BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

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PRINCIPLES OF INTERNET TECHNOLOGIES

EXAMINERS' REPORT

General Comments

Firstly, a gentle reminder that candidates must only use black and/or blue pen. Pencil is fine for diagrams, but it can fade. Red pen should not be used for any element of the exam. Please also remember to write which questions were answered on the front of the exam answer booklet.

There is evidence that candidates generally favoured questions from section B. This year, approximately two-thirds of candidates answered, all three questions from section B.

Past exam papers should be the starting point to exam preparation.

Section A
Answer Section A questions in Answer Book A

A1. Given the HTML Code

```
<form name="myform" onSubmit="calculateAverage();">

<p>
<label for="number1"> Input 1st mark here: </label>
<input type="text" size="10" name="number1"
id="number1"/>
</p>

<p>
<label for="number2"> Input 2nd mark here: </label>
<input type="text" size="10" name="number2"
id="number2"/>
</p>

<p>
<label for="number3"> Input 3rd mark here: </label>
<input type="text" size="10" name="number3"
id="number3"/>
</p>

<input type="submit" value="Calculate"/>

</form>
```

a) Write a JavaScript function `calculateAverage()`, that will:

- read three numbers in from the HTML form as marks
- output the total mark
- output the average of the three marks.

The average mark must be output as a real number.

(15 marks)

b) Why is JavaScript validation regarded as a potential security risk?

(4 marks)

c) What measures and technologies could be put in place to mitigate this potential security risk?

(6 marks)

Answer pointers

a)

```
var mark1=document.myform.number1.value;
```
(2 marks)

```
var mark2=document.myform.number2.value;
```
(2 marks)

```
var mark3=document.myform.number3.value;
```
(2 marks)

```
var theTotal =
parseFloat(mark1)+parseFloat(mark2)+parseFloat(mark3);
```
(2 marks)

```
var theAverage = parseFloat(theTotal/3);
```
(2 marks)

```
window.alert("The total mark is: "+ theTotal + " and the
average is: "+ theAverage);
```
(2 marks)

(15 marks total)

b) JavaScript can be overridden or bypassed in the browser and then malicious data can be sent into your system (SQL Injection attacks for example).
(4 marks)

c) Must allow for server-side validation as well as client side (JavaScript). Server-side validation is very secure but does not lend itself well to a good user experience whereas client-side does. Server side technologies could include asp.net or PHP.
(6 marks)

A1 Examiner's Guidance Notes

This was the least attempted question in Section A. Those who did answer it, received higher marks when compared to Questions A2 and A3.
There is evidence in part (a) that most students understood how to read in a values into variables, perform a calculation with them, and output the results. But candidates need to be aware of the differences between whole numbers and real numbers. In parts (b) and (c), there were weak answers.

A2. **a)** Describe how CSS allows separation of content and presentation for web pages?
(4 marks)

b) Describe a CSS rule, and what it consists of.
Give an example to support your answer.
(7 marks)

c) What are modules in CSS3?

(4 marks)

d) Describe TWO **disadvantages** of using CSS, from a designer's perspective.

(4 marks)

e) What does the **Cascading** in CSS refer to?

(4 marks)

f) Where on an HTML page should a reference to an external CSS be placed?

(2 marks)

Answer pointers

a) Content can be defined on the HTML document and styled by CSS in a separate file.

(4 marks)

b) It's a statement that tells your browser how to render particular elements on a HTML page.

(2 marks)

It consists of a selector (selects the elements) and a declaration block (where you layout your rules and contains a property and a value).

(4 marks)

```
body {color: red};
selector – declaration block
```

(1 mark)
(7 marks total)

c) Modules in CSS3 are various sections of CSS2 split into their own specifications.

(4 marks)

d) Different browsers interpret CSS differently – this has to be taken into account.

(2 marks)

CSS has different levels – can be confusing.

(2 marks)
(4 marks total)

e) It refers to the cascading order in the HTML page. CSS is sorted into order and the most specific rule is chosen (cascading down).

(4 marks)

f) In between the <head> tags

(2 marks)

A2 Examiner's Guidance Notes.

The most attempted question by far in this section however the evidence shows that overall it was not answered well. General theory about CSS was repeated without an acknowledgement of what was being asked for in all parts of the question. Candidates would benefit from research into CSS theory.

A3. **a)** What problem might be present with the DOM if jQuery is executed too early?

(2 marks)

b) How could this be avoided? Provide sample JavaScript code to support your answer.

(4 marks)

c) What is the difference between **well-formed** XML and **valid** XML?

(4 marks)

d) In relation to **XML Data Modelling**:

- model a data source intended for a bank
- model the account number, customer name, customer email address for each bank account that is to be held in the bank
- provide XML mark-up for a bank account

(10 marks)

e) What does **SOAP** stand for and how is it used with XML?

(5 marks)

Answer pointers

a) If you execute your jQuery code too early, then the DOM may not have loaded the elements you're referring to in your scripts. So errors may occur.

(2 marks)

b) To postpone the execution of your code until the DOM is ready, we use the ready function.

```
$(document).ready(function() {
//code added here is executed when the DOM is ready
});
```

(4 marks)

c) Well-formed XML is a document with correct syntax

(2 marks)

An XML document validated against a DTD (Document Type Definition) is 'valid' (and well-formed)

(2 marks)
(4 marks total)

d)
```
<?xml version="1.0" encoding="UTF-8"?>
<bank>
     <account>
          <name>Bob Smith</name>
               <accountnumber>123</accountnumber>
               <email>b.smith@testmailUK.com</email>
     </account>
</bank>
```

(10 marks)

e) SOAP is Simple Object Access Protocol. It is an XML-based messaging protocol for exchanging information among computers.

(5 marks)

A3 Examiner's Guidance Notes.

The second most attempted question in Section A. The evidence shows that candidates tended to answer part (d) extremely well. However, there were weaker answers for parts (a) and (b). In part (c), demonstration of a broad understanding of what XML was shown but most candidates did not differentiate between well-formed XML and valid XML. In regard to part (e), a better understanding of what SOAP is needs to be demonstrated.

Section B

Answer Section B questions in Answer Book B

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

i) DNS
ii) UDP
iii) ARP
iv) IP
v) DHCP
vi) SMTP

(6 marks)

b) Map the six protocols given in part a) above to the layers of the TCP/IP model.

(6 marks)

c) TCP is described as a connection-oriented protocol.

i) Expand the acronym TCP.

(1 mark)

ii) What is meant by the term **connection-oriented** in reference to TCP?

(2 marks)

iii) Draw a diagram that illustrates how TCP establishes a connection between a client and server. You must demonstrate the **three-way handshake** in your answer.

(6 marks)

d) Briefly describe the role of **DNS** in the operation of the Internet. A diagram may be helpful.

(4 marks)

Answer Pointers

a) i) DNS - Domain Name System
ii) UDP - User Datagram Protocol
iii) ARP - Address Resolution Protocol
iv) IP - Internet Protocol
v) DHCP - Dynamic Host Configuration Protocol
vi) SMTP - Simple Mail Transfer Protocol

(6 marks)

b)

Protocol	TCP/IP Layer
DNS	Application Layer

UDP	Transport Layer
ARP	Internet Layer
IP	Internet layer
DHCP	Application Layer
SMTP	Application Layer

(6 marks)

c) i) Transmission Control Protocol

(1 marks)

ii) A connection is established beforehand

(2 marks)

iii) A suitable and well labelled diagram that shows SYN, SYN-ACK and ACK between the client and server.
For full marks client (closed->syn-sent->established) and server state (closed->listen->syn-received->established) must also be shown.

(6 marks)

e) DNS – Domain Name System – A suitable explanation or diagram about DNS. An answer that will get top marks will point out worldwide distributed structure, address resolution, recursion and caching.

(4 marks)

B4 Examiners' Guidance Notes

This was the most well answered question in section B.
The evidence shows that parts a) and b) were generally well answered, with many candidates scoring at least 10 marks for these two parts. Candidates would benefit from demonstrating better knowledge of common protocols and how they map to the layers of the TCP/IP model.
Part c) was split in terms of answers. Some candidates answered this part exceptionally well, and provided excellent diagrams illustrating the three-way handshake. Some candidates who attempted part c) (iii) drew a classic 'client-server' architecture diagram, which isn't what this question was asking for.
Part d) is tested relatively frequently, yet many candidates failed to obtain more than a couple of marks for it. Some candidates who had a clear understanding and drew exceptionally good diagrams received high marks.

B5. a) Expand the acronym **HTTP.**

(1 mark)

b) Briefly explain the difference between **HTTP** and **HTTPS.**

(2 marks)

c) HTTP is described as a **stateless** protocol. In this context:

i) Define what stateless means.

(1 marks)

ii) Provide THREE examples of how a web application maintains state given that HTTP is stateless.

(4 marks)

d) Briefly describe what each of the following HTTP status codes represent, and why such a status code may be returned.

i) 404
ii) 200
iii) 403
iv) 500
v) 401

(10 marks)

e) Read the following simplified HTTP response header, then answer the following questions

```
HTTP/1.1 200
Date: Mon, 02 Apr 2018 13:23:19 GMT
Server: Apache/1.3.29
Last-Modified: Sat, 31 Mar 2018
Content-Length: 38
Content-Type: text/html

<h1>BCS</h1>
<p>Welcome to the BCS</p>
```

i) Briefly explain what the **Content-Length** field represents?
ii) What is the **protocol and status code** of this HTTP response header?
iii) The **Content-Type** field in this header is **text/html**. What would the header be if a portable network graphics image was the Content-Type?
iv) A web browser made the request that generated this response. What would be displayed by the browser?

(8 marks)

Answer Pointers

a) HyperText Transfer Protocol

(1 mark)

b) HTTPS (Hypertext Transfer Protocol Secure) transmits data securely in conjunction with TLS on TCP port 443, whereas HTTP is not secured and transmit over TCP port 80

(2 marks)

c) HTTP is stateless as the connection between the server and client is lost once the transaction finishes. State is maintained by, for example, using server side

sessions, HTTP cookies, encodes URLs, databases and programming variables

(4 marks)

d)

Status Code	Meaning	Reason
404	Not Found	Server is unable to find the requested file/resource
200	OK	Request successful (OK)
403	Forbidden	User does not have sufficient permission to access the requested resource
500	Internal Server Error	Generic error that means the server was unable to process the request for whatever reason
401	Unauthorized	The resource that was requested cannot be accessed because the user has not or cannot authenticate themselves.

(10 marks)

e) i) Content-Length: The number of bytes the body of the request is. In this instance, 38 bytes.

ii) HTTP/1.1 200

iii) image/png

iv) A header (H1) that says “BCS” and a paragraph (p) that says “Welcome to the BCS”

(8 marks)

B5 Examiners’ Guidance Notes

Approximately three-quarters of candidates attempted this question.

There is evidence that parts a) and b) tested rudimentary knowledge and most candidates scored full marks for these parts.
Part c) was answered weakly by many candidates. ‘Statelessness’ is a fundamental concept surrounding HTTP.

Part d) was not answered particularly well. The status codes are extremely common and many candidates did not demonstrate knowledge of 404 (not found).
Part e) was answered acceptably, with many candidates getting at least some marks. Part iv) was particularly well answered as was part ii).

B6. a) Explain the difference between a **packet switched** and a **circuit switched** network. In your answer, state which type applies to the Internet.

(5 marks)

b) **Internet Protocol** (IP) is the main protocol that operates on the Network Layer. One of the fields within the IPv6 header is 'hop limit'.

i) Describe the reasons for including the **hop limit** field in the IPv6 header.
In your answer, include examples of where this field is put to effective use by network administrators for network diagnostics.
(6 marks)

ii) In the **IPv4** header, the **hop limit** field is called **TTL**. Describe what TTL stands for, and why the designers of **IPv6** renamed this field?
(2 marks)

c) Compare and contrast **IPv4** and **IPv6**.
(6 marks)

d) Explain the importance of **NAT**, and the role it plays in the context of **IPv4** addressing.
(4 marks)

e) Provide an example of a **private IPv4** address.
(2 marks)

Answer Pointers

a) 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.

A circuit switched network is one where once the connection is made, that part of the network is dedicated to the single connection.

The Internet is packet switched.
(5 marks)

b) i) The hop field is an 8 bit field that is decremented by 1 each time the packet is forwarded through a network node (e.g. a router). When the hop field reaches zero, the packet is discarded. Hop limit is useful to an administrator because it may help identify a broken node. Hop limits are used in network administrative tools, such as traceroute.
(6 marks)

ii) TTL = Time To Live.
Theoretically, in IPv4, this field was meant to be measured in seconds. However, every node the packet went through decremented the TTL field. So in IPv6, the name changed to hop limit to reflect what was actually happening.

(2 marks)

c) There are many points that can be made, such as address length, address structure, header fields, IPSec. Any reasonable, justified point is good for a mark.

(6 marks)

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

(4 marks)

e) Any address that falls between these ranges: 10.0.0.0 – 10.255.255.255; 172.16.0.0 – 172.31.255.255; 192.168.0.0 – 192.168.255.255

(2 marks)

B6 Examiners' Guidance Notes

This question covered core material which has been examined in previous papers.

The evidence shows that part a) was well answered with many candidates scoring top marks.
Part b) however was not well answered. Answers need to be well established.
Answers to Part c) were disappointing given that it is a core area. Many, candidates only provided the difference in the address spaces that would only gain a few marks.
Part d) was answered well by many candidates, with some producing an excellent diagram which demonstrated their understanding.
In Part e) many candidates correctly identified a **private** IPv4 address, but some misread the question.