THIS PAPER IS NOT TO BE REMOVED FROM THE EXAMINATION HALLS

UNIVERSITY OF LONDON **CO1110 ZA**

BSc, CertHE and Diploma Examination

COMPUTING AND INFORMATION SYSTEMS AND CREATIVE COMPUTING

Introduction to Computing and the Internet

Date and Time: Friday 12 May 2017 : 14.30 - 17.30

Duration: 3 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** questions from part A and **TWO** questions from part B.

Full marks will be awarded for complete answers to a total of **FOUR** questions, TWO from part A and TWO from part B. The marks for each part of a question are indicated at the end of the part in [.] brackets.

Only your first TWO answers from part A and your first TWO from part B, in the order that they appear in your answer book, will be marked.

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) i. A binary number which is formed by replacing 0s by 1s and 1s by 0s is referred to as

1. one's complement notation
2. two's complement notation
3. signed notation
4. floating point notation.

[2]

ii. Which of the following bit patterns represents the value -5 in two's complement notation?

1. 10000101
2. 11111001
3. 00000101
4. 11111011.

[2]

iii. Floating point representation is used to store

1. boolean values
2. integers
3. whole numbers
4. real numbers.

[2]

(b) i. Given that the decimal number A = 54 and the decimal number B = -77, give their 8-bit two's complement representation. [2]

ii. Compute A + B in 8-bit two's complement. [2]

iii. Compute A - B in 8-bit two's complement. Does the result contain an overflow? Explain your answer. [3]

iv. Compute A - B in 16-bit two's complement representation. Does the result contain an overflow? Explain your answer. [2]

(c) Assume we are using the 32-bit IEEE single precision floating point format. The mantissa has 24 bits including the hidden bit. There is one sign bit and there are eight exponent bits.

i. What decimal floating point number is represented by the following 32 bits? Show all of your working.

1100 0001 0111 1000 0000 0000 0000 0000

[7]

ii. When will a positive underflow occur in this representation?

[3]

Question 2

(a) i. The smallest entity of a computer memory is called

1. a cell
2. a block
3. an instance
4. a unit.

[2]

ii. Given a 64 bit machine, what will the length of each word be?

1. 4 bytes
2. 8 bytes
3. 12 bytes
4. 16 bytes.

[2]

iii. Which of the following is a memory management technique that uses hard drive space as additional RAM?

1. virtual private network
2. virtual memory
3. virtual machine
4. none of the above.

[2]

(b) i. In order to execute a program instructions must be transferred from memory along a bus to the CPU. If the bus has 8 data lines, at most one byte (8 bits) can be transferred at a time. How many times must the memory be accessed to transfer a 32 bit instruction from memory to the CPU? [4]

ii. Consider a disk system, which has a track seek time of tSeek = 10ms (milli-second). The disk rotation speed is r = 9000 rpm (revolutions per minute), and each track on the disk has S = 600 sectors. Given that each sector has total B = 512 bytes data, what is the average time it takes to read 1024 bytes data? Give your answer in milli-seconds.

[5]

(c) i. A computer's memory is composed of 4K words of 32 bits each. What is the total number of bits in memory? [5]

ii. A computer's memory is composed of 8K words of 32 bits each, and the smallest addressable memory unit is a byte (8-bits). How many bits will be required for the memory address? [5]

Question 3

(a) i. An operating system is

1. an application program
2. a set of programs
3. a set of users
4. a supervisor program .

[2]

ii. Any computer must at least consist of

1. data bus
2. address bus
3. control bus
4. all of the above .

[2]

iii. A memory management technique used to improve computer performance is

1. selecting memory chips based on their cost
2. storing as much data as possible on disk
3. using the cache to store data that will most likely be needed soon
4. preventing data from being moved from the cache to primary memory.

[2]

(b) i. Given the following 5-stage MIPS Sequence of instructions, identify all the data hazards in the following sequence of instructions. For each hazard, state the register involved, the writing instruction and the reading instruction.

$$
\begin{array}{llll}
LW & \$s0, & -12(\$a0) & \\
ADD & \$t0, & \$s0, & \$s1 \\
XOR & \$t1, & \$t0, & \$s2 \\
SUB & \$s5, & \$s0, & \$s1
\end{array}
$$

[3]

ii. Is it possible to eliminate all hazards identified in (i) by just re-ordering the instructions? [3]

iii. Explain how the forwarding technique can be used to eliminate the hazards identified in (i). [3]

(c) Explain the difference between the following memory management techniques, and list the advantages and disadvantages of each.

- simple paging
- demand paging.

[10]

PART B: Answer TWO questions from this section

Question 4

(a) i. Identify which one of the following possible answers identifies correctly Internet transport layer protocol(s).

1. TCP
2. UDP
3. TCP and UDP
4. none of the above

[2]

ii. ICMP is primarily used for

1. error and diagnostic functions
2. addressing
3. forwarding
4. none of the above

[2]

iii. FTP is an acronym for

1. file transport protocol
2. file translation protocol
3. file transfer protocol
4. file transmission protocol

[2]

(b) i. Explain the concept of layering in TCP/IP. [5]

ii. Suppose a TCP sender receives many successive (i.e., in a row) duplicate acknowledgements for the same packet. What should the TCP sender infer has happened? What action should the sender take in this case? [5]

(c) Explain how a TCP connection is established and how it is terminated.

[9]

Question 5

(a) i. What is a web browser?

1. a program that can display a web page
2. a program used to view HTML documents
3. a program that enables users to access the resources of the Internet
4. all of the above.

[2]

ii. Say which of the following statements is **true**.

1. an XML document can have one root element
2. an XML document can have one child element
3. XML elements have to be in lower case
4. all of the above.

[2]

iii. What is a DNS?

1. a "denial of service" attack typically used by hackers to overload web systems.
2. a system used by search engines to automatically index and archive web sites.
3. an error that occurs when a web site cannot be located
4. a system used to convert addresses that humans can read into addresses that machines can read.

[2]

(b) i. Explain what HTTP stands for and explain its main role in the Internet.

[3]

ii. Describe how to add CSS to a web document using external style sheets and inline style sheets. Describe the advantages/disadvantages of each. [6]

(c) Consider a class C network with the network address 223.132.129.0 A network administrator decides to subnet this network with a subnet mask of 255.255.255.248.

i. Find the number of possible usable subnets. [2]

ii. Find the number of possible usable hosts in each subnet. [2]

iii. Find the address of the first usable subnet. [3]

iv. What is the range of possible host addresses in the first usable subnet? [3]

Question 6

(a) i. Which of the following are sensitive personal data under the Data Protection Act 1998? More than one answer may apply

1. nationality
2. religious beliefs
3. personal finances
4. trade union membership.

[2]

ii. Who is responsible for the safe storage of personal information held on record?

1. the data subject
2. the data controller
3. both data subject and controller
4. none of the above.

[2]

iii. Which one of the following statements about the UK Data Protection Act of 1998 is **false**?

1. under the Act a data subject can be an individual, business, voluntary organisation or trade union
2. under the Act the data controller is the person who determines the purposes for which and the manner in which the data are processed
3. the Act defines a data processor as a third party which processes the data on behalf of the data controller
4. the Information Commissioner is the Government official responsible for the operation of the Act, who can, for example, initiate prosecutions or serve enforcement notices.

[2]

(b) i. In the context of computer security, explain what a macro virus is. [3]

ii. The Computer Misuse Act was introduced to allow the prosecution of people who accessed computer systems without authorisation. State each of the three sections of the Computer Misuse Act. For each section give an example of an activity that would be considered a criminal offence under the section. [6]

(c) Describe ways to ensure that the transfer of data from an EU country to an non-EU country is lawful.

[10]

END OF PAPER