

**BCS THE CHARTERED INSTITUTE FOR IT**  
**BCS HIGHER EDUCATION QUALIFICATIONS**  
**BCS Level 4 Certificate in IT**

**COMPUTER & NETWORK TECHNOLOGY**

Thursday 19<sup>th</sup> March 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.

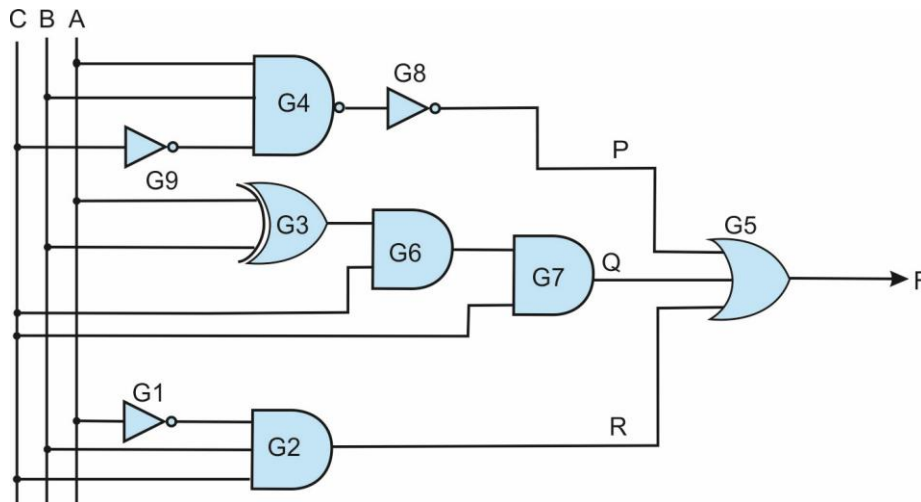
Calculators are <b>NOT</b> allowed in this examination.
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**Section A**

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

**A1.** This question is about fundamentals.

Consider the diagram below:



- For **EACH** of the **FIVE** gates G1, G2, G3, G4, and G5, state its name (logic type) and explain in words what it does. **(10 marks)**
- Construct a truth table for variable F with inputs A, B, C. **(5 marks)**
- Obtain a Boolean algebra expression for output F. You may use either your truth table or Boolean algebra. **(5 marks)**
- Each **NOT** gate has a 1ns delay (the change in state at the output following a logic change at the input), and all other gates have a 2ns delay. What is the shortest delay through the circuit, and what is the longest delay? That is, what is the shortest time between an input change on one of inputs A, B, C and the output F changing, and what is the longest delay? **(10 marks)**

**[Turn Over]**

**A2.** This question is about processor architecture.

A computer contains the following elements:

- i) Registers;
- ii) Buses;
- iii) ALU;
- iv) Cache Memory;
- v) Condition Code Register (also called flag register or status bits).

a) Explain the role of each of the above elements of a computer and describe how it contributes to the execution of instructions.

**(20 marks)**

b) All modern computers include an addressing mode called register indirect (also known as pointer-based addressing or indexed addressing). Explain what this addressing mode does and how it is used by the programmer. Give an example of its use.

**(10 marks)**

**A3.** This question is about processor architecture.

a) Explain how a hard disk drive (HDD), i.e. one with a rotating platter, operates. Describe briefly how data is stored (written) and accessed (read).

**(20 marks)**

b) Describe the difference between the modern solid state drive (SSD) and the hard disk drive. Discuss the advantages and disadvantages of the SSD over the HDD.

**(10 marks)**

**A4.** This question is about operating systems and system software.

In the 1940s, the first generation of digital computer executed programs one at a time. All actions necessary to execute the program had to be included in the code.

Gradually, programs were written to facilitate the execution of other programs. These programs became known as operating systems.

Explain why an operating system is vital to all general-purpose digital computers. Your answer should include a discussion of the wide-range of facilities that a modern operating system provides. Your answer must also include a discussion of how the operating system controls the computer's hardware resources.

**(30 marks)**

**[Turn Over]**

## Section B

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

**B5.** This question is about fundamentals.

Convert the following numbers into the form specified:

- a) Convert 27 into an 8-bit unsigned binary integer. **(4 marks)**
- b) Convert -27 into an 8-bit two's complement signed binary integer. **(4 marks)**
- c) Convert 999 into a 4-digit hexadecimal value. **(4 marks)**

**B6.** This question is about processor architecture.

- a) Explain **THREE** advantages and **THREE** disadvantages of laptops. **(6 marks)**
- b) Discuss **THREE** differences between desktop computers and mainframes. **(6 marks)**

**B7.** This question is about fundamentals.

- a) How does a flip-flop fundamentally differ from a combinational logic element (e.g. an AND gate or an OR gate)? **(3 marks)**
- b) Draw the circuit diagram of a JK flip-flop. **(3 marks)**
- c) Explain the operation of a JK flip-flop. **(3 marks)**
- d) How are flip-flops used (i.e. what are their applications)? **(3 marks)**

**B8.** This question is about processor architecture.

Modern office and personal computers invariably have one or more printers. Today, most office/home printers use two types of technology. Briefly describe the operating principles of the following **TWO** printer types and discuss their relative advantages and disadvantages.

- a) Laser printer; **(6 marks)**
- b) Ink-jet printer. **(6 marks)**

[Turn Over]

**B9.** This question is about networks.

Describe the following types of computer networks.

- a) LAN; **(4 marks)**
- b) WAN; **(4 marks)**
- c) VPN. **(4 marks)**

**B10.** This question is about networks.

- a) Describe how wireless technology can be used to interconnect computers and associated devices. **(6 marks)**
- b) Outline typical uses of a router and a switch. **(6 marks)**

**B11.** This question is about networks.

Discuss the following and provide at least **ONE** example on their use:

- a) DHCP; **(4 marks)**
- b) DNS; **(4 marks)**
- c) Proxy Server. **(4 marks)**

**B12.** This question is about operating systems and system software.

Describe the following Operating Systems related terms.

- a) I/O Management; **(6 marks)**
- b) Process Management. **(6 marks)**

**END OF EXAMINATION**