UNIVERSITY OF LONDON   **CO1110 ZB**

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.

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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 then adding 1 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 -6 in two's complement notation?

1. 10000110
2. 11111001
3. 00000110
4. 11111010.

[2]

iii. Binary numbers can be used to represent

1. integers only
2. fractions only
3. both fractions and integers
4. none of the above.

[2]

(b) i. Given that the decimal number A = 55 and the decimal number B = 76, 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? Justify your answer. [3]

iv. Compute A + B in 16-bit two's complement representation. Does the result contain an overflow? Justify 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.

$$0100\ 0011\ 0111\ 0000\ 0000\ 0000\ 0000\ 0000$$

[7]

    ii. How would infinity (∞) be represented in this 32-bit format? [3]

Question 2

(a) i. Physical computer memory is divided into sets of finite size called

    1. frames
    2. pages
    3. blocks
    4. vectors.

    [2]

  ii. Given a 32-bit machine, then the length of each word will be

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

    [2]

  iii. RAM is called DRAM (Dynamic RAM) when

    1. it requires periodic refreshing
    2. it is always moving around data
    3. it can do several things simultaneously
    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 would the memory be accessed in order to transfer a 64 bit instruction from memory to the CPU? [4]

  ii. Consider a disk system, which has a track seek time of tSeek =10ms (milli-seconds). The disk rotation speed is r = 4000 rpm (revolutions per minute), and each track on the disk has S = 600 sectors. Given that each sector has total B = 512 bytes of data, what is the average time it takes to read 2048 bytes of data ? Give your answer in milli-seconds (ms). [5]

(c) i. A computer's memory is composed of 8K words of 32 bits each. What is the total number of bits in memory? [5]

ii. A computer's memory is composed of 4K 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. The external system bus architecture is named after

    1. Pascal

    2. Dennis Ritchie

    3. Von Neumann

    4. Charles Babbage.

[2]

  iii. Microprocessor references that are available in the cache are called

    1. cache hits

    2. cache line

    3. cache memory

    4. all of the above.

[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.

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

[3]

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

  iii. Explain how the forwarding technique can be used to eliminates 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. The physical or logical arrangement of a computer network is called
1. topology
2. routing
3. networking
4. none of the above.

[2]

ii. Which one of the following allows a user to connect and login to a command-line interface on a remote computer?
1. FTP
2. HTTP
3. Telnet
4. none of the above.

[2]

iii. ICMP is primarily used for
1. error and diagnostic functions
2. addressing
3. forwarding
4. none of the above.

[2]

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

ii. Explain how TCP deals with lost packets.   [5]

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

[9]

Question 5

(a) i. A web cookie is a small piece of data that is

    1. sent from a website and stored in user's web browser while a user is browsing a website

    2. sent from a user and stored in the server while the user is browsing a website

    3. sent from the root server to all servers

    4. none of the above.

[2]

ii. Which one of the following is used to generate dynamic web pages?

    1. PHP

    2. ASP.NET

    3. JSP

    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. Name 5 ways in which XHTML differs from HTML. [3]

ii. Describe how to add CSS to a web document using external style sheets and embedded (Internal) style sheets. Describe the advantages of using CSS. [6]

(c) Consider a class C network with the network address 220.108.192.0. A network administrator decides to subnet this network with a subnet mask of 255.255.255.240.

    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. ethnic origin
3. personal finances
4. political views.

[2]

ii. In what circumstances does the Data Protection Act 1998 permits the disclosure of sensitive personal data without consent?

1. if this is necessary to protect the health of a third party
2. to close family members
3. for research, teaching and audit purposes
4. none of the above.

[2]

iii. The rights of an author or artist with respect to his or her creation are governed by the law of

1. patents
2. copyrights
3. trademarks
4. industrial designs.

[2]

(b)   i. In the context of computer security, explain what a buffer overflow attack is. [3]

ii. State six of the principles of the 1998 Data Protection Act. [6]

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

[10]