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Cambridge Assessment International Education

Done

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9618/13

October/November 2025

1 hour 30 minutes

COMPUTER SCIENCE

Paper 1 Theory Fundamentals

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.

[Turn

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1 (a) A student creates sound recordings. Done after paper

Making changes to a sound recording may impact the accuracy of the resulting sound file or the size of the file.

Draw **two** lines from each change to the impacts it has on the sound file.

Change	Impact
increase the duration of the recording	the file size gets bigger
increase the sampling rate	no change in the file size
decrease the sampling resolution	the file size gets smaller
	the accuracy of the sound file improves
	no change to the accuracy of the sound file
	the accuracy of the sound file worsens

0

[3]

(b) The file names of the sound recordings are stored using the ASCII character set.

Explain how text is represented by the ASCII character set.

In ASCII character ~~the 32~~ 7 to 8 bits of character are stored. It only support Engish.

[2]

(c) Give **two** differences between the ASCII and UNICODE character sets.

1 ASCII uses 7 to 8 bits. Unicode supports upto 32 bits.

2 Unicode can represent wider range of character including different languages.

[2]

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2 (a) Data in a computer system is represented in binary.

Put **one** tick (✓) in each row to identify the minimum number of bits used to store each example of data.

Example of data	Number of bits						
	4	8	16	24	32	64	128
the hexadecimal value F139			✓				
16 000 000 unique amplitude values				✓			
an IPv4 address					✓	✓	
256 unique colours		✓					
an IPv6 address							✓
the denary value 65 000			✓				

[3]

(b) Convert the denary number –108 into a 12-bit two's complement binary number.

128 64 32 16 8 4 2 1

1 1 1 1 1 0 0 1 0 1 0 0 [1]

(c) A three-place arithmetic shift to the right is performed on the following two's complement negative integer.

Show the result of this arithmetic shift.

10010011

1 1 1 1 0 0 1 0 [1]

(d) Convert the following positive binary integer into hexadecimal.

128 64 32 16 8 4 2 1 128 64 32 16 8 4 2 1

1111 0011 0011 1011

E 3 B [1]

64
+32
96
+4
100

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3 (a) Complete the truth table for the following logic expression:

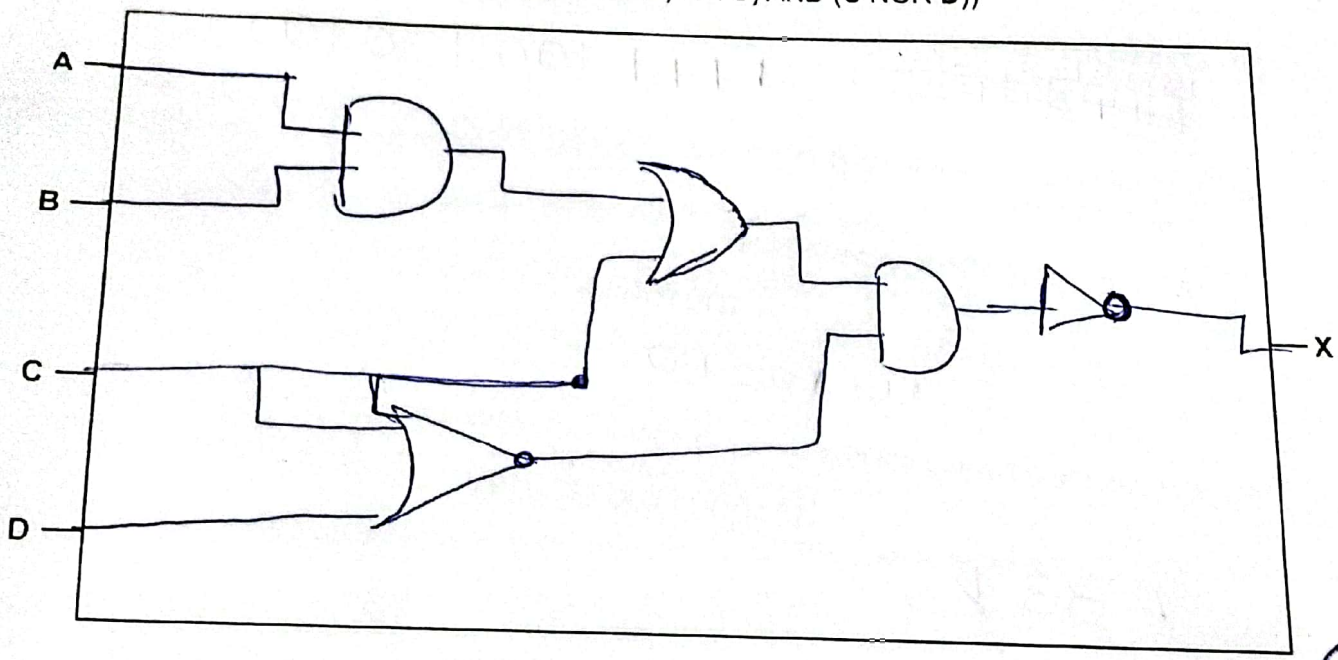
X = (A NOR B) NAND (C XOR B)

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

[2]

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

X = NOT (((A AND B) OR C) AND (C NOR D))



[2]

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4 A network engineer is setting up a Local Area Network (LAN) in an office. The network uses both wired and wireless connectivity.

(a) Give three advantages of a wireless network compared to a wired network.

1 No cabling is used easier to setup.

2 Multiple different types of network can be connected.

3 Easier to add additional devices

[3]

(b) Give **one** drawback of using a wireless network.

Transmission can be slow.

[1]

(c) Complete the table by writing the name of the type of memory technology for each description.

Description	Memory technology
A read only memory where the contents can be erased using a voltage pulse. The contents can be changed multiple times without physically removing the memory.	EEPROM
A read only memory where the contents are erased using ultraviolet (UV) light. The memory must be physically removed to be reprogrammed.	ffPROM
A read only memory where the contents can be written only once after manufacture.	PROM

[3]

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5 A company creates a relational database to store data about its customers.

The database, REVIEWS, stores data about the customers, products, complaints and staff.

The database has four tables:

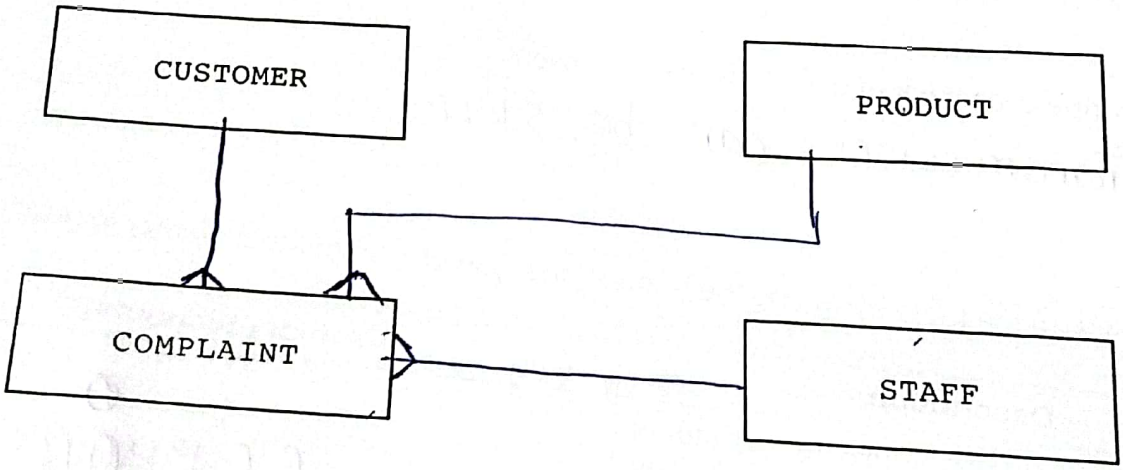
CUSTOMER(CustomerID, CustomerFirstName, CustomerLastName, CustomerEmail)

PRODUCT(ProductID, ProductName, ProductDetail, Price, Rating)

COMPLAINT(ComplaintID, ProductID, CustomerID, ComplaintDetails, StaffID)

STAFF(StaffID, StaffFirstName, StaffLastName, Department, RemoteWorker)

(a) Complete the entity-relationship (E-R) diagram for the database REVIEWS.



[3]

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(b) Some example data from the STAFF table is shown.

StaffID	StaffFirstName	StaffLastName	Department	RemoteWorker
1	Ralph	Jura	E	Yes
2	Luca	Emcee	A	Yes
3	Darwin	Acula	F	No

Write a Structured Query Language (SQL) script to define the table STAFF.

```
CREATE TABLE STAFF(
StaffID INTEGER,
StaffFirstName VARCHAR,
StaffLastName VARCHAR,
Department CHAR,
RemoteWorker BOOLEAN
PRIMARY KEY (STAFFID),
);
```

[4]

(c) Products are given a rating between 1 and 10 inclusive.

Write an SQL script to return only the ProductID, ProductName and ComplaintDetails for all products with a rating of 5 or less. The results need to be displayed in descending order of rating.

```
SELECT PRODUCT.ProductID, ProductName, ComplaintDetails
FROM PRODUCT, COMPLAINT
WHERE PRODUCT.ProductID = COMPLAINT.ProductID
AND RATING <= 5
ORDER BY RATING DESC;
```

[5]

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(d) A Database Management System (DBMS) is used to maintain and manage the database.

Describe **two** ways in which the DBMS can be used to ensure the security of the customer data.

1 Authentication method can be implemented which prevents unauthorised access to customer's data.

2 Regular backups can be schedules so that the second copy of the customer is available.

[4]

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6 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 the ACC
[illegible]	[illegible]	Bitwise AND operation of the contents of the ACC with the operand
AND	<address>	Bitwise AND operation of the contents of the ACC with the contents of <address>
XOR	#n / Bn / &n	Bitwise XOR operation of the contents of the ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of the ACC with the contents of <address>
OR	#n / Bn / &n	Bitwise OR operation of the contents of the ACC with the operand
OR	<address>	Bitwise OR operation of the contents of the ACC with the contents of <address>
CMP	#n	Compare the contents of the ACC with number n
CMP	<address>	Compare the contents of the ACC with the contents of <address>
LSL	#n	Bits in the ACC are shifted logically n places to the left. Zeros are introduced on the right-hand end
LSR	#n	Bits in the ACC are shifted logically n places to the right. Zeros are introduced on the left-hand end

<address> can be an absolute or symbolic address
# denotes a denary number, e.g. #127
B denotes a binary number, e.g. B10010001
& denotes a hexadecimal number, e.g. &4A

The current contents of main memory are shown:

Address	Data
100	0000 0011
101	1010 1110
102	1100 1100
103	1111 1111
104	1100 1100

F 1

1 1 1 0001

0000 0011
1111 0001
0000 0001

100

128	64	32	16	8	4	2	1
0	1	1	0	0	1	0	0

00001111
10101110
00001110

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(a) Complete the table by writing the contents of the ACC after the execution of each instruction.

Current contents of the ACC	Instruction	Contents of the ACC after the execution of the instruction
0000 1111	AND 101	00001110
0000 0000	LDM #100	0 11 00100
0000 0001	XOR &F1	1111 0000
0001 0001	CMP 101	00010001

[4]

(b) The Von Neumann model for a computer system uses registers.

Describe the role of the Memory Address Register (MAR) and Memory Data Register (MDR) in the fetch-execute (F-E) cycle.

MAR stores the address ~~to~~ of the next instruction. The address is recieved from the Program counter (PC). The MAR stores the data instruction which has been written. The instruction is passed to CIR for decoding and executing.

[4]

(c) Assembly language instructions are grouped.

Complete each statement by writing the name of the appropriate instruction group.

Loading data into the accumulator is an example of an instruction in the ~~Address~~ Data movement group. Incrementing the index register is an example of an instruction in the Arithemictic operation group. Branching to another address is an example of an instruction in the Conditional and unconditional jum instructions group. [3]

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7 A digital video camera records students in a classroom. The data is transferred from the digital video camera over the internet to a server. Artificial Intelligence (AI) is used to analyse the video on the server to identify when students are interacting with the lesson and the teacher.

(a) Describe **one** ethical impact of this use of AI in the classroom.

The learning method would be improved by identifying the students who are struggling. There ~~would~~ could be privacy concerns which make teachers and student uncomfertable. [2]

(b) A video is made of many bitmap images called frames. 30 frames are recorded every second.

Each frame is 4000 pixels wide by 3000 pixels high. The video records using 16-bit colour depth.

Calculate an estimate for the file size for **one** second of the video in gigabytes.

Show your working.

File size = $\frac{4000 \times 3000 \times 30 \times 16}{1000 \times 1000 \times 1000}$

$= \frac{3 \times 16}{100}$

$= \frac{48}{50} = \frac{24}{25}$

$= \frac{12}{25} = 0.72$

File size ..0.72.. gigabytes

[2]

(c) Identify **and** describe **one** method of data verification that can be used when transferring data from the digital video camera to the server.

Method ..Checksum..

Description ..A calculation is made from the data and transmitted within the data. The receiver performs the same calculation and compares with received checksum. [3]

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(d) Describe **two** reasons why the server that stores the videos uses magnetic hard disks instead of solid state (flash) memory.

1 A large number of write operations are being performed continuously.

2 Lower cost per unit charge so high capcity of storage is required.

[4]

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(e) The table contains three algorithms that perform data validation. The third algorithm uses the functions MID and LENGTH.

The functions MID and LENGTH are defined as follows:

- MID(ThisString : STRING, x : INTEGER, y : INTEGER) RETURNS STRING
  returns a string of length y starting at position x from ThisString
- LENGTH(ThisString : STRING) RETURNS INTEGER
  returns the integer value representing the length of ThisString

Complete the table to identify the method of data validation for each algorithm. Each method of data validation must be different.

Algorithm	Method of data validation

INPUT x
IF x < 1 or x > 26 THEN
OUTPUT "Invalid"
ENDIF
	Range check

INPUT x
IF x <> 'R' AND x <> 'G' AND x <> 'B' THEN
OUTPUT "Invalid"
ENDIF
	Existence Check

INPUT x
FLAG ← FALSE
FOR INDEX ← 1 TO LENGTH(x)
IF MID(x, INDEX, 1) = "@" THEN
FLAG ← TRUE
ENDIF
NEXT INDEX
IF NOT FLAG THEN
OUTPUT "Invalid"
ENDIF
	Format check.

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Compilers and interpreters are used to translate programs written in a high-level language into a low-level language.

(a) State **two** disadvantages of using a compiler compared to an interpreter during program development.

1 Large amount of source code take time to compile.

2 The code must be recompilied when it is changed. [2]

(b) Explain how a programmer benefits from using program libraries during program development.

Programmer time is saved as code does not have written from sctrach. A library routine is more likely to be worked, as the code is already tested. ~~Be~~ Use of library routine to perform complex functions. [3]

(c) A programmer is developing an Operating System (OS).

Identify **two** types of software licence the programmer can use to allow other people to edit and redistribute the OS.

1 Open Source

2 Free software [2]

(d) Memory management is one key management task performed by an OS.

Give **three** other key management tasks that are performed by an OS.

1 File managment

2 Security managment

3 Hardware managment [3]

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