

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2014

IS51009A

Introduction to Computing and the Internet

Duration: 3 hours

Date and time:

*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.

**THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM**

PART A: Answer TWO questions from this section

Question 1

- (a) i. A computer with a 32-bit word size uses two's complement to represent numbers. The range of integers that can be represented by this computer is:

- (1) -2^{32} to 2^{32}
- (2) -2^{32} to 2^{31}
- (3) -2^{31} to $2^{31} - 1$
- (4) -2^{31} to $2^{32} - 1$

[2]

- ii. What procedure is required to add the two two's complement numbers 01101101 and 110?

- (1) take the two's complement of the smaller number and extend it
- (2) pad the shorter number with 0's
- (3) sign extend the shorter number
- (4) shift the shorter number to the left by 5 places

[2]

- iii. In which one of the following two's complement addition problems does an overflow error occur?

- (1) $0011 + 1010$
- (2) $0100 + 0100$
- (3) $0100 + 1011$
- (4) $1100 + 0111$

[2]

- (b) i. Register A holds the 8-bit binary number 11011001. Determine the B operand and the logic micro-operation to be performed in order to change the value in A to 01101101.

- ii. Perform the following 8-bit two's complement calculation:

$$01110000_2 - 11101011_2$$

- iii. Does the above two's complement calculation give an overflow? Justify your answer.

[9]

(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 your workings.

1100 0011 1000 1010 0000 0000 0000 0000

ii. How would the smallest normalised number be represented in this 32-bit format?

[10]

Question 2

(a) i. Which of the following are usually combinational logic circuits?

- (1) Adder
- (2) Program counter
- (3) Multiplexer
- (4) Memory

[2]

ii. Which one of the following statements is a correct definition of the term "virtual memory"?

- (1) an extremely large main memory
- (2) an extremely large secondary memory
- (3) an illusion of extremely large main memory
- (4) a type of memory used in super computers

[2]

iii. Which one of the following statements is correct about the meaning of a "page fault"?

- (1) the page is corrupted by application software
- (2) the page is in memory
- (3) the page is not in memory
- (4) division by zero error

[2]

(b) i. Explain the concept of pipelining in CPU design.

ii. Explain the concepts of data and control pipelining hazards.

iii. State and explain a way to reduce pipelining stall caused by each of the hazards in (ii) above.

[9]

(c) i. List three advantages of RISC based system architecture.

ii. Explain the concept of the "spatial locality" principle.

iii. Explain how the "spatial locality" principle is used by the cache memory to improve performance.

[10]

Question 3

(a) i. Which one of the following storage medium has the fastest information retrieval?

- (1) hard disk
- (2) magnetic tape
- (3) optical disk
- (4) floppy disk

[2]

ii. What is the control unit's function in the CPU?

- (1) to transfer data to primary storage
- (2) to store program instruction
- (3) to perform logic operations
- (4) to decode program instructions

[2]

iii. Which of the following registers is used to keep track of the address of the memory location where the next instruction is located?

- (1) Memory Address Register
- (2) Memory Buffer Register
- (3) Program Register
- (4) Instruction Register

[2]

(b) i. How many 128 x 8 RAM chips are needed to provide a memory capacity of 1024 bytes?

ii. How many lines of the address bus must be used for the above RAM chip selection?

iii. How many lines of the address bus must be used to access 1024 bytes of memory ?

iv. How many of these lines will be common to all RAM chips?

[9]

(c) i. Explain the concept of programmed I/O.

ii. How does the CPU deal with interrupts?

iii. How does DMA differ from programmed I/O?

[10]

PART B: Answer TWO questions from this section

Question 4

- (a) i. Which class of IP address provides a maximum of $2^{16} - 2$ host addresses per network ID?

- (1) class A
- (2) class B
- (3) class C
- (4) class D

[2]

- ii. Which of the following are TCP/IP protocols used at the Application layer of the OSI model? More than one answer may apply.

- (1) IP
- (2) TCP
- (3) Telnet
- (4) FTP

[2]

- iii. Which of the following statements is false with reference to the purpose of TCP sequence numbers? More than one answer may apply.

- (1) to ensure that data is delivered to the application in the order it was sent
- (2) to distinguish duplicate packets
- (3) to determine how much data is left to send
- (4) All of the above

[2]

- (b) i. Give three advantages of layering in TCP/IP.

- ii. Explain how TCP/IP uses headers to implement layering.

[9]

- (c) i. Explain in one sentence the difference between a packet and an IP datagram.

- ii. Describe the meaning of each of the three following IP datagram fields: Version; IHL; and Time to live.

- iii. In a network that has a maximum packet size of 128 bytes, a maximum packet lifetime of 30s, and a 8 bit packet sequence number, what is the maximum data rate per connection.

[10]

Question 5

(a) i. Which one of these statements about XHTML is true?

- (1) XHTML stands for EXtensive HyperText Markup Language
- (2) HTML is a stricter and cleaner than XHTML
- (3) XHTML elements must be properly nested

[2]

ii. Choose from below the correct syntax to add the attribute named Type to the <student> tag.

- (1) <student Type=" excellent" >
- (2) <student attribute Type= "excellent">
- (3) <student Type attribute ="excellent?">
- (4) None of the above

[2]

iii. Choose one statement that best describes why XHTML is preferred over HTML.

- (1) HTML documents must be well formed.
- (2) XHTML strictness allows browsers to run faster making them more suitable for smaller devices.
- (3) XHTML is XML rewritten in HTML

[2]

(b) i. Explain what is a well formed XML document.

ii. When web pages containing emails are sent out they are prefixed by MIME Header. Explain why.

[9]

(c) Consider a class C network with the network address 201.168.67.0. 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.

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

iii. Find the address of the first subnet.

iv. What is the range of possible host addresses in the first subnet?

[10]

Question 6

- (a) i. Which statement best describes a worm virus?
- (1) a virus that is designed to slow down your computer
 - (2) a virus that replicates itself and moves through computer networks.
 - (3) a virus that is designed to shut down a server
 - (4) malicious code that masquerades as a legitimate program
- [2]
- ii. The UK Data Protection Act of 1998 is based on eight principles of protection for personal data and the processing of that data. Which one of the following is not one of these principles?
- (1) data must be processed fairly and lawfully
 - (2) data cannot be transferred outside the European Economic Area under any circumstances
 - (3) data should be adequate, relevant and not excessive for the purpose for which it is processed.
 - (4) data should be accurate and kept up to date
- [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 general terms what is the difference between static and dynamic web pages?
- ii. Give two examples of a functionality that is suitable for client side scripting.
- iii. Which of the following are client and which are server-side technologies?
- (1) Javascript
 - (2) JSP
 - (3) ASP
- iv. How do client-side technologies save on transaction time? What is the advantage of this for the user?

[9]

- (c) The Internet is the ultimate vehicle for information retrieval and transmission in modern times, for people and nation states. Discuss how modern warfare might take place over the Internet.

[10]

END OF PAPER