UNIVERSITY OF LONDON 291 0110 ZB

FOR EXTERNAL STUDENTS (Eastern)

BSc/Diploma Examination

COMPUTING AND INFORMATION SYSTEMS AND CREATIVE COMPUTING

CIS110 Introduction to computing and the Internet

Duration: 3 hours

Date and time: Monday 12 May 2008 : 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 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.

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

PART A: Answer TWO questions from this section

QUESTION 1

Multiple choice question:

This question consists of 25 multiple choice sub-questions, worth 1 mark each. Please put your answers on the answer sheet provided. **Only one answer from each question is correct**

(a) The abbreviation CISC means

(i) Complex Instruction Set Computing

(ii) Complex Interrupt System Computing

(iii) Complete Instruction System Configuration

(b) Which of the following is generally considered a distinguishing characteristic of CISC machines?

(i) fewer instructions than RISC machines

(ii) fixed-length instructions

(iii) small code sizes

(c) The key characteristic of CISC machines is

(i) less complex, simple instructions.

(ii) single-length instructions

(iii) relatively few registers

(d) Which of the following is **not** generally considered a distinguishing characteristic of CISC machines?

(i) variable-length instructions

(ii) memory access is only through explicit operations: LOAD and STORE

(iii) heavily microprogrammed implementations

(e) CPU registers have

(i) slower speed and a bigger memory size than the cache memory

(ii) a faster speed and a bigger memory size than the main memory

(iii) a faster and a smaller memory size than the main memory

(f) Cache memory

(i) has less capacity than RAM

(ii) is faster to access than CPU registers

(iii) is slower to access than DRAM

(question continues on next page)

(g) A machine cycle refers to

(i) fetching an instruction
(ii) executing an instruction
(iii) fetching, decoding and executing an instruction

(h) The memory address register is used to store

(i) data to be transferred to memory
(ii) data that has been transferred from memory
(iii) the address of a memory location

(i) The memory data register is used to store

(i) data to be transferred to or from memory
(ii) the address of a memory location
(iii) an instruction that has been transferred from memory

(j) The instruction register stores

(i) an instruction that has been decoded
(ii) an instruction that has been fetched from memory
(iii) the address of the next instruction to be executed

(k) The program counter stores

(i) the next instruction to be executed
(ii) the address of the next instruction to be executed
(iii) the instruction that is being currently executed

(l) ALU is the CPU component responsible for

(i) calculations of arithmetic and logical operations
(ii) storing data to be transferred to the main memory
(iii) storing the address a cell in the main memory

(m) Pipelining improves CPU performance due to

(i) reduced memory access time
(ii) the introduction of parallelism
(iii) additional functional units

(n) A 32-bit address bus allows access to a memory of capacity of

(i) 64 Mb
(ii) 16 Mb
(iii) 4 Gb

(question continues on next page)

(o) A computer's main memory is linked to a decoder with 8 address lines. If multiplexed addresses are used, the maximum number of addresses that can be generated is

(i) 2^8
(ii) 8^2
(iii) 2^{16}

(p) The decimal number 127 may be represented by

(i) 1111 1111
(ii) 1000 0000
(iii) 0111 1111

(q) The byte 1111 1111 is in excess notation. The decimal number it represents is

(i) 127
(ii) 128
(iii) 255

(r) In IEEE single precision format, if the normalised is 1100 0000 0000 0000 0000 0000 0000 0000, what is the real mantissa ?

(i) 1.1
(ii) 1.11
(iii) 0.11

(s) a time sharing operating system is an operating system that:

(i) shares the CPU time between processes using a priority based scheduling system
(ii) shares the CPU time between processes using equal time quanta
(iii) shares the CPU time between processes using using a random distribution

(t) A Long-term scheduler

(i) decides which process should go to the ready queue
(ii) decides which process should be executed next
(iii) neither of the above

(u) The dispatch algorithm that maximises throughput by selecting jobs requiring only a small amount of CPU time is called

(i) first-in, first out (FIFO)
(ii) shortest job first (SJF)
(iii) priority scheduling

(question continues on next page)

(v) If a page table entry is missing and the memory management hardware attempts to access it, an interrupt occurs called a

(i) page swapping
(ii) demand paging
(iii) page fault

(w) The process of page replacement is known as

(i) page swapping
(ii) demand paging
(iii) page fault

(x) In demand paging

(i) all pages of a process are loaded at once into the main memory
(ii) only the needed pages are loaded into the main memory
(iii) neither of the above

(y) The quality of a digital sound depends on:

(i) the sampling rate only
(ii) both the sampling rate and the size of the word representing a sample
(iii) neither of the above

QUESTION 2

Data storage, Data representation and Central processing unit

(a) The CPU is essentially a serial processor. How can it deal with several instructions simultaneously in the same time unit?

[4 Marks]

(b) What is the advantage of using single-length instructions over variable-length ones?

[3 Marks]

(c) Why do conditional branches impact the performance of a pipelined implementation?

[3 Marks]

(d) Find the decimal number represented by the following IEEE format:

1	1000 0100	011 0000 0000 0000 0000 000

[8 Marks]

(e) Consider a disk with the following characteristics:

- Number of surfaces: 16
- Number of sectors / cylinder: 4096
- Number of tracks / surface: 2048
- Number of bytes / sector: 512

(i) How many platters does this disk have?

(ii) How many sectors per track?

(iii) What is the total size (i.e., capacity) of this disk? For full credit, please show your workings

(iv) Assume the platters rotate at a of speed 3000 rev/min, calculate the following:

i. The average latency for this disk.

ii. The maximum data transfer rate that can be achieved by the read-write heads (show all your workings).

[7 Marks]

[25 Marks]

QUESTION 3

Operating Systems

(a) Describe the two general roles of an operating system, and explain why these roles are important.

[4 Marks]

(b) Explain the difference between logical and physical addresses. Why are logical addresses important?

[3 Marks]

(c) The following are innovations to the basic computer architecture that can improve the overall performance of a system.

- DMA
- Pipelining
- Virtual memory

for each innovation state:

(i) In what way the innovation improves performance

(ii) Any limitations or shortcomings

[9 Marks]

(d) For each of the following devices, discuss the advantages and disadvantages of each method of dealing with I/O (programmed I/O, interrupt-driven I/O, and DMA).

(i) Keyboard

(ii) Screen

(iii) DVD drive

Suggest which method would be most appropriate for each device.

[9 Marks]

[25 Marks]

PART B: answer TWO questions from this section.

Question 4

(a) What is the difference between *static* and *dynamic* web pages? Give examples of software which can be used to create dynamic pages. When should server-side applications be used and when are client-side technologies more appropriate?

[7 marks]

(b) What are the advantages of *separation of content and presentation* in web authoring? Briefly describe some technologies that support this division.What are the advantages of *separation of content and presentation* in web authoring? Briefly describe some technologies that support this division.

[7 marks]

(c) What HTML syntax errors does the following document contain? How will these errors affect the way the page is displayed by a standard web browser? What additional changes need to be made for the document to conform to XHTML standards?

```
<Head><Title>Classic Science Fiction Novels</Title></Head>
<Body BGcolor = ffffcc>
<head><title>Classic science fiction novels</title></head>
<h1>Classic science fiction novels</h2>
<P>Novels  by <b><i>HG Wells</b></i>
<ol>
  <li>The War of the Worlds
    <li>First Men in the Moon
  <li>The Time Machine</ol>
<BR>Novels by <i><b>Jules Verne</i></b>
<ul>
  <li>20,000 Leagues Under the Sea
  <li>From the Earth to the Moon
</html>
```

[11 marks]

Question 5

(a) Describe three techniques which might be used by hackers to gain unauthorised access to a password-protected system. Discuss defences which can be used against these techniques.

[7 marks]

(b) (i) According to the UK Data Protection Act 1998, which of the following are entitled to know what information is being kept about them on computer files?

- Corporations
- Private individuals
- Voluntary organisations
- Trade Unions
- Private clubs
- All the above
- None of the above

(ii) Which of the following types of information are covered by the Data Protection Act? List all that apply.

- Records in a computer database
- Emails
- Printed or hand-written records
- All the above
- None of the above

(iii) What restrictions are placed on the transfer of personal data to countries outside the European Economic Area? Give examples of common applications that could involve such a transfer, and procedures that companies can follow to ensure they comply with these provisions.

[10 marks]

(c) Discuss the view that "ethical" or "white hat" hackers provide a useful service in highlighting security weaknesses in computer systems, as compared with "malicious" or "black hat" hackers, so that it is inappropriate for the former to be prosecuted or otherwise penalised for their activities.

[8 marks]

Question 6

(a) Explain the difference between:

- A computer network and an internet
- The Internet and the World Wide Web
- Logical and physical addressing

[6 marks]

(b) (i) In the TCP/IP model, which layer is primarily responsible for *reliable (error-free) transmission*? Explain in general terms how TCP/IP protocols ensure data is transmitted reliably, with reference to relevant header fields.

(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.*

- SMTP
- UDP
- ARP
- WAP

[10 marks]

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

(i) `128.232.0.20:25`

(ii) `18.7.22.83:80`

[9 marks]