



Cambridge International AS & A Level

CANDIDATE NAME



CENTRE NUMBER

--	--	--	--	--

CANDIDATE NUMBER

--	--	--	--



COMPUTER SCIENCE

9618/12

Paper 1 Theory Fundamentals

October/November 2024

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **16** pages. Any blank pages are indicated.





1 (a) Complete the truth table for the logic expression:

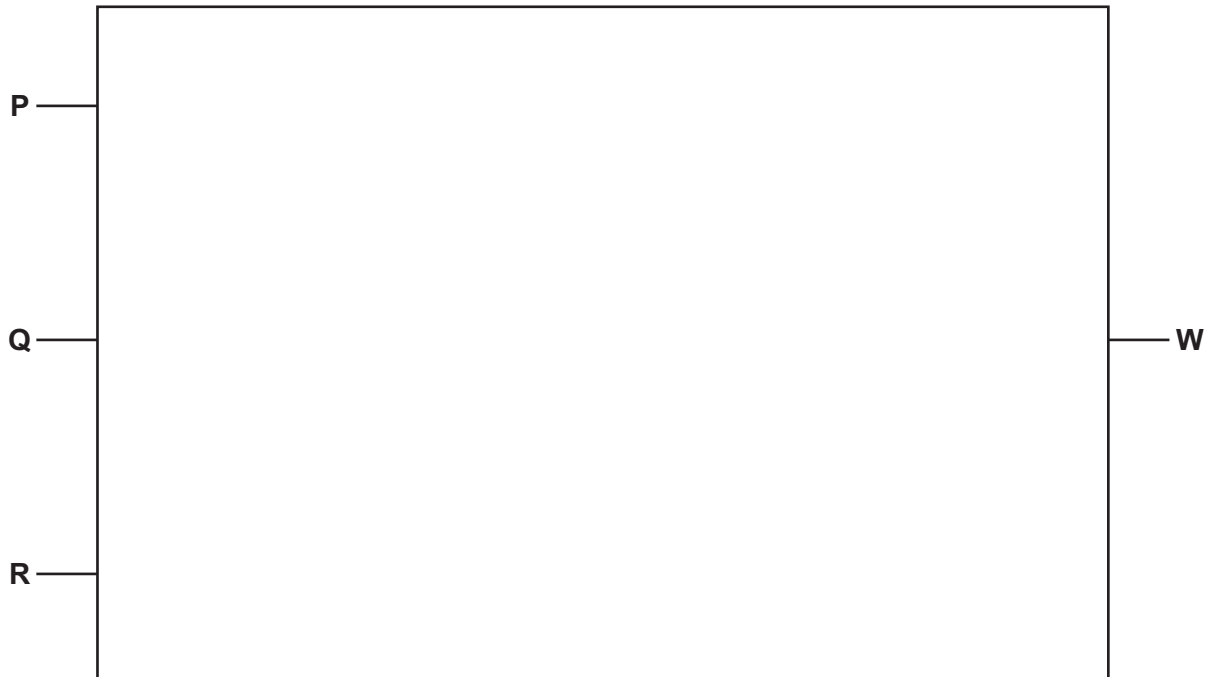
$$X = (A \text{ XOR } B) \text{ NAND } (A \text{ AND } (B \text{ XOR } C))$$

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[2]

(b) Draw the logic circuit for the logic expression:

$$W = P \text{ NAND } ((Q \text{ OR } \text{NOT } R) \text{ XOR } (P \text{ XOR } Q))$$



[2]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





2 Embedded systems are used in many electronic devices.

(a) Describe the drawbacks of embedded systems.

.....

.....

.....

.....

.....

.....

..... [3]

(b) An embedded system has Dynamic RAM (DRAM).

Identify **one** benefit of using DRAM instead of Static RAM (SRAM) in an embedded system.

.....

..... [1]

(c) Give **two** differences between Erasable Programmable ROM (EPROM) and Electrically Erasable Programmable ROM (EEPROM).

Difference 1

.....

.....

Difference 2

.....

.....

[2]



DO NOT WRITE IN THIS MARGIN



3 A student has a computer.

(a) The computer is designed using the Von Neumann model for a computer system.

Complete the table by describing the purpose of each of the given registers.

Register	Purpose
Program Counter (PC)
Memory Address Register (MAR)
Memory Data Register (MDR)
Index Register (IX)

[4]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





5 A computer programmer is learning about the importance of acting ethically at work.

(a) Explain the reasons why the computer programmer needs to act ethically towards colleagues and the public.

Colleagues
.....
.....

The public
.....
.....

[4]

(b) The programmer writes a program to be used in a business. The source code of the program can be modified by the business. The business pays the programmer for the maintenance and security updates.

(i) Identify **one** suitable type of software licence for the program **and** describe the reasons for your choice.

Type of software licence

Reasons for choice

.....
.....
.....

[3]

(ii) Explain the reasons why the programmer should copyright their program.

.....
.....
.....

[2]

DO NOT WRITE IN THIS MARGIN





(ii) The database also has the table `INVOICE` that stores data about each invoice that is sent to a customer.

Example data from the table `INVOICE` is given.

<code>InvoiceID</code>	<code>DateSent</code>	<code>Amount</code>	<code>Paid</code>	<code>JobID</code>
29262	12/12/2023	105.20	Y	221
26765	11/11/2023	200.00	Y	315
13290	02/01/2024	50.00	Y	315
34090	05/02/2024	25.95	N	569

Write a Structured Query Language (SQL) script to return the total amount of all the invoices sent in the year 2023 that have been paid.

.....

.....

.....

.....

.....

.....

..... [3]

DO NOT WRITE IN THIS MARGIN





7 A student takes a photograph of a science experiment.

(a) The photograph is saved as a bitmapped image.

(i) Define the following bitmap terms.

Colour depth
.....

File header
.....

[2]

(ii) Explain why changing the image resolution will affect the image quality and file size.

Image quality
.....
.....

File size
.....
.....

[2]

(iii) Identify **one** lossless method of compressing an image.

..... [1]

(b) The student draws a picture on paper that is scanned into the computer and saved as a vector graphic.

Define the vector graphic terms property and drawing list.

Property
.....

Drawing list
.....

[2]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN



* 00080000011 *



11



BLANK PAGE

DO NOT WRITE IN THIS MARGIN





- 8 The following table shows part of the instruction set for a processor. The processor has two registers, the Accumulator (ACC) and the Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
ADD	#n/Bn/&n	Add the number n to the ACC
ADD	<address>	Add the contents of the given address to the ACC
SUB	#n/Bn/&n	Subtract the number n from the ACC
SUB	<address>	Subtract the contents of the given address from the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
DEC	<register>	Subtract 1 from the contents of the register (ACC or IX)
<address> can be an absolute or a symbolic address # denotes a denary number, e.g. #123 B denotes a binary number, e.g. B01001010 & denotes a hexadecimal number, e.g. &4A		





(a) The current contents of memory are shown:

Address	Data
19	25
20	23
21	2
22	4
23	15
24	50
25	22

The current contents of the ACC and IX are shown:

ACC	50
IX	20

Complete the table by writing the content of the ACC and the IX after each set of instructions has run.

	Instructions	ACC content	IX content
1	LDM #19 DEC ACC		
2	LDD 23 ADD 19		
3	LDI 25 INC ACC		
4	LDR #21 LDX 2		

[5]



DO NOT WRITE IN THIS MARGIN



(b) The instruction set also includes these bit manipulation instructions:

Instruction		Explanation
Opcode	Operand	
AND	#n/Bn/&n	Bitwise AND operation of the contents of ACC with the operand
AND	<address>	Bitwise AND operation of the contents of ACC with the contents of <address>
XOR	#n/Bn/&n	Bitwise XOR operation of the contents of ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of ACC with the contents of <address>
OR	#n/Bn/&n	Bitwise OR operation of the contents of ACC with the operand
OR	<address>	Bitwise OR operation of the contents of ACC with the contents of <address>
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right-hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left-hand end.

<address> can be an absolute or a symbolic address
 # denotes a denary number, e.g. #123
 B denotes a binary number, e.g. B01001010
 & denotes a hexadecimal number, e.g. &4A

The current content of the ACC is shown:

ACC	1	0	0	1	1	0	1	0
------------	---	---	---	---	---	---	---	---

(i) The table has three sets of instructions. The binary number 10011010 is reloaded into the ACC before each set of instructions is run.

Complete the table by writing the content of the ACC after each set of instructions has run.

	Instructions	ACC content
1	LSL #2	
2	ADD #5 AND #30	
3	OR B11110010 INC ACC	

[3]





- (ii) Explain how bit manipulation can be used to test whether the binary number stored in the ACC represents an odd denary number.

Write the bit manipulation instruction that will be used.

Explanation

.....

.....

.....

.....

Instruction

[3]

DO NOT WRITE IN THIS MARGIN





- 9 A road bridge has a weight limit and a height limit for vehicles. For example, a vehicle must weigh less than 10 000 kg and must have a height of less than 3 m.

The bridge has a warning system. If a vehicle is approaching the bridge and it exceeds one or both limits, a sign displays a warning telling the driver of the vehicle to stop.

- (a) The bridge warning system uses sensors to detect if a vehicle exceeds the limits.

Complete the table by identifying **two** different sensors that could be used by the system **and** describe how each sensor is used by the system.

Sensor	Use in bridge warning system
<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>
<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>

[2]

- (b) Explain whether the bridge warning system is an example of a monitoring system or of a control system.

.....

.....

.....

..... [2]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

