BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 4 Certificate in IT

COMPUTER & NETWORK TECHNOLOGY

Tuesday 26ᵗʰ September 2017- Morning
Time: TWO hours

Section A and Section B each carry 50% of the marks.
You are advised to spend about 1 hour on Section A (30 minutes per question)
and 1 hour on Section B (12 minutes per question).

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.

Section A
Answer 2 questions (out of 4). Each question carries 30 marks.

A1

a) Desktop and workstation computers have changed immensely over the last decade. Discuss how the general-purpose desktop computer has changed over the last few years in terms of hardware, software, and applications. Your answer should include a reference to the way in which the performance has changed.

(20 marks)

b) Over the years, the clock rate of computers has increased, rising from 1 MHz in the 1970s to 4 GHz today. However, over the last few years, clock speeds have not increased greatly. Briefly explain why the clock speed of modern processors is limited, and state what engineers are doing to overcome this limitation.

(5 marks)

c) You want to buy 100 new computers for your organization. You shortlist two contenders; machine *A* and machine *B*. These computers each run four tasks; *P, Q, R,* and *S*. The table below gives the performance data; for example, task *P* runs on machine *A* in 20 seconds. Task *P* occupies 10% of the load of the computer; that is, the task occupies 10% of the jobs/programs being run on computer A.

Use the data to say, with a brief reason, which computer is the better.

Task	Machine A		Machine B	
	Time	Load	Time	Load
P	20s	10%	30s	10%
Q	100s	5%	60s	10%
R	5s	70%	10s	60%
S	10s	15%	15s	20%

(5 marks)

A2

In assembly language, an addressing mode specifies how an operand is accessed by an instruction.

a) There are three fundamental addressing modes used by processors. These addressing modes are called:

i) Immediate addressing (or literal addressing)
ii) Memory direct addressing (or absolute addressing)
iii) Register indirect addressing (or indexed or pointer-based addressing).

Briefly explain what each of these addressing modes means and provide an example of its application.

(9 marks)

b) Write an assembly program (using an assembler of your choice) to search a sequence of 64 integers stored in memory, starting at location 100, for the occurrence of 42. If 42 is found, location 200 should be loaded with 1. If 42 is not found it should be loaded with 0.

Marks will be awarded for your design and documentation (comments) of the program. All instructions you use should be defined. Students may make up (invent) their own assembly language operations as long as they approximate to real-world operations.

(21 marks)

A3

a) Convert the decimal number 123 into the following bases:

i) 2 (binary) in 8 bits
ii) 16 (hexadecimal) in 4 digits

(4 marks)

b) Why is two's complement arithmetic so widely used by digital computers? **(4 marks)**

c) What is the answer to the following binary addition operation? Assume that the numbers are in 8-bit signed two's complement format.

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  00011101
 +11110011
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(4 marks)

d) Convert the two binary values in part c) and your result into decimal form and comment on the result.

(6 marks)

e) Carefully explain the fundamental differences between binary integers and binary floating-point numbers. What are the relative advantages and disadvantages of each form of number representation?

(12 marks)

A4

The stack, a data structure, is also called a last-in-first-out (LIFO) queue, and is used in many areas of computing. In particular, it is used in the implementation of interrupt structures and subroutine call and return mechanisms.

a) Describe the structure of a stack and explain how it is implemented and maintained in a computer. Your answer should also include a description of the two basic operations that can be applied to a stack.

(10 marks)

b) Briefly explain how the stack is used to implement a subroutine call and return mechanism.

(10 marks)

c) What is an interrupt and what is its role in input/output operations? Show, with the aid of a diagram, how the computer implements an interrupt mechanism.

(10 marks)

SECTION B
Answer 5 questions (out of 8). Each question carries 12 marks.

B5

Storage in computer systems is essential. Using examples of their use, briefly explain:

a) Hard disk **(3 marks)**
b) Magnetic tape **(3 marks)**
c) RAM **(3 marks)**
d) USB pen drive **(3 marks)**

B6

Describe the following types of computer network terms:

a) Network address **(4 marks)**
b) MAC address **(4 marks)**
c) IP address **(4 marks)**

B7

As a computer technician, you have been asked to provide advice on a range of computing interfaces. Briefly describe and differentiate between:

a) HDMI **(4 marks)**
b) Ethernet **(4 marks)**
c) WiFi **(4 marks)**

B8

Describe the following Operating Systems related terms:

    a) Kernel   **(4 marks)**
    b) Scheduler   **(4 marks)**
    c) Multiprocessing   **(4 marks)**

B9

Explain the purpose of each of the following in distributing data on the internet:

    a) World Wide Web   **(3 marks)**
    b) Router   **(3 marks)**
    c) HTTP   **(3 marks)**
    d) Server   **(3 marks)**

B10

Computers need to be protected and made more secure. Describe briefly the following computer security terms:

    a) Firewall   **(3 marks)**
    b) Access Control List   **(3 marks)**
    c) Pop-up blocker   **(3 marks)**
    d) Anti-Virus Software   **(3 marks)**

B11

    a) Differentiate between a program counter and an instruction register.   **(4 marks)**
    b) Describe the Fetch Execute Cycle during the operation of the CPU.   **(8 marks)**

B12

Briefly describe the four layers of the TCP/IP model.   **(12 marks)**