

**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS  
BCS Level 4 Certificate in IT

**COMPUTER AND NETWORK TECHNOLOGY**

Thursday 12<sup>th</sup> November 2020 – 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 <b>NOT</b> allowed in this examination.
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## Section A

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

**A1.** This question is about FUNDAMENTALS.

- a) All digital systems are constructed from two types of component: combinational logic element (i.e. gates) and sequential elements (i.e. flip flops).

Describe the fundamental difference between these **TWO** circuit elements and explain why both types are needed to construct a digital computer.

**(10 marks)**

- b) Explain the difference between the following flip-flops:

- i) D flip-flop;
- ii) RS flip-flop.

**(8 marks)**

- c) Show how flip-flops can be used to construct **EITHER**:

- i) a shift right register; or
- ii) a binary counter.

Construct only **ONE** of these circuits.

**(12 marks)**

**A2.** This question is about PROCESSOR ARCHITECTURE.

- a) Explain the meaning of the term **interrupt** in computer technology and describe the sequence of events that takes place when an interrupt from a peripheral occurs.

Your answer should include the events that take place between a peripheral issuing an interrupt request, up to the point at which normal processing resumes after the interrupt.

**(21 marks)**

- b) As well as dealing with peripheral requests, interrupts (also called **exceptions**) are used by a computer in other applications. Briefly describe **THREE** different applications of interrupts (exceptions) by a computer.

**(9 marks)**

**A3.** This question is about PROCESSOR ARCHITECTURE.

A computer system's memory is a complex structure involving several technologies (e.g. DRAM semiconductor, magnetic disk, optical disk) and mechanisms. Discuss the following **TWO** aspects of modern memory systems. In each case, explain what it is, how it operates, and the advantages it brings to modern computing. You are expected to use diagrams to explain your answers.

Note that part (a) and part (b) carry different marks. This is indicative of the amount of detail expected.

a) Cache memory.

**(10 marks)**

b) Virtual Memory.

**(20 marks)**

**[Turn Over]**

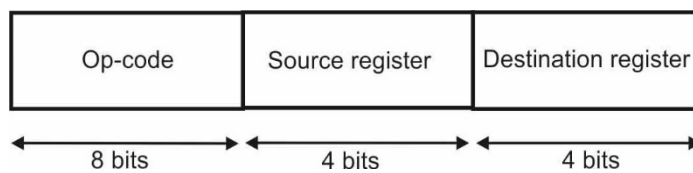
**A4.** This question is about OPERATING SYSTEMS AND SYSTEM SOFTWARE.

a) The first microprocessors of the 1970s were described as 8-bit chips. Some microprocessors were described as 16-bit chips. Later, 32-bit chips appeared, and now there are 64-bit chips.

- i) What do the terms “8-bit” microprocessor or “32-bit” microprocessor mean?
- ii) What are the advantages **AND** disadvantages of a microprocessor with a larger number of bits (for example, what are the advantages and disadvantages of a 16-bit microprocessor compared with a 32-bit microprocessor)?

**(10 marks)**

b) A computer has a 16-bit instruction word with the following format:



- i) How many different instructions can this computer support?
- ii) How many registers can be uniquely addressed?

**(4 marks)**

c) This question asks you about the Program Counter (PC), sometimes called the Instruction Register (IR).

- i) What is the purpose of the Program Counter in a digital computer?
- ii) Under what circumstances does the Program Counter change its value (i.e. when is it updated or modified)?

**(8 marks)**

d) A computer can be programmed in a low-level language (also called an assembly language or machine code) or it can be programmed in a high-level language (e.g., Java, C, Python). What are the differences between these two classes of language and what are their relative advantages and disadvantages as a means of programming computers?

**(8 marks)**

**Section B**

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

**B5.** This question is about FUNDAMENTALS.

Given the following numbers, convert them to the indicated base:

- i)  $110100101010_2$  to Base 10
- ii)  $555_{10}$  to Base 2
- iii)  $0x68_{16}$  to Base 10
- iv)  $1010101011_2$  to Base 8
- v)  $123_8$  to Base 10
- vi)  $118_{10}$  to Base 16

**(12 marks)**

**B6.** This question is about PROCESSOR ARCHITECTURE.

Storage in a computer is essential. Using examples, briefly explain the following:

- a) Register storage;
- b) Permanent disk storage.

**(6 marks)**

**(6 marks)**

**B7.** This question is about PROCESSOR ARCHITECTURE.

Explain each of the following terms:

- a) Peripheral polling;
- b) DMA;
- c) I/O;
- d) Display Driver.

**(12 marks)**

**B8.** This question is about PROCESSOR ARCHITECTURE.

- a) Discuss **THREE** input devices and their uses.
- b) Discuss **THREE** output devices and their uses.

**(6 marks)**

**(6 marks)**

**[Turn Over]**

**B9.** This question is about NETWORKS.

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

- a) Anti-virus software; **(3 marks)**
- b) Anti-spyware; **(3 marks)**
- c) Access Control List; **(3 marks)**
- d) Pop up blocker. **(3 marks)**

**B10.** This question is about NETWORKS.

- a) Provide a diagram indicating, in correct order, the **SEVEN** layers of the ISO/OSI model. **(7 marks)**
- b) Discuss the organisation and purpose of the data link layer and examples of transmission protocols. **(5 marks)**

**B11.** This question is about NETWORKS.

Explain the purpose and functionality of the following devices:

- a) Router;
  - b) Bridge;
  - c) Switch.
- (12 marks)**

**B12.** This question is about OPERATING SYSTEMS AND SYSTEM SOFTWARE.

- a) What is meant by system performance and how it is measured? **(6 marks)**
- b) What is the purpose and use of benchmarking? **(6 marks)**

**End of Examination**