BCS THE CHARTERED INSTITUTE FOR IT
BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT
March 2014

EXAMINERS REPORT
Principles of Internet Technologies

General Comments
Few candidates attempted more than one question from Section A. Answers covered a range of performance from excellent to poor, at times evidencing no awareness of some of the core concepts being examined. Answers often showed signs of students running out of time, which could suggest that some examination technique training might prove beneficial. The section was heavily practice centred, rather than recall, so perhaps this is at the root of why questions were not attempted as frequently as those in Section B. The mark allocation should provide a clear indication of how much to write but some candidates wrote several pages for relatively few marks. Other examples of questionable technique include illegible handwriting and answers to questions that differ from those asked.

Section A

A1. **a)** In relation to JavaScript, briefly state what each of the following terms refer to:

      i) Variable
      ii) Data type
      iii) Operator
      iv) Statement
      v) Function

(**5 marks**)

b) Consider the following JavaScript code:

```
function exampleFunction {

  var f = document.forms["myForm"]["email"].value
  var atpos = f.indexOf(@);
  var dotpos = f.lastIndexOf(".");

  if (atpos < 1 , dotpos < atpos+2 , dotpos+2 >= f.length)
    alert("invalid entry");
    return false;

}
```

      i) Identify EIGHT missing or incorrect characters in the code that will cause errors.

(**8 marks**)

      ii) State the intended purpose of the code.

(**2 marks**)

c) In relation to JavaScript:

   i) Write code for a JavaScript function that:
   - takes two integers as parameters,
   - sums all the numbers from the lowest of the parameters to the highest of the parameters. For example, if the parameters were 2 and 4 the result would be 9, that is 2+3+4=9),
   - the function should then return the value of the result.

   (6 marks)

   ii) Write JavaScript code for the function call that calls the above function and passes it two numbers.

   (**4 marks**)

Answer Pointers

a) i) to v) A brief statement correctly defining each term

(1 mark each = total 5 marks)

b) i)
```
function exampleCode() {

    var f = document.forms["myForm"]["email"].value;
    var atpos = f.indexOf("@");
    var dotpos = f.lastIndexOf(".");

    if (atpos < 1 || dotpos < atpos+2 || dotpos+2 >= f.length) {
      alert("invalid entry");
      return false;
    }

}
```

(1 mark for each error = 8 marks)

b) ii) To validate an email address entered into a form.

(2 marks)

(total 10 marks)

c) i)
```
<html>
  <head>

    <script>
      function addTwo(start, end) {
       var sum = 0;
        for (var i = start; i <= end; i++)
          sum += i;
        return sum;
      }
    </script>

  </head>
```

(6 marks)

c) ii)
```
<body onload="checkBrowserCompatibility()">
```

```
<script>
  var total;
  total = addTwo(2,4);
  alert(total);
</script>

  </body>
</html>
```

(4 marks)

**(total 10 marks)**

Examiners' Guidance Notes

Most students showed good awareness of the core concepts explored in part a) of this question and most were also able to go on to find the errors in part b). Fewer were able to write well formed code in response to part c), with most not showing good awareness of parameter passing. However, many who answered part c) well went on to provide a comprehensive response, exceeding what was anticipated in the sample answer.

A2. **a)** In relation to Cascading Style Sheets (CSS), briefly state what each of the following terms refer to:

    i)   Selector
    ii)   Property
    iii)   Value
    iv)   Id
    v)   Class

(**5 marks**)

    b) In relation to Cascading Style Sheets, consider the diagram below:
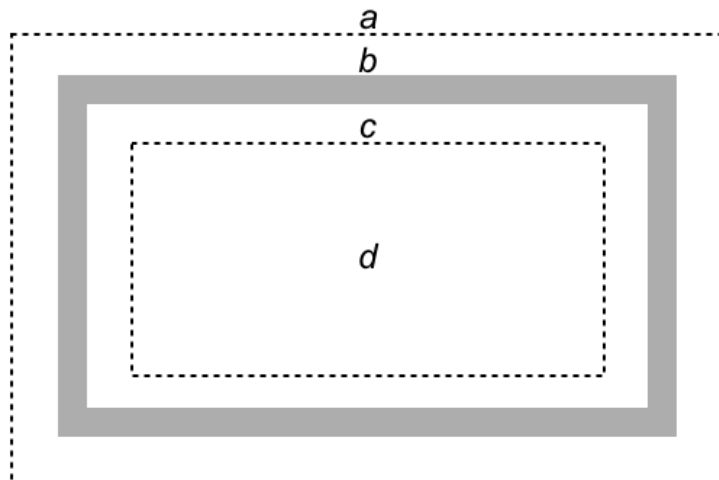
Provide correct labels for the elements of the diagram annotated *a*, *b*, *c* and *d* and identify this model and state what is represents.

(**5 marks**)

c) Consider the following CSS markup:

```
<style>

  body {
    width: 800px;
    text-align: left;
  }

  h1 {
    margin: 50px 50px 10px 50px;
    font-family: Helvetica, Arial, Sans-Serif;
    font-size: 16px;
    text-decoration:underline;
  }

  p {
    margin: 20px 50px;
    font-family: "Times New Roman", Georgia, Serif;
    font-size: 16px;
    text-indent: 50px;
    text-align: justify;
  }

  p.quote {
    margin: 0px 100px;
    font-family: "Courier New", Courier, monospace;
    font-size: 90%;
    text-indent: 0px;
    color: #2a2;
  }

</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.

(**8 marks**)

ii) Write HTML markup to demonstrate how each of the styles might be used.

(**3 marks**)

iii) Sketch how the HTML you have provided might be rendered in a browser, noting styles and spacing between elements on your diagram.

(**4 marks**)

Answer Pointers

a) i to v A brief statement correctly defining each term

(1 mark each = total 5 marks)

b)
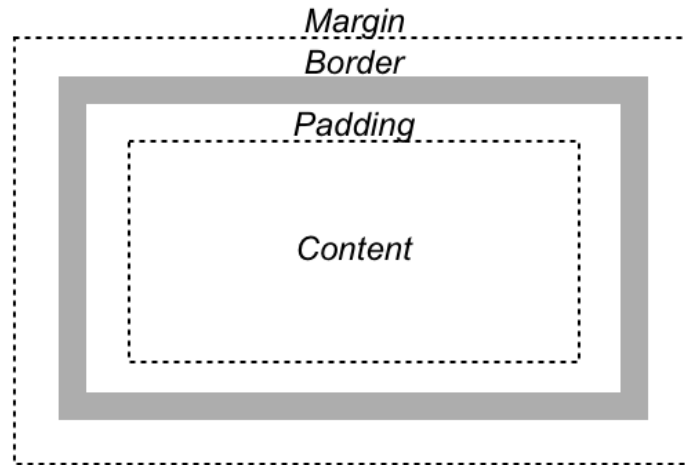
(4 marks)

b) CSS Box Model, illustrates relationships between margins, borders, padding and content.

(1 marks)

(total 5 marks)

c) i) A series of brief statements covering aspects to include the selectors used the properties effected and the values set.

(1 mark each = up to total 8 marks)

c) ii)
```
<body>

   <h1>
     Heading
   </h1>

   <p>
     Lorem ipsum dolor…
   </p>

   <p class="quote">
     Lorem ipsum dolor…
   </p>

</body>
```

(total 3 marks)

c) iii)

Heading

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. Donec pede justo, fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo. Nullam dictum felis eu pede mollis pretium. Integer tincidunt. Cras dapibus. Vivamus elementum semper nisi.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. Donec pede justo, fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo. Nullam dictum felis eu pede mollis pretium. Integer tincidunt. Cras dapibus. Vivamus elementum semper nisi.

With styles and spacing correctly annotated

(total 4 marks)

Examiners' Guidance Notes

This was the most popular question in Section A. However, most students did not attempt part b), which might suggest some absence of examination planning and carefully reading ahead. Part a) was generally well answered, which is reassuring given the core nature of the material considered. As noted, part b) was often not attempted and when it was the answer was almost always incorrect. Often students interpreted the diagram as a sketch of a rendered web page and labelled the lines as divs. A few students chose a more literal interpretation, labelling the parts as "dotted line, thick grey line" and so on. The CSS Box Model is a very fundamental concept and the diagram should be easily identifiable to anyone studying or working in the area. Most students gave informed and extensive responses to part c), although not all showed good awareness of the hierarchical/cascading nature of some aspects of the style sheet. Most were able to produce well formed markup, as requested in part c) ii) but few provided a well annotated sketch in response to c) iii).

A3. **a)** In relation to XML data modelling:

i) Model a *music* data source in XML:
- provide XML markup for the data source; and
- model the song *title*, *performer* and *duration* for each *song*; and
- provide XML markup for THREE example songs.

(7 marks)

ii) With reference to the XML markup you produced for a) i), what task might the following JavaScript statement perform and what data would it return:

```
getElementsByTagName("performer")[1].childNodes[1].nodeValue;
```

(3 marks)

b) In relation to the `XMLHTTPRequest`:

i) State what the `XMLHTTPRequest` stands for and briefly describe TWO examples of how it might be used in web authoring.

(**6 marks**)

ii) Identify and briefly describe THREE of the `XMLHTTPRequest` methods commonly supported by user agents that support the `XMLHTTPRequest` object.

(**9 marks**)

Answer Pointers

a) i)
```
<?xml version="1.0" encoding="ISO-8859-1"?>
<music >
  <song>
    <title>Deep Blue Day</title>
    <performer>Brian Eno</performer>
    <duration>3:59</duration>
  </song>
  …
</music>
```
(total 7 marks)

a) ii) Retrieves the data stored in the node *performer* at position *[1]* in the XML data source, the second entry as numbering starts as *0. Should also show the data stored at the correct position in their example XML markup*

(total 3 marks)

b) i) An appropriate description of the XMLHTTPREquest

(2 marks)

and descriptions of two examples that reflect the fact that it is used of in-page updating of webpage content.

(2 marks each)

(total 6 marks)

b) ii) Three from GET, POST, PUT, HEAD, OPTION and DELETE each with a brief description.

(3 marks each = total 9 marks)

Examiners' Guidance Notes

This was the least attempted question in Section A. For the most part was answered well, with most students showing good ability to form appropriate XML markup. Fewer understood the exact nature of the script in part a) ii) but many had a rough idea of its nature. Most students were able to provide a good description to part b) i), which is recall of core knowledge in the area. Fewer were able to state the methods referred to in b) ii) and fewer still could describe them.

Section B

B4. **a)** State what each of the following stands for AND briefly explain its purpose:

   i) TCP
   ii) IP
   iii) UPnP
   iv) SMTP
   v) DHCP

   (10 marks)

b) Explain the main reason for the introduction of IPv6.

   (3 marks)

c) What is the importance of NAT in the context of IPv4?

   (3 marks)

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

   (4 marks)

e) Explain the role of DNS in the operation of the Internet.

   (5 marks)

Answer Pointers

a)   i)   TCP - Transmission Control Protocol, breaks the data into packets using variable paths across LANs and the Internet and then recombines at the receiving end.
      ii)   IP - Internet Protocol, handles the actual routing of the packets.
      iii)   UPnP - Universal Plug and Play, allows devices to automatically connect with one another and work together over a network
      iv)   SMTP - Simple Mail Transfer Protocol, sending and transfer of email
      v)   DHCP – Dynamic Host Configuration Protocol, used for the network configuration of devices on a network

b) The main reason for the development of IPv6 is to deal with the problem of IPv4 address depletion arising from the growing number and types of devices connecting to the Internet. It uses 128 bit addressing compared to the 32 bit addressing of IPv4 allowing for 2^{128} addresses instead of 2^{32}.

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

d) 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 transitory connections.

e) Domain Name System performs address resolution. The system uses a hierarchy of local name servers, root domain servers and primary/secondary name servers.

Examiners' Guidance Notes

This popular question was frequently well answered. The terms in section a) were generally well understood with the exception of UPnP. It was expected that in section b) candidates would quote that IPv6 uses 128 bits in comparison to the 32 bits of IPv4. In section c) some candidates wrote about the security aspects of NAT which are unrelated to the main point about the reuse of internal IP addresses. In section d), some candidates confused static/dynamic IP addresses with static/dynamic routing. In section e) with five marks available, it was expected that candidates would provide detail of how DNS works rather than what is achieves.

B5. **a)** What do the following terms stand for?

 i) FTP
 ii) NTP
 iii) URL
 iv) HTML
 v) HTTPS
 vi) RFC

(6 marks)

 b) Define and briefly explain the role of:

 i) IETF
 ii) ISOC
 iii) NRO
 iv) W3C

(8 marks)

 c) Explain what is meant by dynamic routing and static routing. Which of these applies to the Internet?

(5 marks)

 d) Explain the role of a web crawler (spider).

(4 marks)

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

(2 marks)

Answer Pointers

a) i) FTP – File transfer protocol
 ii) NTP - Network Time Protocol
 iii) URL - Uniform resource locator
 iv) HTML - HyperText Markup Language
 v) HTTPS - Hypertext Transfer Protocol Secure
 vi) RFC - Request For Comments

b) i) IETF -– Internet Engineering Task Force develops and promotes Internet standards
    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) NRO - Number Resource Organisation - manages the allocation and registration of IP number resources
    iv) W3C - World Wide Web Consortium - develops standards for the WWW

c) i) 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. (2 marks)
    ii) In static routing, the routing table has specific paths to specific destinations which don't change according to network traffic. (2 marks)

    The Internet uses both methods. (1 mark).

d) 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.

e) 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.

Examiners' Guidance Notes
Another popular and generally well answered question. Section a) only required that candidates state what the terms stood for. Some candidates went far beyond the requirement and gave extensive explanations as well. These of course scored no extra marks and wasted time and effort. Few candidates were able to correctly identify the Number Resource Organisation in section b). In section c) some candidates confused static/dynamic routing with static/dynamic IP addresses and a worrying number incorrectly stated that dynamic routing required dynamic IP addressing. Whilst dynamic routing is the majority method found on the Internet, there are some networks which use static routing and therefore the correct answer is that the Internet uses both methods. In section d) some candidates incorrectly stated that a web crawler is invoked when the search term is entered thus demonstrating a fundamental misunderstanding of how search engines work.

B6. **a)** **i)** Explain, with the aid of an example, what is meant by client-server architecture.

(4 marks)

ii) State a protocol used in the context of the WWW and briefly outline its role.

(2 marks)

b) Explain, with the aid of an example, what is meant by peer-to-peer architecture.

(4 marks)

c) **i)** Explain the role of VDSL in broadband Internet access.

(5 marks)

ii) What is the main advantage of VDSL compared to ADSL?

(1 mark)

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

(4 marks)

e) Explain the ways in which Voice over IP (VoIP) and Video on Demand make different demands on the Internet infrastructure compared to conventional Internet applications such as email and web browsing.

(5 marks)

Answer Pointers

a) i) 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
ii) Expected answers include HTTP or HTTPS – the protocol for the exchange of hypertext (web pages) between web server and web browser.

b) Peer-peer architecture describes the relationship between equally privileged peers which are both suppliers and consumers of resources. Examples include file sharing and instant messaging.

c)

   i) Very High Bitrate Digital Subscriber Line is a development of ADSL to provide high speed Internet access over normal copper telephone lines and coaxial cable as used for cable TV. Performance degrades with increasing line length. Typically fibre optic cable is used between the exchange and roadside cabinet, known as FTTC (Fibre to the cabinet/curb).

   ii) Speed

d) 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.

e) Issues include:

Bandwidth/connection speed
Latency
Packet loss
QoS
Security

Examiners' Guidance Notes
Given the fundamental nature to the Internet of client – server architecture, some candidates had a very limited grasp of the concept and indeed that of peer-peer architecture. Few candidates could correctly explain VDSL with many believing that the V stood for virtual. In section d) many candidates wrote about the features and benefits of VoIP and VOD. Answers should have focussed on the technical differences between these and other Internet applications as reflected in the demands imposed on the Internet infrastructure.