each is appropriate.

(4 marks)

iii)   *Network Address Translation* (NAT) is one solution to the shortage of IP addresses. Explain when it can be used and how it addresses the problem.

(4 marks)

iv)   State another solution to the shortage of IP addresses and briefly explain how it addresses the problem.

(2 marks)

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

(5 marks)

ii)   Give **three** reasons for DNS errors.

(3 marks)

Most candidates attempted this question and were generally successful. Some candidates confused the WWW with the more general Internet when they incorrectly referred to a URL pointing to a Web resource. Others confused IP addresses with URLs by suggesting that the former uniquely identified resources rather than computers and hardware. NAT and the operation of DNS were poorly understood.

Answer Pointers

a) Uniform resource locater is used to uniquely identify individual resources on the web. It consists of:
- Protocol
- Host computer
- Domain
- Country
- Document

b) i) IP addresses uniquely identify individual computers, printers and other hardware connected to the Internet.

ii) If a computer has a static address, it always has the same address and this facilitates the addressing of servers. Dynamic addresses are allocated from a pool when a computer connects by a DHCP server. This is more appropriate for more transitory connections.

iii) NAT is used on local networks which are connected to the Internet via a router. The router allocates a local address which is then translated to a public address. Multiple local networks can reuse the same local addresses thus easing the burden on IP addresses. The translation makes use of ports to allow the sharing of the public address.

iv) IPv6 brings a much bigger address space as it uses 128bits instead of the 32 bits of IPv4.

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.

QUESTION 2

a) i) Give **three** examples of the use of the client-server protocols on the internet.

(6 marks)

ii) Give three methods of making an Internet connection and for each method state when it would be appropriate and when it would be inappropriate.

(9 marks)

b) i) Electronic mail (e-mail) relies on a number of protocols to facilitate the sending, transfer and receiving of mail. State three such protocols and briefly describe their role.

(6 marks)

ii)   How does Webmail differ in the protocols that it uses?

(2 marks)

iii)   Why is the practise of operating an open mail relay frowned upon?

(2 marks)

Most candidates attempted this question which was generally well done. Some candidates incorrectly used TCP/IP as an example of a client – server protocol. Some candidates missed the point of part b) – they were not expected to write about the features of each connection method but to say when they were appropriate / inappropriate. Many suggested that ADSL was inappropriate for home use. The roles of the mail protocols were a mystery to some candidates. Many thought that IMAP was the protocol used in Webmail. Few understood the implications of an open mail relay.

Answer Pointers

a)   i)

Client	Server
Web browser	Web server
Email client	POP/IMAP/SMTP
FTP Client	FTP Server
News reader programme	News server etc.

ii)

Method	Appropriate	Inappropriate
Dialup	Remote areas with telephone line but too far for ADSL	If a fast connection is necessary e.g. VoIP
ADSL	For fast connections close to exchange	For light use where cost is a factor
Cable	For fast connections when service available	If area not cabled!
WiFi	For mobile applications	For static applications where other methods are available

b)   i)

Protocol	Role
SMTP	Sending and relaying
POP3	Retrieval
IMAP	Retrieval

ii)   Webmail uses HTTP between the web browser and the web server/ mail server for sending and receiving mail. SMTP will then be used for transmission in the normal way.

iii)   An open mail relay will allow spammers to send mail.

QUESTION 3

You are a member of a Web design team working on a website for an on-line retail organisation. The website provides potential customers with product information and has an interactive order form through which items can be purchased.

a)   Give six reasons why your team would want to evaluate the website before it is made live to customers on the Web.

(12 marks)

b)   In designing the order form, how might you arrange to reduce user interaction errors and what mechanisms might be incorporated to allow users to correct their errors when completing the form?

(13 marks)

Approximately half the candidates attempted this question. In part a) many candidates discussed security and validation, but not the general cycle of evaluation areas. In part b) few discussed methods of recovery and most limited their coverage to validation checks and use of form input types that were relevant to the data to be entered.

Answer Pointers

a)   Suggest improvements in design - better fit to tasks, environment and user preferences
Confirm it meets the functional and usability specifications
Compare alternative designs – early in the process
Ensure meets retailers needs
See it matches or exceeds competitor's site.
Ensure compliance with statutory requirements such as SENDA (UK) or 501 (USA).

b)   <u>Minimising Errors</u>
Reducing typing - select menus, radio buttons and checkboxes used where appropriate
Validation checks on input via scripting.
Clearly differentiate between 'essential' and 'optional' data elements.
Lay out form in clear & logical manner - group related items.
Instructions to help complete the form- brief but clear
Use common terms and be consistent.
Make field lengths conform to length of data (if fixed length)

<u>Error recovery approach</u>
On the form, have options to RESET the form or to point out the problem fields in a different colour or with an asterisk.
Provide messages eg. JavaScript alert boxes and on the status bar.

QUESTION 4

a)   What is an Internet firewall and what is it used for?

(4 marks)

b)   Give **five** forms of attack that web servers on the Internet are likely to face and for each a method of protection.

(10 marks)

c)   How can a demilitarized zone (DMZ) play a part in protecting an organisation's LAN and name the type of services that are located in the DMZ?

(5 marks)

d)   Many users assume that they are anonymous when using the Internet. Where are their records of usage likely to be stored?

(6 marks)

Two thirds of the candidates attempted this question.   In part a) few candidates scored the complete four marks, lacking the necessary detail.   Generally part b) was well attempted by all candidates but in c) few candidates described the part a DMZ plays in protecting an organisation's LAN or the services typically located there. Most candidates knew that the ISP retained details of sites visited.

Answer Pointers

a)   A firewall is a hardware or software device which is configured to permit, deny, or proxy data through a computer network which has different levels of trust. – source – Wikipedia

b)   Due to the fixed IP makes it is 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

c) The DMZ is a physical or logical subnetwork that contains an organization's external services to a larger, untrusted network, usually the Internet. The purpose of a DMZ is to add an additional layer of security to an organization's Local Area Network (LAN).
Generally, any service that is being provided to users in an external network should be placed in the DMZ. The most common of these services are web servers, mail servers, and DNS servers. In some situations, additional steps need to be taken to be able to provide secure services. - source – Wikipedia

d)
- Web servers maintain logs
- Spyware tracks usage
- ISP logs use

QUESTION FIVE

There is a range of formats to deliver text, graphics, sound, animation and video on the Internet.

a) What are the issues that need to be addressed when multimedia content is delivered on the Internet?

(9 marks)

b) Which file formats are you most likely to use for such delivery? Justify your choices.

(8 marks)

c) List appropriate authoring tools, that are widely available, to generate the file formats you mentioned in part (b).

(4 marks)

d) Define the terms *lossy* and *lossless* with respect to image compression.

(4 marks)

This question was attempted by most candidates and the majority passed. Many described the features of multimedia content rather than focussing on the issues they cause. Some misunderstood the role of authoring tools and quoted Adobe reader as one such tool.

Answer Pointers

a)   A likely breakdown of marks would be:

Issues such as:
- file size
- download times
- browser support

(9 marks)

b)   A wide range of formats could be mentioned as part of the answer.
Formats: (a selection from)
- GIF
- JPEG
- PNG
- FLASH / SHOCKWAVE
- WAV, MIDI,
- AVI, MOV
- PDF

(6 marks)

Justifications might include:
- Compact file size commensurate with quality of the artefact and reasonable download time

(2 marks)

(Total Marks: 8)

c)   For example in the Adobe range of tools there are:
- Acrobat
- Photoshop (bitmap) / Illustrator (vector)
- Flash
- Premiere / Final Cut / Movie Maker

Should not include the likes of FrontPage or Dreamweaver.

(4 marks)

d)   For still image the choice of:
- lossy means the file size can be reduced, but at the cost to quality.

- Lossless means that the image will be faithfully reproduced with no artifacts introduced, but the file size is likely to be larger.

(4 marks – 2 marks each)

QUESTION 6

a) Complete a table in the following format to show **three** benefits of having dynamic content and **three** benefits of having static content in a Website.

	Dynamic	Static
Benefit 1		
Benefit 2		
Benefit 3		

(**Hint**: Keep each listed benefit to a short sentence or point.)

(12 marks)

b) Describe the benefits of including a scripting language on the client's browser.

(6 marks)

c) What drawbacks are there in relying on client-side scripting?

(3 marks)

d) Describe the two ways that server-side scripts can accept information passed to them from a Web form.

(4 marks)

A small number of candidates discussed the connection to a database to serve information to the end user. Most candidates could see the benefits of maintenance for dynamic sites and a cheaper option to develop a static site. In part b) few candidates mentioned the ability to change the client Document Object Model that the HTML is a view of. Part c) was better understood compared to parts b) and d). Only a few candidates described the use of the "GET" and "POST" methods in part d).

Answer Pointers

a)

	Dynamic	Static
Benefit 1	Regularly updated and can be customized specifically for users	Pages that do not change unless the webmaster modifies the tags directly within the page
Benefit 2	Cheaper to maintain	Typically easier to develop
Benefit 3	Possibility to connect to use a relational database management system (RDBMS)	Suited to information of general nature

b) On client-side – Javascript/Jscript/VBScript offers embedding code that is visible to user in source and can manipulate the DOM objects. It can be used to verify data before the synchronous transmission to the server. This can save time in communication to the server and return to client.

c) Needs browser to have JavaScript functionality turned on
   May deal with interaction with DOM in different ways
   Debugging is difficult and poorly supported
   Password could be listed in client source.

d) "GET" means that form data is to be encoded (by a browser) into a URL and is for retrieving data. It is limited to 256 characters.
"POST" means that the form data is to appear within a message and may involve larger amounts of data.