BCS HIGHER EDUCATION QUALIFICATIONS
Level 5 Diploma in IT

March 2013

EXAMINERS' REPORT

Principles of Internet Technologies

General Comments
Some candidates are failing to use the marks allocation as a guide to how much to write, often spending too much time on simple parts of questions attracting one or two marks. Where expansions of terms were not known, many candidates resorted to making them up and then writing about their inventions – which is not a good use of time in an examination! Unfortunately this year a significant number of candidates demonstrated a lack of even general knowledge of the subject.

Section A

A1. **a)** Briefly state what each of the following languages are normally used for in relation to Web development?

i) JavaScript
ii) PHP
iii) Java
iv) Ruby on Rails
v) XML

(**5 marks)**

b) In relation to placing JavaScript code in an HTML page:

i) State the HTML markup to include an external JavaScript file.
(3 marks)

ii) State TWO advantages of keeping JavaScript code in an external file.
(2 marks)

c) Consider the following JavaScript code:

```
var days = [Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday];
var today = new Date().getDay();

for (var i=1; i<7; i++) {
    if (i = today) {
        document.write("Today is "  days[today]  "<br>");
    }
    else {
        document.write("Today is not "  days[today]  "<br>" );
    }
}
```

i) Identify FIVE types of errors in the code.
Note that each type of error may occur at more than one point in the code. This counts as a single error.
(5 marks)

ii) Explain the effect that each error would cause when the script is run.
(5 marks)

iii) Show what the corrected code would output.
(2 marks)

iv) Write JavaScript code to produce the following output:

```
Saturday
Friday
Thursday
Wednesday
Tuesday
Monday
Sunday
```

(3 marks)

Answer Pointers

a) i) JavaScript **- Client side scripting**

ii) PHP **- Server side scripting**

iii) Java **- Server side programming**

iv) Ruby on Rails **- Server side programming**

v) XML **- Data formatting/storage**

(**5 marks)**

b) i) Give an example line of markup to include an external JavaScript file.

- **`<script src="doStuff.js"></script>`**

(3 marks)

ii) State 2 advantages of keeping JavaScript code in an external file.

- **Reusable across websites**
- **Easier to maintain**

(2 marks)

c) i)

- **Quotes in array**
- **Loop counter**
- **assign in if condition**
- **no + in output statement**
- **today in else output**

Corrected Code:

```
var days = ["Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday"];
var today = new Date().getDay();

for (var i=0; i<7; i++) {
    if (i == today) {
        document.write("Today is " + days[today] + "<br>");
    }
    else {
        document.write("Today is not " + days[i] + "<br>" );
    }
}
```

(5 marks)

ii) Explain the effect that each error would cause when the script is run.

- **Quotes in array : will not run**
- **Loop counter: Will miss the first day**
- **assign in if condition: infinite loop**
- **no + in output statement: will no run**
- **today in else output: Always output Wednesday as the day**

(5 marks)

iii) Show what the corrected code would output.

(if today were Wednesday)

```
Today is not Sunday
Today is not Monday
Today is not Tuesday
Today is Wednesday
Today is not Thursday
Today is not Friday
Today is not Saturday
```

(2 marks)

iv) Write JavaScript code to produce the following output:

```
Saturday
Friday
Thursday
Wednesday
Tuesday
Monday
Sunday
```

```
var days = ["Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday"];
var today = new Date().getDay();

for (var i=6; i>=0; i--) {
        document.write(days[i] + "<br>");
}
```

(3 marks)

Examiners' Guidance Notes

Candidates tended to do quite well when answering part a of question A1, with the exception that only a few were aware of Ruby on Rails. Most also faired quite well on part b, although more so on point ii than point i, with reasons for maintaining external JavaScript files being quite well understood. However, most candidates did not do well in the JavaScript coding exercise in part c. Their understanding of what was wrong with the code and the effect the errors might cause was poor (points i and ii). Additionally, while most candidates seemed to understand that point iv centred around forming an appropriate for-loop, most were unable to complete this task correctly. Many candidates seem to have misinterpreted point iii, showing corrected JavaScript code rather than indicating the output for the same.

A2. **a)** In relation to image file formats used on the Web:

i) Briefly describe what the term *vector image* refers to and state a common vector image file format.

(2 marks)

ii) Briefly describe what the term *bitmap image* refers to and state a common bitmap image file format.

(2 marks)

iii) Briefly state TWO advantages of vector images over bitmapped images for displaying images on the Web.

(2 marks)

iv) Why is the Adobe Flash .swf file format becoming a less appropriate way of presenting graphical content on the Web?

(2 marks)

v) State an image file format best suited to presenting photographic images on the Web.

(1 mark)

vi) State an image file format best suited to presenting non-photographic images on the Web.

(1 mark)

b) In relation to audio and video data on the Web:

i) Outline what is meant by the term *streaming*.

(1 mark)

ii) Explain how streaming differs from downloading a file, stating ONE advantage and ONE disadvantage of streaming compared to downloading a file.

(3 marks)

iii) Outline what is meant by the term *podcasting*. Identify a suitable file format to use in audio podcasting.

(2 marks)

c) In relation to syndicating Web content:

i) What does the term RSS mean and outline the role that RSS plays?

(2 marks)

ii) Identify 2 benefits that can be had from using RSS, either for the provider or the consumer.

(2 marks)

iii) What does the term XML mean and outline the role that it plays in relation to RSS?

(2 marks)

iv) What does the `<channel>` element specify in an RSS file?

(1 mark)

v) What does the `<item>` element specify in an RSS file?

(1 mark)

vi) What does the `<enclosure>` element specify in an RSS file?

(1 mark)

Answer Pointers

a) i) Description of what a vector image is and SVG or similar.
(2 marks)

ii) Description of what a bitmap image is and PNG or similar.
(2 marks)

iii) Scalable
Efficient
(2 marks)

iv) Not supported by iOS and Android, and mobile is growing
Improving support for SVG, which is a W3C standard
(2 marks)

v) JPEG
(1 mark)

vi) PNG
(1 mark)

b) i) A brief description of streaming
(1 mark)

ii) Briefly describe downloading and highlighting differences
(1 mark)

Playback can start sooner
More control of file for provider…
(1 mark)

Needs a good connection while playing back
(1 mark)

iii) A brief description of podcasting
(1 mark)

MP3
(1 mark)

c) i) Really Simple Syndication
Used to push, or pull, Web content updates
(2 marks)

ii) Attract traffic to a website
Allows users to selectively view new and updated content
Removes unwanted content
(2 marks)

iii) eXtensible Markup Language
Used to specify RSS content
(2 marks)

iv) Specifies the RSS feed's title, description and URL
(1 mark)

v) Specifies items in an RSS feed, giving their title, description and URL
(1 mark)

vi) Specifies a media file that is enclosed in and RSS feed item, giving its type, length and URL
(1 mark)

Examiners' Guidance Notes

In answering part a, candidates had a very poor understanding of what a vector image was (point i) and their understanding of bitmap images (point ii) was not much better. Many of those candidates who showed an awareness of what a vector image was were then able to identify appropriate advantages in point iii. Most candidates did not show an awareness of the emerging incompatibility of Adobe Flash with many new platforms (point iv). More concerning, many were not able to correctly identify suitable file formats when answering points v and vi, which is a basic point of understanding in website development.

When answering part b, candidates generally had a good understanding of streaming and downloading and how each compared to the other. Podcasting was less well understood and, surprisingly, a suitable file format to use was not always correctly identified.

While a good proportion of the candidates showed some awareness of RSS and its use, many did not. The benefits of syndication were largely understood by those who had a general awareness of RSS but the specifics of the XML markup (points iv to vi) were only understood by a few candidates.

A3. **a)** What does CSS mean and what is the purpose of CSS?

(2 marks)

b) Name each of the 4 required parts of a CSS rule and very briefly state the purpose of each part.

(4 marks)

c) In relation to inserting CSS rules into an HTML file:

i) Identify the THREE ways in which CSS rules can be inserted.

(3 marks)

ii) State which is the preferred approach and why this is the case.

(2 marks)

d) Consider the following CSS markup:

```
<style>
  body
  {
    width: 400px;
    text-align: left;
  }
  h1
  {
    font-family: Helvetica, Arial, Sans-Serif;
    font-size: 16px;
    margin: 20px 10px 5px 10px
  }
  p
  {
    font-family: "Times New Roman", Georgia, Serif;
    font-size: 14px;
    margin: 10px 10px 20px 10px;
  }
</style>
```

i) Briefly state the purpose of each part of the above CSS and the effect each rule would have on any HTML it might be applied to.

(7 marks)

ii) Write a declaration for the `body` rule to set its background colour to white.

(1 mark)

iii) Write a declaration for the `h1` rule to set its text colour to `#226622`.

(1 mark)

iv) Write a declaration for the `p` rule to flush justify paragraph text.

(2 marks)

v) Write a CSS id selector called `firstParagraph` that reduces the top margin of a paragraph to 0px.

(2 marks)

vi) Write an HTML p tag that makes use of the id selector from part v) above.

(1 mark)

Answer Pointers

a)

- Cascading Style Sheets
- Specify the presentation of HTML and associated Web Content

(2 marks)

b)

- Selector, identifies the HTML tag to be styled
- Declaration, encapsulates Properties/values pairs
- Property, identifies the style attribute to be styled
- Value, specifies the value to set the Property to

(4 marks)

c) i)

- External Style Sheets
- Internal Style Sheets
- Inline Styles
- To Update the DOM without refreshing the document

(3 marks)

ii)

- External Style Sheets
- Full separation of content and presentation and reusable

(2 marks)

d) i)

- A clear understanding of the purpose and effect of each unique rule their elements and overarching structure.

(7 marks)

ii)

- `background-color: #ffffff;`

(1 mark)

iii)

- `color: #226622;`

(1 mark)

iv)

- `text-align:justify;`

(2 marks)

v)

- `#firstParagraph {margin: 0px 10px 10px 10px;}`

(2 marks)

vi)

- `<p id = "firstParagraph">`

(1 mark)

Example completed code:

```
<style>
  body
  {
    background-color: #ffffff;
    width: 400px;
    text-align: left;
  }
  h1
  {
    font-family: Helvetica, Arial, Sans-Serif;
```

```
    color: #226622;
    font-size: 16px;
    margin: 20px 10px 5px 10px
  }
  p
  {
    font-family: "Times New Roman", Georgia, Serif;
    font-size: 14px;
    text-align:justify;
    margin: 10px 10px 20px 10px;
  }
  #firstParagraph
  {
    margin: 0px 10px 10px 10px;
  }
</style>

<html>
      …
      <p id = "firstParagraph">
      …
</html>
```

Examiners' Guidance Notes

Candidates had a very good understanding of what CSS was and the purpose it serves (part a). They were also aware of the different methods of including CSS rules and the merits of using external files to do so (part c). Most were also able to explain the effects of the CSS markup provided (part d.i) and to offer new rules for the requested styles (part d.ii to d.vi), although many made errors in the property names and made up properties that were close instead. The weakest performance in answering this question was found in part b with very few candidates showing an awareness of the parts of a CSS rule. While it is accepted that the subtlety of the declarations being a composite of two of the other parts, and this was reflected in the marking, most candidates simply did not answer this part. When candidates did provide an answer it was often a description of the parts of a style tag instead of a CSS rule.

Section B

B4. **a)** Expand each of the following:

i) TCP
ii) IP
iii) NAT
iv) DNS
v) URL

(5 marks)

b) Write down an example of an IPv4 address. By using this example and considering the binary equivalent or otherwise, calculate the total number of distinct addresses possible under IPv4 addressing.

(4 marks)

c) Explain the role of ports in port-based (overloaded) NAT.

(3 marks)

d) What is the importance of NAT in the context of IPv4 addressing?

(3 marks)

e) Give an outline of the structure of DNS and explain briefly how it operates.

(5 marks)

f) Write down an example of an URL and explain its individual parts.

(5 marks)

Answer Pointers

a) i) TCP - transmission control protocol
ii) IP - Internet Protocol
iii) NAT – Network Address Translation
iv) DNS – Domain Name System
v) URL – Uniform resource locator

b) Anything with the format 0-255.0-255.0-255.0-255 e.g 196.123.0.5 This is an 8bit +8bit +8bit +8bit i.e. 32 bit address, therefore total number of addresses is 2^{32} or 4,294,967,296

c) Port-based (overloaded) NAT uses ports to identify clients on the internal private network. This allows multiple clients to share a single external IP address by changing the port numbers used in TCP and UDP messages.

d) With the expansion of the Internet, the IPv4 address space is becoming exhausted. NAT allows internal networks to share IP addresses.

e) Hierarchical (tree), worldwide-distributed structure. Address resolution, recursion and caching.

f) Technically, scheme://domain:port/path?query_string#fragment_id (SRC: W3C) but any answer which demonstrates the four parts protocol, domain, port and path will be considered equivalent.

Examiners' Guidance Notes

Part a) required the candidate only to expand the acronym. Many candidates wasted time by going on to explain the acronym but more careful reading of the question would have shown that this was unnecessary. DNS expands as Domain Name System but many wrongly expanded it as Domain Name Server. The correct term would be DNS server which would thus abbreviate to DNSS although this is not commonly used in this context. Answers to Part b) varied from totally correct to no understanding of binary digits (bits) and their manipulation. Few candidates were able to explain the role of ports in part c) but some did understand the benefit of reusing internal IP addresses in part d). Many cited the security aspects of NAT but this was entirely irrelevant to the question posed. Parts d & e should have been straightforward but an alarming number of candidates struggled to provide satisfactory answers.

B5. **a)** What do the following terms stand for and what is the purpose of each?

i) ADSL
ii) BBS
iii) DHCP
iv) IRC
v) MIME
vi) RFC

(12 marks)

b) Define and briefly explain the role of:

i) IANA
ii) ISOC
iii) IAB
iv) W3C

(8 marks)

c) Explain what is meant by:

i) a packet switched network; and
ii) a circuit switched network.

Which of these applies to the Internet?

(5 marks)

Answer Pointers

a) i) ADSL - Asymmetric Digital Subscriber Line – technology which allows broadband communication over ordinary copper telephone wires
ii) BBS - Bulletin Board System – an online meeting and communication system for discussion, file upload and download and announcements
iii) DHCP - Dynamic Host Configuration Protocol – a protocol for obtaining network configuration information from a server over a local network.
iv) IRC - Internet Relay Chat – an online multi-user, live chat facility
v) MIME - Multipurpose Internet Mail Extensions – initially a standard for defining the type of files attached to mail messages but now more widely used.
vi) RFC - Request For Comments - the process for creating standards on the Internet.

b) i) IANA - Internet Assigned Numbers Authority – oversees the global IP address allocation
ii) ISOC - Internet Society - "to assure the open development, evolution and use of the Internet for the benefit of all people throughout the world"
iii) IAB - Internet Architecture Board - oversight of the technical and engineering development of the Internet
iv) W3C - World Wide Web Consortium - develops standards for the WWW

c) i) A packet switched network is one where there is no single unbroken connection between sender and receiver. Information is broken into packets which are sent over various routes and reassembled at the destination. (2 marks)
ii) A circuit switched network is one where once the connection is made, that part of the network is dedicated to the single connection. (2 marks)
The Internet is packet switched. (1 mark).

Examiners' Guidance Notes

Parts a and b tested candidates' knowledge of terms and organisations which are core to a study of Internet Technology. Some candidates demonstrated that they lacked this core knowledge and therefore were ill-prepared to attempt this question. In part c some candidates displayed little basic knowledge of packet switched and circuit switched networks.

B6. **a)** **i)** What is Web accessibility as defined by the W3C?
(2 marks)

ii) Why is Web accessibility important?
(2 marks)

b) Explain, with the aid of an example, what is meant by client-server architecture.
(4 marks)

c) State TWO protocols used in the context of email and briefly outline their roles.
(4 marks)

d) **i)** Explain the role of ADSL in broadband Internet access.
(5 marks)

ii) What is "the local loop"?
(2 marks)

iii) What is local loop unbundling?
(2 marks)

e) Outline TWO communication technologies which allow high-speed Internet access through mobile devices such as smart phones.
(4 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.

b) Client/server architecture 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 e.g. www, email, ftp etc

c) Answers may include SMTP, POP3, IMAP etc.

d) i) Asymmetric Digital Subscriber Line (ADSL) is a digital technology for providing broadband internet access over a normal copper telephone line. It is significantly faster than conventional dial-up connection. At the exchange end it uses a Digital Subscriber Line Access Multiplexer (DSLAM). A splitter separates the broadband traffic from telephone traffic and the line may be used for telephone calls simultaneously. Speed is determined by line length and there is a maximum limit beyond which the technology will not operate.
ii) The local loop is a reference to the final connection to the customer, typically the copper telephone line between the exchange and the customer.
iii) Local loop unbundling is where multiple operators are allowed access to the local loop to provide their own services.

e) Possible technologies include:
The mobile phone network – outline will include the use of base stations, cells, and the various generations including WAP, EDGE, UMTS & HSPA+
WiFi outline will include hotspots, hardware inc wireless access points, infrastructure and range
WiMax - coverage of similar issues to the above.

Examiners' Guidance Notes

In part a some candidates missed the point about equal opportunities. Similarly in part b the word "relationship" was central to a simple answer and was frequently omitted. Part d i was worth 5 marks which could be gained by demonstrating a technical understanding of ADSL; "marketing speak" gained no marks.