Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMPUTER SCIENCE **9618/11**

Paper 1 Theory Fundamentals **May/June 2025**

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.

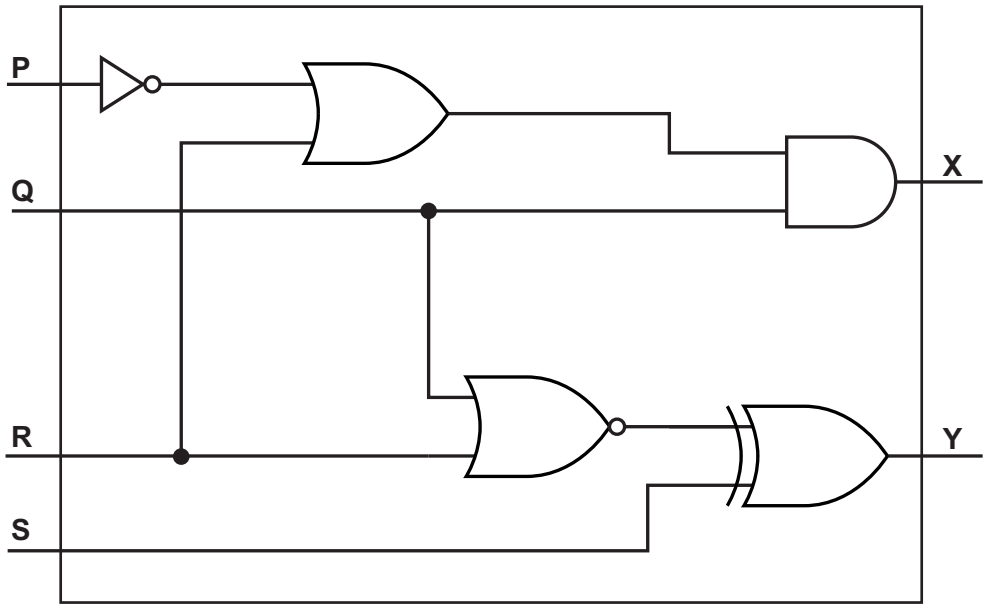
INFORMATION

- 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 **20** pages. Any blank pages are indicated.

[Turn over

1 **(a)** Write the logic expressions for the following logic circuit.

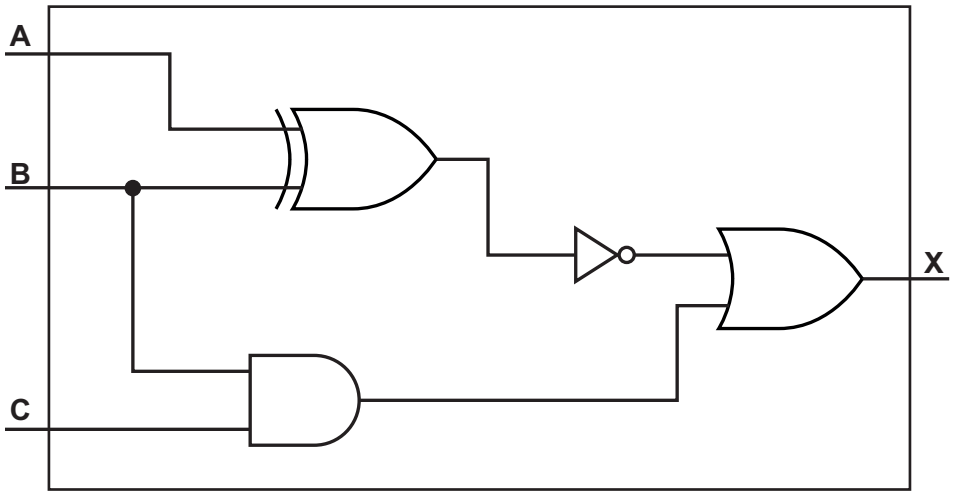


X = ...

Y = ...

[2]

(b) Complete the truth table for the following logic circuit.



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]

2 Programmers in a software development company take part in live video conferences to discuss their work.

The live video conferences take place using real-time bit streaming. The video is compressed before it is transmitted.

(a) Explain how data is transferred using real-time bit streaming.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) **(i)** Explain the reasons why a video is compressed before it is transmitted using real-time bit streaming.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Identify whether the lossy or lossless compression method is more appropriate for real-time bit streaming. Justify your answer.

Compression method .....

Justification .....

.....

.....

.....

.....

.....

[3]

(c) The video conference is accessed over the internet.

Complete the table by stating how modems **and** dedicated lines are used when data is transmitted over the internet.

Hardware	Use
modems	....
dedicated lines	....

[2]

3 A computer stores images and text files.

(a) One of the images is a bitmapped image.

Complete the table by writing the answer for each statement.

Statement	Answer
the term for the smallest element that makes up an image	
the largest number of different colours that can be represented with a bit depth of 8 bits	
the term for the dots per inch (dpi) when an image is displayed	

[3]

(b) The text in the files is stored using the Unicode character set.

(i) Give **two** advantages of using the Unicode character set instead of using the ASCII character set.

1 .....

.....

2 .....

.....

[2]

(ii) The Unicode character '**ᚲ**' has the binary value: 0010 0111 0110 1110

Convert the binary value for the character '**ᚲ**' into denary.

..... [1]

(iii) The Unicode character '∑' has the hexadecimal value 2140

Convert the hexadecimal code for the character '∑' into denary.

..... [1]

4 A shop installs a new system that allows users to purchase items without going through a manual checkout.

The new system:

- identifies customers when they enter the shop and matches them to their account
- prevents a customer from walking through the automatic barriers if they do not have an account
- automatically detects the items that a customer has taken from a shelf and charges these to the customer's account.

(a) The new system uses digital cameras and Artificial Intelligence (AI) to identify the customers.

Explain how the new system uses AI to identify each customer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) The new system uses sensors to identify the items taken from a shelf.

Identify **one** type of sensor that can be used in this new system.

State how the sensor can be used to identify the items taken from a shelf.

Sensor .....

Use .....

.....

[2]

5 A company builds and sells furniture to customers. The company stores data about customers, their payment cards and their furniture orders in a database.

The database, FURNITURE, has the following tables:

CUSTOMER(CustomerID, Name, Phone)

CUSTOMER_CARD_DATA(CardID, CustomerID, CardType, CardNumber, EndDate)

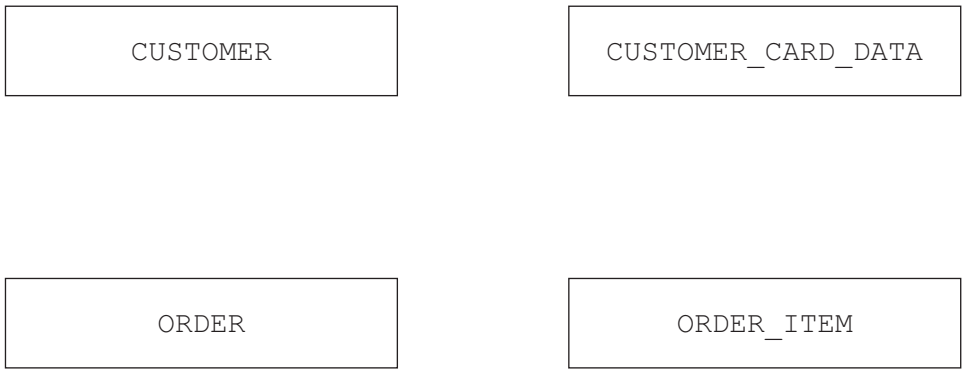
ORDER(OrderID, CustomerID, TotalCost, Paid, OrderDate, Complete)

ORDER_ITEM(OrderItemID, OrderID, Type, Height, Width, Depth, Details)

The primary keys are underlined in each table.

The attribute Complete in the table ORDER stores the Boolean value TRUE if the order has been built and FALSE if the order has not been built.

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



[3]

(b) Identify **one** attribute in the table CUSTOMER_CARD_DATA that could be a candidate key.

..... [1]

(c) Identify **two** tables in the database that contain one or more foreign keys.
Give **one** attribute that is a foreign key in each table.

	Table	Foreign key
1		
2		

[2]

(d) Explain the reasons why the data in the table `ORDER_ITEM` cannot be stored in the table `ORDER`

.....

.....

.....

.....

.....

..... [3]

(e) Write an Structured Query Language (SQL) script to output the customer ID, the customer's name and the total cost of the customer's orders that have **not** been paid.

The output of the total cost must have an appropriate title.

.....

.....

.....

.....

.....

.....

.....

..... [4]

6 A programmer is buying a new computer.

(a) The programmer is considering the following two computers:

Computer 1	Quad-core 2.2 GHz processor 16-bit architecture 1 GB Random Access Memory (RAM) 500 GB magnetic hard disk
Computer 2	Dual-core 3.8 GHz processor 32-bit architecture 2 GB RAM 500 GB solid state drive (SSD)

(i) Computer 1 has a magnetic hard disk.

Complete the description of the principal operation of a magnetic hard disk by writing the missing words.

The magnetic hard disk has one or more ..... that can be magnetised. These are mounted on a ..... and rotate at high speed.

A ..... is moved across the surface on an arm.

When data is read, the changes in the ..... produce a change in the electric current.

[4]

(ii) The two computers have different amounts of RAM.

Explain how different amounts of RAM affect the performance of a computer.

.....

.....

.....

.....

.....

..... [3]

(iii) The two computers have different bus widths.

Explain how different bus widths affect the performance of a computer.

.....

.....

.....

..... [2]

(b) Both computers have an Operating System (OS).

Describe the purpose of an OS in a computer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

7 A banker stores personal data on their work computer.

(a) The banker needs to transfer confidential data across the internet.

Identify and describe **one** method of restricting the risks posed by an unauthorised person intercepting the data whilst it is being transferred across the internet.

Method .....

Description .....

.....

.....

.....

.....

[3]

(b) The banker receives confidential data across the internet. The data includes a digital signature.

Explain how a digital signature can make sure the data has **not** been changed during transmission.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(c) The data that is transferred can also be verified using a checksum.

Explain how data can be verified using a checksum.

.....

.....

.....

.....

.....

..... [3]

8 **(a)** The following table shows part of the instruction set for a processor. The processor has two registers: the Accumulator (ACC) and an 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
INC	<register>	Add 1 to the contents of the register (ACC or IX)
STO	<address>	Store the contents of ACC at the given address
ADD	#n/Bn/&n	Add the number n to the ACC
DEC	<register>	Subtract 1 from the contents of the register (ACC or IX)
JMP	<address>	Jump to the given address
CMP	<address>	Compare the contents of ACC with the contents of <address>
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
END		Return control to the operating system

ACC denotes Accumulator
<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 contents of memory are:

address	Instruction
80	10
81	8
82	80
83	81
...	
200	LDD 81
201	INC ACC
202	STO 83
203	LDI 82
204	CMP 83
205	JPE 209
206	LDD 83
207	ADD #10
208	JMP 210
209	DEC ACC
210	STO 81
211	END

Trace the program currently in memory using the following trace table.

Instruction address	ACC	Memory address			
		80	81	82	83
		10	8	80	81

[4]

(b) The table shows part of the instruction set for a processor. The processor has one register: the Accumulator (ACC).

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 symbolic address # denotes a denary number, e.g. #123 B denotes a binary number, e.g. B01001010 & denotes a hexadecimal number, e.g. &4A		

(i) Write the bit manipulation instruction that can be used to set the least significant bit to 1 in an 8-bit register. All other bits must remain unchanged.

The instruction needs to work on a register that contains any 8-bit binary number.

..... [1]

(ii) The ACC currently contains the following binary value.

0	1	0	1	0	1	0	1

Write the result after the instruction `XOR &FE` is run.

[1]

(iii) The ACC currently contains the following binary value.

0	1	1	0	1	0	1	1

Write the result after the instruction `LSR #5` is run.

[1]

BLANK PAGE

BLANK PAGE

BLANK PAGE