



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2026
Computer Science

Sections A & B
Higher Level

Wednesday 20 May Morning 9:30 - 11:00
130 marks

Examination Number

Date of Birth

/

/

For example, 3rd February
2005 is entered as 03 02 05

For Examiner use only								
Section	Question	Mark	Section	Question	Mark	Section	Question	Mark
A	1		A	7		B	13	
	2			8			14	
	3			9			15	
	4			10		Section B Total:		
	5			11		P1 Total (A+B)		
	6			12		C	16	
						P2 (Sec C) Total:		
Section A Total:						Total:		

Instructions

There are **three** sections in this examination. Section A and B appear in this booklet. Section C is in a separate booklet that will be provided for the computer-based element.

Section A	Short Answer Questions	Attempt any nine questions All questions carry equal marks	54 marks
Section B	Long Questions	Attempt any two questions All questions carry equal marks	76 marks
Section C	Programming	Answer all question parts	80 marks

Calculators may **not** be used during this section of the examination.

The superintendent will give you a copy of page 78 (Logic gates) of the *Formulae and Tables* booklet on request. You are **not** allowed to bring your own copy into the examination.

Write your answers for Section A and Section B in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

Answer any **nine** questions.

Question 1

Use the trace table below to show the changing states of the variables a and b during program execution.

1	a = 0
2	b = 7
3	while b > 0:
4	if b % 2 == 0:
5	a = a + 2
6	b = b - 2
7	else:
8	a = a + 1
9	b = b - 1

a	b
0	7
7	0

Question 2

Cache and RAM are both important types of computer memory. Compare cache and RAM under the headings: purpose and speed.

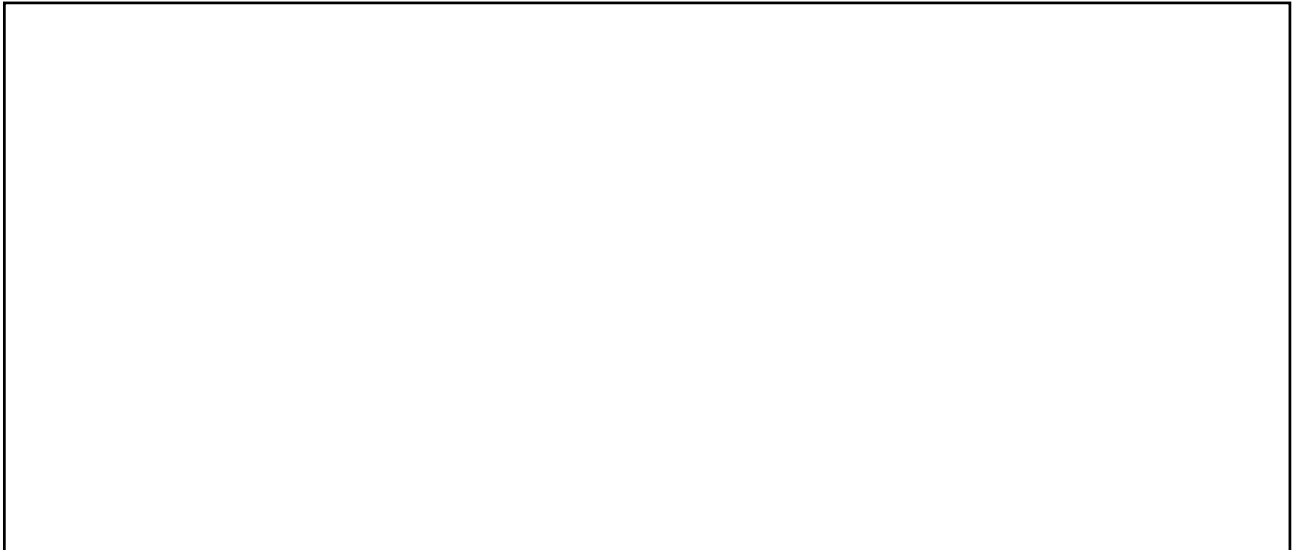
Purpose:
Speed:

Question 3

A school computer system uses the three conditions below to decide whether a student login attempt should be granted or blocked. Access is granted when both username and password are correct, or an administrator override is active.

- A:** Username entered: 1 = correct, 0 = incorrect
- B:** Password entered: 1 = correct, 0 = incorrect
- C:** Administrator override: 1 = activated, 0 = not activated

Sketch the logic circuit diagram for this system using the appropriate gate symbols.



Question 4

Binary and hexadecimal numbers are both used in computer systems to represent digital data.

- (a)** State the highest hexadecimal number that can be represented using 16 bits.

Answer:



- (b)** Convert the hexadecimal number 3F into its 8-bit binary equivalent.

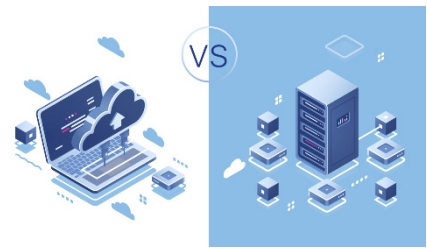
Answer:



Question 5

A school is moving its student records from a local server to a cloud-based storage service.

- (a) Outline **one** advantage of this move to cloud storage for the school.



- (b) Explain **one** concern the school should consider when storing student records in the cloud.

Question 6

Construct an algorithm that uses a `while` loop to display the values 0, 3, 6, 9 and 12.
The algorithm can be expressed in a flowchart *or* in pseudo code.

--

Question 7

A student is applying the insertion sort algorithm to a list of numbers. After four passes, the numbers 4, 6, 9 and 12 have been sorted as shown in **Figure 1** below. Four more passes are required to complete the sort, and the next value to be inserted is 5.

4	6	9	12	5	10	3	11
---	---	---	----	---	----	---	----

Figure 1

- (a) Complete the state of the list after each of the remaining four passes.

Pass 5:							
Pass 6:							
Pass 7:							
Pass 8:							

- (b) Outline how the insertion sort algorithm decides where to place each new element during the sorting process.

Question 8

Some students use Artificial Intelligence (AI) tools, such as Copilot and ChatGPT, to help with their schoolwork. One of the main arguments against this is that sometimes, despite good prompts, AI can give incorrect or misleading information, which may confuse students or lead them to learn inaccurate material. Explain **two** reasons why AI can make mistakes.

1.
2.

Question 9

A company is developing a software program to fully manage a restaurant ordering system for customers. They will use modular design for this system.

(a) Explain what is meant by modular design in software development.

(b) Suggest **three** modules that could be created for this restaurant ordering system.

1.
2.
3.

Question 10

A company is designing a new educational app for secondary school students. The app will be used by students with a wide range of abilities, including those with visual, auditory, and motor impairments.

Describe **two** examples of how the educational app could be designed to follow Principles of Universal Design by referring to a specific principle in each example.



Example 1:
Example 2:

Question 11

The algorithms that control self-driving vehicles often rely on heuristics to help them make decisions.

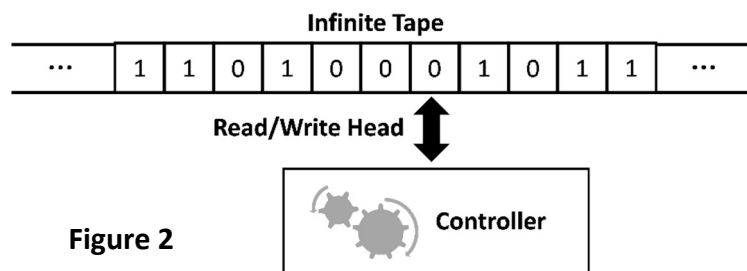


(a) Outline **one** heuristic that could be used in the context of self-driving cars.

(b) State **one** limitation of heuristics.

Question 12

Figure 2 below shows a simplified model of a Turing machine.



(a) Outline the purpose of the controller.

(b) Explain why Turing machines are considered important in computer science.

Answer any **two** questions.

Question 13

- (a) Newgrange is a prehistoric passage tomb in Meath. It was built over 5,000 years ago and is world-famous for the beam of sunlight that lights up its inner chamber at sunrise on the winter solstice. The Office of Public Works (OPW) plans to launch an information system for the 2026 Winter Solstice Lottery, allowing members of the public to apply for a place inside the chamber during this event.



- (i) Explain the term 'information system'.

- (ii) State the names of **two** components of every information system.

Component 1:
Component 2:

- (iii) Suggest **two** functional requirements (what the system does) and **two** non-functional requirements (how the system performs) for the Winter Solstice Lottery system.

Functional requirement 1:
Functional requirement 2:
Non-functional requirement 1:
Non-functional requirement 2:

This question continues on the next page.

(b) Applicants must provide certain details before submitting their lottery entry.

- (i)** For each of the **three** datatypes named below, provide **one** suitable example of a field name that the system might use and explain why the example is appropriate for the datatype.

String example:
Explain:
Integer example:
Explain:
Boolean example:
Explain:

- (ii)** Sketch a simple wireframe (user interface) for the application page where users submit their entry details for the lottery. Your diagram should include notes outlining the purpose of the main elements.

--

(c) The development team is deciding between creating a mobile application or a responsive website.

(i) Compare a mobile application and a responsive website under the headings: user experience and accessibility.

User experience:
Accessibility:

(ii) Applicants often make mistakes when entering data. Explain **two** checks the system could make to ensure that user-entered data is valid (validation) and **one** check the system could make to confirm that the data entered is correct (verification).

Validation check 1:
Validation check 2:
Verification check:

Question 14

Königsberg was a city built around a river with two islands in the middle. Seven bridges, numbered 1 to 7, connected the four areas of land, A, B, C and D, as shown in **Figure 3**.

The Königsberg bridge problem asks: Is it possible to go on a walk that crosses each bridge exactly once, without ever crossing the same bridge twice?

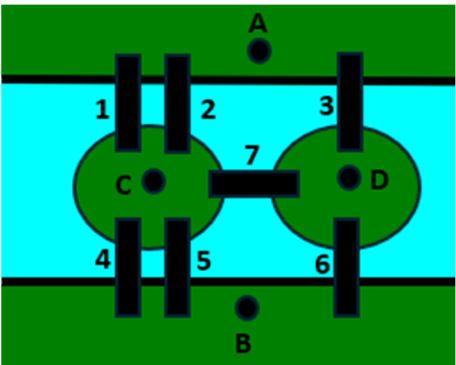


Figure 3

- (a) An Euler path is a path that crosses all bridges exactly once without ever crossing the same bridge twice.
- (i) Starting from side A, $1 \rightarrow 4 \rightarrow 5 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 7$ includes all seven bridges but is not an Euler path. Outline why this path is not an Euler path.

- (ii) **Figures 4 and 5** both show alternative bridge networks to **Figure 3**. Both figures contain Euler paths. Starting from land area C, identify an Euler path from each of the two figures.

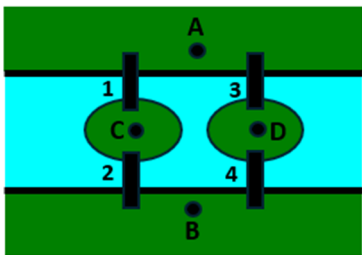


Figure 4

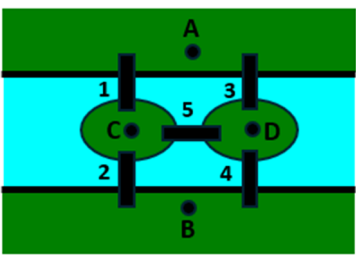


Figure 5

Euler path from Figure 4:
Euler path from Figure 5:

- (iii) Examine the three figures above. For each land area listed in Column A of the table below, state whether the number of bridges connected to it is **odd** or **even**. Record your answers in Columns C and D. Column B has already been completed for Figure 3.

Column A Area of Land	ODD OR EVEN		
	Column B (Figure 3)	Column C (Figure 4)	Column D (Figure 5)
A	Odd		
B	Odd		
C	Odd		
D	Odd		

- (iv) Deduce **one** pattern that is necessary for an Euler path to exist.

- (b) Abstraction and algorithmic thinking are two important aspects of computational thinking.

- (i) Using **Figure 6** explain how abstraction is applied to the Königsberg bridge problem. State **one** limitation of using abstraction in this context.

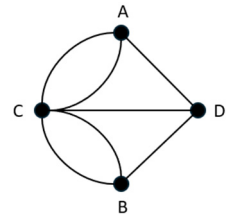


Figure 6

Explain:

Limitation:

--

- (ii) Four friends must cross a dangerous bridge at night. Only two people can cross at a time, and a torch is required for any crossing. The group only has one torch. Crossing times are: Alex (1 min), Beth (3 min), Carol (6 min), David (10 min).



A pair crosses at the speed of the slower person, and the torch must be returned if anyone remains. Calculate the fastest sequence of crossings so that everyone gets across.

--

This question continues on the next page.

- (c) A city council is considering adopting a system to find and recommend the most efficient routes based on algorithms like those used to analyse the Königsberg bridge problem. Appraise the potential positive and negative impacts these types of systems could have on culture and society.

Appraise positive impacts:
Appraise negative impacts:

Question 15

A horticulture company is designing a greenhouse controller that contains an embedded system to automate healthy growing conditions in a greenhouse. The device will monitor the environment and control equipment automatically. A simplified design is shown in **Figure 7**.

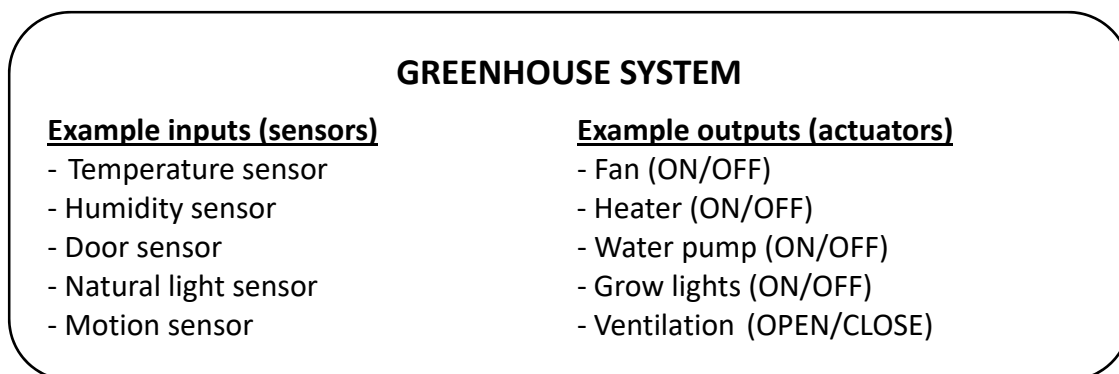


Figure 7

(a) The system uses a combination of digital and analogue sensors.

(i) Name any **two** digital sensors and any **two** analogue sensors that could be used in the greenhouse system.

Digital sensor 1:
Digital sensor 2:
Analogue sensor 1:
Analogue sensor 2:

(ii) List **two** additional outputs, other than those named in **Figure 7**, that could be used in the greenhouse system.

1.
2.

(iii) Describe the difference between digital and analogue sensors.

This question continues on the next page.

(b) The system maintains healthy growing conditions by following a set of rules.

(i) The intention of the code snippet shown below is to implement a rule that sets the state of the fan, based on the current temperature reading and the state of the door.

```
1 if temperature > 30:
2     fan = "ON"
3 if door_open:
4     fan = "OFF"
```

Identify **one** potential problem that could be caused in a real greenhouse by the above code. Describe a solution to overcome the problem.

Problem:
Solution:

(ii) Suggest **one** additional rule that uses sensors which could be used to maintain healthy growing conditions in the greenhouse system.

(iii) The greenhouse system stores sensor readings and the state of the fan each hour. Describe **one** benefit of collecting this data and explain how it could be used to improve the performance of the system.

Benefit:
Explain:

- (c) Reflect on the design and development process of an embedded system you worked on either as part of a group or as an individual.
- (i) State **two** characteristics of embedded systems and justify why each one is important in the design of a greenhouse controller.

Characteristic 1:
Justify:
Characteristic 2:
Justify:

- (ii) A good test strategy is a key aspect of the design and development process. Choose any **two** stages of software testing and explain how each stage applies to the greenhouse system.

1.
2.

Space for extra work.

Indicate clearly the number and part of the question(s) you are answering.

[illegible]

Space for extra work.

Indicate clearly the number and part of the question(s) you are answering.

[illegible]

Acknowledgements

Images

Image on page 5: <https://www.linkedin.com/pulse/cloud-vs-local-server-where-should-you-store-your-data-ankita-sharda>

Image on page 7: <https://medium.com/@khanmahad974/10-best-educational-apps-for-kids-learning-and-fun-c48aee5ecee>

Image on page 8: https://www.flaticon.com/free-icon/self-driving_8002041

Image on page 9: <https://www.ouririshheritage.org/content/archive/place/miscellaneous-place/newgrange-the-winter-solstice>

Copyright notice

This examination paper may contain text or images for which the State Examinations Commission is not the copyright owner, and which may have been adapted, for the purpose of assessment, without the authors' prior consent. This examination paper has been prepared in accordance with Section 53(5) of the *Copyright and Related Rights Act, 2000*. Any subsequent use for a purpose other than the intended purpose is not authorised. The Commission does not accept liability for any infringement of third-party rights arising from unauthorised distribution or use of this examination paper.

Leaving Certificate – Higher Level

Computer Science – Sections A & B

Wednesday 20 May

Morning 9:30 – 11:00