291 0110W

UNIVERSITY OF LONDON

FOR EXTERNAL STUDENTS — WESTERN

B. Sc. and Diploma Examination 2005

COMPUTING AND INFORMATION SYSTEMS

CIS110 Introduction to Computing and the Internet

Duration: 3 hours

Date and time: Tuesday, 24 May 2005 : 10.00 - 1.00 pm

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 questions from Part A and two questions 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. Each question carries 25 marks. The marks for each part of a question are indicated at the end of the part in [.] brackets.

There are 100 marks available on this paper.

Electronic calculators must not be programmed prior to the examination. Calculators which display graphics, text or algebraic equations are not allowed.

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

PART A: answer TWO questions from this section

QUESTION 1

(a) What is the difference between the word size and cell size in computing?

[5 Marks]

(b) To keep track of memory addresses, instructions and data to be operated on, the central processing unit (CPU) contains a number of registers. Explain the role of the following registers:

(i) Memory Address Register (MAR)

(ii) Memory Buffer Register (MBR)

(iii) Instruction Register (IR).

[3 Marks]

(c) One of the main functions of Operating Systems is memory management. Explain the concepts of swapping, simple paging and demand paging, and list their advantages and disadvantages.

[10 Marks]

(d) Suppose that a computer's main memory has 1015 cells.

(i) How many address lines are needed in order for all the cells to be useable? Explain your answer.

(ii) What would be the number of address lines needed if multiplexed addresses are used?

[7 Marks]

QUESTION 2

(a) Signed magnitude and excess notation are two representations used to represent signed integers. Describe and state the advantages and disadvantages of each one of the two notations.

[8 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 significant (mantissa) conforming to IEEE 754.

1 | 10000011 | 1010 0000 0000 0000 0000 000

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

[6 Marks]

(c) The fractional part of a decimal can be converted to binary by repeated multiplication by 2, where at each stage the digit(1 or 0) to the left of the decimal point is appended to the right of the binary number that is represented.

(i) Represent the decimal value +0.8 in a binary **floating point** representation with 1-bit sign, 4-bit biased exponent (bias 7) with a base 2, and 6-bit normalised significand (mantissa).

(ii) Convert the value represented back to decimal.

(iii) Calculate the relative error of the representation by subtracting the value of the floating point approximation from +0.8, and dividing the result by +0.8.

[11 Marks]

QUESTION 3

(a) An instruction word consists of an Op-Code part and Operand part. Explain what each of these is for.

[2 Marks]

(b) Describe the concept of pipelining. What are the advantages of using pipelines?

[3 Marks]

(c) Suppose that in a computer the fetch-execute cycle is further decomposed into 6 stages.

(i) How many time units will 10 instructions take without pipelining?

(ii) How many time units will 10 instructions take if pipelining is used? Explain your answer.

[8 Marks]

(d) I/O devices are connected to the system bus through I/O modules.

(i) What are the advantages of I/O modules?

(ii) Explain the concepts of Interrupt-driven I/O and Direct Memory Access (DMA).

(iii) Why is Direct Memory Access (DMA) more efficient than Interrupt-Driven I/O?

[12 Marks]

PART B: answer TWO questions from this section.

Question 4

(a) Describe the *client-server* model in the context of internet computing. Give two examples of server applications and two examples of clients.

[6]

(b) What are the important differences between the most commonly used email protocols? How does email software handle attachments with different file types?

[7]

(c) (i) Most current web browsers are fairly tolerant of HTML coding errors, omissions and unrecognised tags. Explain why this situation may be considered undesirable, and why XHTML is now being promoted as a standard language for web documents.

(ii) What changes need to be made to the following HTML document in order for it to conform to the XHTML standard?

```
<Html>
<Head> <Title>Film Directors</Title></Head>
<H1>Some facts about movie directors</H1>
<dl>
<dt><b>Martin Scorsese</b>
<dd>First film was <i><b>Mean Streets</b></i>
starring Harvey Keitel and Robert de Niro.
<dt><b>Sergio Leone</b>
<dd>Originator of the <i></b>spaghetti western</i></b>.
Famous for close-ups.
<dt><b>Fritz Lang</b>
<dd>Born in Austria.  Emigrated to US in the 1930s.<br>
Directed little-known silent epic <i><b>Die Nibelungen</b></i>.
</dl>
<p> For more information see the Internet Movie Database.
```

[12]

Question 5

(a) Explain the difference between:

(i) An internet and the Internet

(ii) The Internet and the World Wide Web

(iii) Connection-oriented and connectionless protocols

[6]

(b) (i) Explain the concept of *layering* in networked computing. How are *headers* used to implement layering in TCP/IP?

(ii) Which TCP/IP layers do the following protocols belong to? Briefly state the functions defined for each protocol, for instance *DHCP: Internet layer protocol for automatically assigning IP addresses and other parameters to host computers.*

- HTTP
- TCP
- DNS
- ICMP

[7]

(c) (i) Explain how the following addresses identify a particular network, host computer and application.

i. `18.7.22.83:80`

ii. `172.20.149.22:143`

(ii) Why do many experts claim that the Internet is in imminent danger of running out of addresses?

What techniques have been implemented or proposed to alleviate this problem?

[12]

Question 6

(a) Explain **four** of the following terms in the context of data protection: *data subject*, *data controller*, *data processor*, *subject access*, *sensitive personal data*.

[8]

(b) List three ways in which a computer virus can enter a computer system. Describe two techniques used by anti-virus software to identify malicious code.

[7]

(c) Do you think it is acceptable for companies to monitor the content of their employees' email? Discuss arguments for and against.

[10]