Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0392410263

COMPUTER SCIENCE **9618/13**

Paper 1 Theory Fundamentals **October/November 2021**

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)** Draw **one** line from each binary value to its equivalent (same) value on the right.

Binary value	
8 bits	1 kibibyte
8000 bits	1 gigabyte
1000 kilobytes	1 byte
1024 mebibytes	1 kilobyte
8192 bits	1 gibibyte
	1 megabyte
	1 mebibyte

[5]

(b) **(i)** Perform the following binary addition. Show your working.

```
  10101010
+ 00110111
```

[2]

(ii) State how an overflow can occur when adding two binary integers.

.....

..... [1]

(c) Convert the hexadecimal value F0 into denary.

.....

..... [1]

2 Xanthe wants to maintain the integrity and security of data stored on her computer.

(a) Explain the difference between data security and data integrity.

.....

.....

.....

..... [2]

(b) Xanthe uses both data validation and data verification when entering data on her computer.

(i) Describe how data validation helps to protect the integrity of the data. Give an example in your answer.

Description .....

.....

.....

Example .....
[2]

(ii) Describe how data verification helps to protect the integrity of the data. Give an example in your answer.

Description .....

.....

.....

Example .....
[2]

(c) Two malware threats are spyware and viruses.

Give **two** similarities and **one** difference between spyware and a virus.

Similarity 1 .....

.....

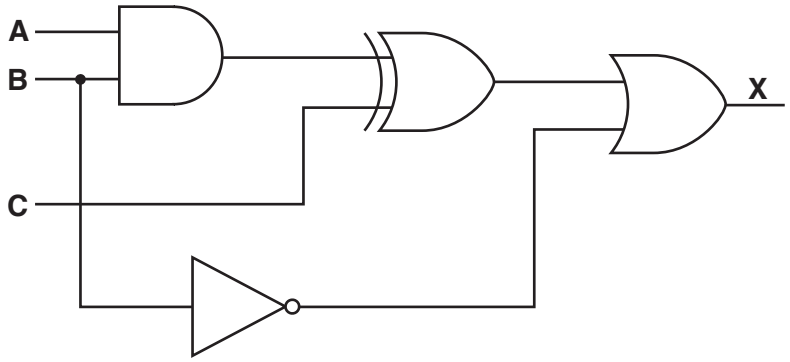
Similarity 2 .....

.....

Difference .....

.....
[3]

3 A logic circuit is shown:



(a) Write the logic expression for the logic circuit.

.....

..... [3]

(b) Complete the truth table for the given 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]

(c) Identify **one** logic gate **not** used in the given logic circuit. Draw the symbol for the logic gate **and** complete its truth table.

Logic gate: ……

Symbol:

Truth table:

A	B	Output
0	0	
0	1	
1	0	
1	1	

[3]

4 Francis is starting his first job as a software developer for a multinational company.

(a) Francis has been advised to join a professional ethical body.

Describe the benefits to Francis of joining a professional ethical body.

.....

.....

.....

.....

.....

..... [3]

(b) Francis is shown the software he will be working on. He is unfamiliar with the Integrated Development Environment (IDE) he is required to use.

(i) Describe the ways in which Francis can act ethically in this situation.

.....

.....

.....

..... [2]

(ii) A typical IDE provides debugging tools to support the testing of a program.

Identify **three** other tools or features found in a typical IDE to support the writing of the program.

1 .....

2 .....

3 .....

[3]

(c) Francis is part of a team writing a program. He finds an error in part of the program that has already been tested. He decides not to tell anyone because he is worried about the consequences.

Explain the reasons why Francis acted unethically in this situation.

.....

.....

.....

..... [2]

(d) Francis's team use language translators.

Complete the descriptions of language translators by writing the missing words.

..... are usually used when a high-level language program is complete. They translate all the code at the same time and then run the program.

They produce ..... files that can be run without the source code.

..... translate one line of a high-level language program at a time, and then run that line of code. They are most useful while developing the programs because errors can be corrected and then the program continues from that line.

Assemblers are used to translate assembly code into ..... .

[4]

5 Javier owns many shops that sell cars. He employs several managers who are each in charge of one or more shops. He uses the relational database `CARS` to store the data about his business.

Part of the database is shown:

```
SHOP(ShopID, ManagerID, Address, Town, TelephoneNumber)

MANAGER(ManagerID, FirstName, LastName, DateOfBirth, Wage)

CAR(RegistrationNumber, Make, Model, NumberOfMiles, ShopID)
```

(a) Tick (✓) **one** box in each row to identify whether each field is a primary key or a foreign key.

Table	Field name	Primary key	Foreign key
MANAGER	ManagerID		
SHOP	ManagerID		
CAR	RegistrationNumber		
CAR	ShopID		

[2]

(b) Describe the ways in which access rights can be used to protect the data in Javier's database from unauthorised access.

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.....

..... [3]

(c) Javier uses Data Definition Language (DDL) and Data Manipulation Language (DML) statements in his database.

(i) Complete the following DML statements to return the number of cars for sale in each shop.

```
SELECT COUNT(.....)

FROM .....

..... ShopID
```

[3]

(ii) Complete the DML statement to include the following car in the table `CAR`.

Field	Data
RegistrationNumber	123AA
Make	Tiger
Model	Lioness
NumberOfMiles	10500
ShopID	12BSTREET

```
..... ..... CAR

..... ("123AA","Tiger","Lioness",10500,"12BSTREET")
```

[2]

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6 **(a)** There are **two** errors in the following register transfer notation for the fetch-execute cycle.

```
1   MAR ←[PC]

2   PC ← [PC] - 1

3   MDR ← [MAR]

4   CIR ← [MDR]
```

Complete the following table by:

- identifying the line number of each error
- describing the error
- writing the correct statement.

Line number	Description of the error	Correct statement

[4]

(b) The following table shows part of the instruction set for a processor. The processor has one general purpose register, 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
STO	<address>	Store the contents of ACC at the given address
INC	<register>	Add 1 to the contents of the register (ACC or IX)
CMP	<address>	Compare the contents of ACC with the contents of <address>
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False
JMP	<address>	Jump to the given address
IN		Key in a character and store its ASCII value in ACC
OUT		Output to the screen the character whose ASCII value is stored in ACC
END		Return control to the operating system
XOR	#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>
AND	#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>
OR	#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. B01001101		

The current contents of main memory are shown:

Address	Data
100	00001111
101	11110000
102	01010101
103	11111111
104	00000000

Each row of the following table shows the current contents of ACC in binary and the instruction that will be performed on those contents.

Complete the table by writing the new contents of the ACC after the execution of each instruction.

Current contents of the ACC	Instruction	New contents of the ACC
11111111	OR 101	
00000000	XOR #15	
10101010	LSR #2	
01010101	AND 104	

[4]

7 Bobby is recording a sound file for his school project.

(a) He repeats the recording of the sound several times, with a different sample rate each time.

(i) Describe the reasons why the sound is closer to the original when a higher sample rate is used.

.....

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..... [2]

(ii) Describe the reasons why the sound file size increases when a higher sample rate is used.

.....

.....

.....

..... [2]

(b) Bobby wants to email the sound file to his school email address. He compresses the file before sending the email.

(i) Explain the reasons why Bobby compresses the sound file.

.....

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..... [2]

(ii) Bobby uses lossless compression.

Describe how lossless compression can compress the sound file.

.....

.....

.....

..... [2]

8 A school is setting up a network within one of its buildings.

(a) State whether the network will be a LAN (local area network) or a WAN (wide area network). Justify your choice.

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.....

..... [3]

(b) One classroom in the building has 30 computers. The computers need to be connected to the network. Each computer has a network interface card (NIC).

Identify **two** possible devices that can be used to physically connect the 30 computers to the rest of the network.

1 .....

2 .....
[2]

(c) The school has several laptops. Each laptop has a Wireless Network Interface Card (WNIC).

Describe the functions of a Wireless Network Interface Card.

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..... [4]

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