

# Department of Education National Secondary Education Examinations

## Computer Science

**Materials needed:**

- Pen (black ink only)
- Calculator

**Time allowed:** 1 hour 30 minutes

<b>Candidate Number</b>	
<b>Centre Number</b>	

**Instructions:**

- Fill the boxes above clearly in black ink.
- Answer all the questions.
- Show all of your working out.
- Do not write outside the box.
- Do not write over the barcodes.
- **Do not turn over until told to do so by an invigilator.**

**Information:**

- This paper has 16 pages.
- The total mark for this paper is 100.
- The marks for each question are shown in brackets [ ].
- If additional space is required, please ask an invigilator for an additional answer booklet.

For examiner's use only	
Question	Mark
1	/ 10
2	/ 12
3	/ 10
4	/ 10
5	/ 06
6	/ 10
7	/ 08
8	/ 10
9	/ 13
10	/ 11
<b>TOTAL</b>	<b>/ 100</b>



C S / 1 1 0 1 / L E S 1

**Section A: Computer Systems**

1 Samuel is part of a company. The company uses an **intranet**.

a) What is the purpose of an intranet? **[1]**

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b) Samuel's company handles highly confidential information. The company uses a firewall and anti-malware software.

Describe how these can help the company be secure. **[4]**

Firewall: \_\_\_\_\_

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Anti-malware software: \_\_\_\_\_

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c) Samuel's company is considering adding Wireless Access Points. Explain one benefit and drawback which arise from adding these. **[2]**

Benefit: \_\_\_\_\_

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Drawback: \_\_\_\_\_

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Recently, the company network has become very slow. A technician has determined that it is due to one of the following reasons:

- There are too many devices using the network.
- There are too many transmission errors.
- The network has a very high latency.

**d)** Describe how each of the reasons above can slow down a network. **[3]**

Too many devices: \_\_\_\_\_

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Too many errors: \_\_\_\_\_

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High latency: \_\_\_\_\_

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**The total for Question 1 is 10 marks.**

**2** Martha has built a new computer.

**a)** She needs to install an operating system (OS). What is an operating system? **[2]**

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- b) The operating system comes with utility software.  
What is utility software? **[1]**

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- c) After a month of using her computer, Martha finds that her computer is slow because her hard drive has become fragmented. How can a hard drive become fragmented? **[3]**

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- d) Martha runs defragmentation software on her hard disk. How does defragmentation work, and how does it improve the performance of Martha's hard drive? **[4]**

How it works: \_\_\_\_\_

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Why it improves performance: \_\_\_\_\_

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**The total for Question 2 is 12 marks.**

- 3** A CPU is the most important component in a computer system.

- a) What other component would a general-purpose computer require? **[1]**

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b) Many computers used today are built with the Von Neumann architecture. What is the Von Neumann architecture? [2]

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c) The table below describes the different components of a CPU. Complete the table. [3]

Component Name	Description
Control Unit (CU)	<hr/> <hr/> <hr/>
<hr/>	Performs simple calculations and logical operations.
Register	<hr/> <hr/> <hr/>

d) A CPU goes through the fetch-decode-execute cycle. What happens during the decode and execute stages? [2]

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e) The CPU has various special purpose registers. Give one example of a special purpose register, and its function. [2]

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The total for Question 3 is 10 marks.

4 A car has many embedded systems.

a) What is an embedded system? [2]

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b) The car has cruise control, powered by an embedded system. When activated, the car will maintain its speed. The cruise control software is stored on a ROM chip.

What else would be stored on the ROM for the cruise control system? [1]

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c) RAM contains running instructions and data. When the cruise control system is active, what two things would be stored in its RAM? [2]

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d) Why is it not necessary for the cruise control system to have secondary storage? [2]

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e) The car's infotainment system has secondary storage to store user preferences.  
What would be an appropriate size for the storage device (circle the correct option) [1]

- 10 kilobytes
- 1 megabyte
- 1 gigabyte
- 1 terabyte

- f) The software for the car's embedded systems are written using a compiled language, rather than an interpreted language. What are two reasons for this? [2]

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**The total for Question 4 is 10 marks.**

- 5 Ulek is a musician. They record their music and store it on their computer.

- a) How does a computer convert an analogue signal to a digital one? [2]

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- b) The average file size of Ulek's recordings is 1.2 MB. Ulek has a 2 TB hard disk drive. How many music files can Ulek store? Show your working. [2]

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- c) Ulek has decided to increase the sampling frequency of their recording. What effect would this have on the recording, and the file size? [2]

Recording: \_\_\_\_\_

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File size: \_\_\_\_\_

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The total for Question 5 is 6 marks.

**Section B: Devising and Debugging Programs**

**6** A game developer is creating a game. Before publishing it, they decide to test it.

**a)** Why is it important to test a program before publishing it? **[1]**

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**b)** The developer uses iterative and final testing. What is the difference? **[2]**

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**c)** The developer finds some syntax errors, and some logical errors in their code. What is the difference? **[2]**

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**d)** What are the four types of test data? **[2]**

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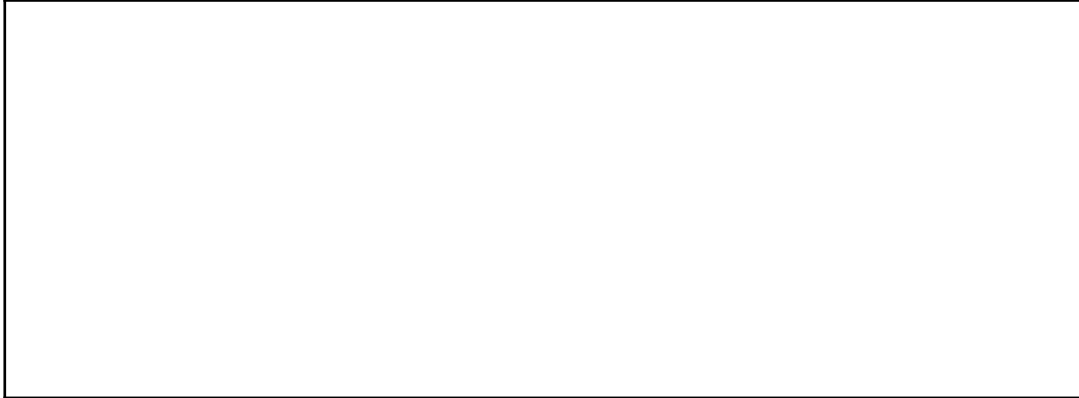






**8** Draw diagrams using logic gates for the following boolean expressions.

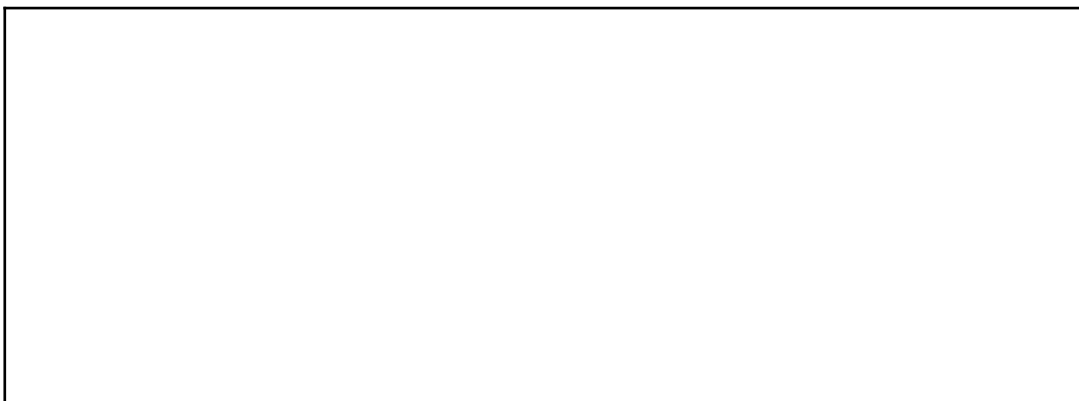
**a)**  $(A \text{ AND } C) \text{ OR } B$  **[2]**



**b)**  $(\text{NOT } (A \text{ AND } B) \text{ OR } C) \text{ AND } D$  **[4]**



**c)**  $(C \text{ OR } (B \text{ AND } A)) \text{ OR NOT } A$  **[4]**



**The total for Question 8 is 10 marks.**

**9** Anita is creating a game.

In this game, there are 20 tiles arranged linearly. The game requires two players, and the players take turns. The game uses a 6-sided die.

Both players initially roll a die, and start on the square the die rolled. For each subsequent roll, the number on the die is the number of tiles the player can move. If a player passes or lands on a tile with the other player on it, the other player must roll a die and move back that amount of tiles.

The first player to reach the final tile wins.

- a)** Anita is splitting her game into different functions and procedures. What is the difference between a function and a procedure? **[2]**

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- b)** The game has a subprogram called `rollDie()`. This subprogram does not take in any arguments, and returns a random number from 1 - 6.

Write an implementation of `rollDie()` in a programming language of your choice. **[3]**

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The game has a globally accessible array of size 20 called `tiles`, which keeps track of the players' positions. Unoccupied tiles in the array contain a 0.

Player 1's position is stored as a 1, and Player 2's position is stored as a 2.

The game contains a subprogram called `validateMovement`. It takes in 3 arguments: `player`, `startTile`, and `moveTiles`.



The subprogram sets the current position of the player in the array to 0 (unoccupied), and sets the new position of the player in the array to the player number.

- d) Write an implementation of `movePlayer` in a programming language of your choice. [3]

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The total for Question 9 is 13 marks.

- 10 A shop sells the following items:

Item ID	Name
1	Fizzy drink
2	Crisps
3	Alcohol

Part of the pseudocode for a point-of-sale (POS) system is shown below. `items` is an array containing the item IDs of the current items the customer is buying.

```
itemId = input("Enter item ID: ")
if (itemId > 1 and itemId < 3):
    items.addElement(itemId)
    print("Added item!")
else:
    print("That item does not exist!")
```



- c) The developer used an integrated development environment (IDE) to make the game. What are four features of an IDE? [2]

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**Total for Question 10 is 11 marks.**

**END OF QUESTION PAPER.**