2910110 Introduction to computing and the internet

Examination paper: Zone B

Time allowed: three hours

This paper is in two parts, Part A and Part B. There are a total of three questions in each part. **You should answer TWO from Part A and TWO from Part B**. Your answers to Part A and Part B should be written in separate answer books.

Full marks will be awarded for complete answers to a total of four questions, two from Part A and two from Part B. There are 100 marks available on this paper.

A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics, text or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

PART A: answer TWO questions from this section

QUESTION 1

(a) What is the difference between latches and flip-flops?

[5 Marks]

(b) (i) Describe briefly instruction pipelining and explain how it works. Discuss the difference between parallel computing based on multi-processor and pipelining architectures.

(ii) Referring to pipelining, discuss what is meant by the so-called hazards. Describe two distinct types of hazards.

(iii) Describe branch prediction and explain why it is important with respect to a pipelined execution of programs.

[10 Marks]

(c) Suppose that we have a decoder with 10 address lines. How many address cells can be generated? Consider both cases when multiplexed addresses and non-multiplexed addresses are used.

[5 Marks]

(d) What advantages does DMA give over interrupt-driven I/O?

[5 Marks]

QUESTION 2

(a) (i) State three notations that can be used to represent negative integers?

(ii) Use these three notations to represent −25.

(iii) State the advantages and disadvantages of each.

[14 Marks]

(b) The following bit pattern represents a single precision floating point number with an 8-bit exponent (with a bias of 127) and a normalised 23-bit Significand (mantissa) conforming to IEEE 754.

1	10000100	1010 0000 0000 0000 0000 000

Calculate the decimal number this represents. Your answer should include all of your workings.

[6 Marks]

(c) A computer monitor displays 800 lines of 1000 pixels. Each pixel needs 4 bytes to represent its colour and intensity.

(i) How many Megabytes of memory are needed to hold one full screen image?

(ii) A full screen movie with no compression requires 30 images to be displayed each second. How many Gigabytes of data are needed for a movie that is 1 hour and 40 minutes long?

[5 Marks]

QUESTION 3

(a) (i) What is the difference between I/O bound processes and CPU bound processes? Explain how a mixture of both maximises the system utilisation.

(ii) Suppose two processes enter the ready queue with the following properties:

Process 1 has a total of 8 units of work to perform, but after every 2 units of work, it must perform 1 unit of I/O (So the completion time of this process is 12 units. Assume that there is no work to be done following the last I/O operation. **Process 2** has a total of 20 units of work to perform. This process arrives just behind P_1.

Show the resulting schedule for the shortest-job-first (preemptive) and the round-robin algorithms. Assume a time slice of 4 units for RR. What is the completion time of each process under each algorithm?

[13 Marks]

Part B: Answer TWO questions from this section.

Question 4

(a) (i) What are the essential differences between a **network**, an **internet** and the **Internet**?

(ii) Briefly describe the following basic LAN topologies:

star/hub

bus

token ring

(iii) What factors may prevent LAN architectures from scaling up to serve more than a localised domain?

[8 marks]

(b) (i) Briefly describe the 4 layers of the TCP/IP reference model and compare it with the OSI model.

(ii) Explain the difference between **connection-oriented** and **connectionless** protocols.

(iii) Which of the following are connection-oriented and which connectionless?

IP (Internet Protocol)

TCP (Transmission Control Protocol)

UDP (User Datagram Protocol)

[8 marks]

(c) (i) What is meant by **routing** in the context of the Internet? What is the difference between **static** and **dynamic** routing?

(ii) Identify the network and host portions of the following IP addresses, assuming the class-based addressing scheme. Justify your answer.

198.83.178.11

129.218.128.43

[9 marks]

Question 5

(a) (i) Consider the following web page which employs both internal and external style sheets, and an inline style attribute. How will the four lines of this poem appear in a CSS-compliant brower?

```
<html>

<head>
<title>Tyger</title>
<link rel = "stylesheet" type = "text/css" href = "tyger.css" />
<style type = "text/css">
div {font-family:arial;color:red;margin:20px 50px;}
div.emph {font-style:italic;}
div.bold {font-weight:bold;font-size:20px;}
div.gothic {font-family:"Copperplate Gothic Bold";margin:50px 100px
div.blue {background-color:yellow;}

</style>
</head>

<body>
<div class = "emph">Tyger, tyger burning bright</div>
<div class = "bold" style = "margin:10px 20px 0px;">
In the forests of the night</div>
<div class = "emph bold">What immortal hand or eye</div>
<div class = "gothic blue" style = "font-size:24px;">
Dare frame thy fearful symmetry?</div>
</body>

</html>
```

Example web page

```
div {font-size:16px;font-family:Courier;}
div.blue {border-style:solid;color:blue;background-color:aqua;}
```

Style sheet tyger.css

(ii) Discuss the relative merits of HTML tables and CSS positioning in laying out web pages.

[10 marks]

(b) (i) List the main rules that have to be followed for a web document to conform to XHTML standards.

(ii) What is meant by **deprecated** tags in HTML and XHTML? Why are they deprecated, and by whom?

[7 marks]

(c) (i) Explain the terms **client** and **server** in the context of networked computing.

(ii) Describe examples of client-side and server-side technologies for generating dynamic web pages.

(iii) In a typical web-based e-commerce transaction, what functions are suitable for client-side processing and which for the server-side?

[8 marks]

Question 6

(a) What are the essential differences between copyright and patent in UK law and what implications do they have with regard to

(i) computer programs?

(ii) emails?

(iii) webpages?

[7 marks]

(b) (i) Summarise the main restrictions placed on access to computer data by the Computer Misuse Act and the Data Protection Act.

(ii) Are there cases where a server may legitimately cause files to be modified or programs executed on a client's machine without the client's explicit permission for that particular operation? Justify your answer giving examples.

[9 marks]

(c) (i) List three possible symptoms indicating virus infection of a computer system.

(ii) Describe some techniques that can protect computers from virus infection under each of the following headings:

- Built-in features of computer hardware or operating systems
- Anti-virus software
- Other security-related technologies

[9 marks]