

BCS THE CHARTERED INSTITUTE FOR IT
BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 4 Certificate in IT
COMPUTER AND NETWORK TECHNOLOGY

Tuesday 17th September 2019 - 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 Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

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

Calculators are NOT allowed in this examination.

[Turn Over]

Section A

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

A1. All numbers in a computer are stored in binary form as strings of 1s and 0s.

a) Why do computers use binary arithmetic with bits representing 0 and 1, rather than decimal arithmetic with digits representing 0,1,2,3 ..., 9? **(5 marks)**

b) How can negative numbers be represented in a computer using only 0s and 1s? Describe two different widely-used representations of negative values. **(5 marks)**

c) Computers can handle both integer numbers and floating-point numbers. In general, separate arithmetic units (and even separate machine-level instructions) are required for integer and floating-point operations. Why is it necessary to treat integer and floating-point numbers so differently? **(10 marks)**

d) The IEEE standard for floating-point arithmetic represents a floating-point value in 32 bits in the form

$$N = (-1)^S \times 1.F \times 2^{E-B}$$

Where N is the floating point-number, S is the *sign-bit*, F the *fractional mantissa*, E the *exponent*, and B the *bias*. Explain the meaning of each of these terms as they relate to the floating-point format.

(10 marks)

A2.

a) In the context of computer architecture and assembly language, what is indexed addressing (also called pointer-based or register-indirect addressing)? How is it used and why is it so important to the programmer? **(10 marks)**

b) A region of a microprocessor's memory contains a consecutive sequence of integers, from memory location FIRST to location LAST.

Write an assembly language program to read each of these numbers one by one to determine the largest integer. Put the largest integer in the location following LAST.

You may choose any assembly language you want for this problem. You may even invent your own assembly language. However, you must clearly explain the operation of each assembly language instruction and say what it does.

(20 marks)

[Turn Over]

A3.

- a) What is an operating system; why is it necessary on a general-purpose computer, and what facilities does it provide?

(12 marks)

- b) In the context of operating systems:

1. What is virtual memory?
2. Why is virtual memory necessary?
3. How is virtual memory implemented?

(18 marks)

A4.

- a) Some people use a computer's clock speed to judge the performance (speed) of a computer; for example, they may say that computer X is better than computer Y because computer X has a 3.5 GHz clock and computer Y has a 3.1 GHz clock. In general, it is regarded as wrong to use clock frequency to compare computers. Why is this?

(10 marks)

- b) You are employed as a consultant to select a suitable high-performance computer for use by a small company. You make your selection and copy out the candidate computer's parameters (specification) for your client. Because your client is non-technical, you have to explain the relevance of some of the parameters. For the following specifications, write a paragraph that indicates the meaning, relevance, and importance of the specified parameter.

Your report should also explain why this specification corresponds to a high-performance computer (in 2019).

Workstation specifications:

- Processor:
 - CPU cores: 8
 - CPU threads: 16
- Memory: 64 GB, DDR4
- CPU clock: 4.7 GHz
- Storage device:
 - 2 TB SSD
 - 10 TB HDD
- Interface:
 - USB 3.0
 - USB 3.1 Type-C
- Extension slots: 4 x PCIe
- Network: Gigabit Ethernet

(20 marks)

[Turn Over]

Section B

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

- B5.** Describe two advantages and two disadvantages of using biometric systems. **(12 marks)**
- B6.** Explain how cloud computing could be more vulnerable to cyber-attacks compared to an isolated network. **(12 marks)**
- B7.** Discuss the following Cloud Models with examples: **(12 marks)**
- a. Software as a Service (SaaS).
 - b. Platform as a Service (PaaS).
- B8.** Describe three advantages and three disadvantages of embedded systems. **(12 marks)**
- B9.** Discuss the following security threats: **(12 marks)**
- a. DoS attacks.
 - b. Viruses.
 - c. Rouge Access Point.
- B10.** Briefly explain each of the following concepts: **(12 marks)**
- a. HDMI.
 - b. 10BaseT.
 - c. CSMA/CD.
- B11.** Discuss the following with at least one device example: **(12 marks)**
- a. Full Duplex.
 - b. Half Duplex.
- B12.** Discuss three advantages of setting up a Local Area Network. **(12 marks)**

End of Exam