Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

1079392752

COMPUTER SCIENCE **9608/13**

Paper 1 Theory Fundamentals **October/November 2020**

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. Blank pages are indicated.

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1 Identify the **most appropriate** utility program to use for each of the following tasks.

Task	Utility program
Rearrange the data on a disk so that files are contiguous, and all free space is collected together	
Prepare a disk for initial use	
Reduce the size of a file	
Examine a disk to find any bad sectors	

[4]

2 Four terms about videos are given with six descriptions.

Draw **one** line from each term relating to videos to its correct description.

Term	Description
	The number of images that are displayed per second
Progressive encoding	The number of pixels per unit of measurement e.g. per inch
Frame rate	Each frame is split into two fields: the first field contains only the odd lines, the second field contains the even lines
Interlaced encoding	Only the pixels that have changed are transmitted
Image resolution	The complete frame is reproduced in each scan of the image
	The number of pixels in the image

[4]

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3 Hannah is writing a computer program using a high-level language. She uses both a compiler and an interpreter.

(a) Describe the ways in which Hannah will use an interpreter while writing the program.

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..... [2]

(b) Explain the reasons why Hannah uses a compiler when she has finished writing the program.

.....

.....

.....

..... [2]

(c) Some high-level languages are partially compiled and partially interpreted.

Give **one** benefit and **one** drawback of using a language that is partially compiled and partially interpreted.

Benefit .....

.....

Drawback .....

.....

[2]

4 A laptop on a home network connects to the Internet through a router.

(a) The laptop has an IP address.

(i) Give the reasons why the laptop has an IP address.

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.....

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..... [2]

(ii) The laptop's IP address is private.

Give the reasons why the laptop does **not** have a public IP address.

.....

.....

.....

..... [2]

(iii) The router has an IPv4 address.

Give **three** differences between the format of an IPv4 address and an IPv6 address.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) A Public Switched Telephone Network (PSTN) is one example of a communication system that can be used to support the Internet.

Identify **and** describe **two other** communication systems that can be used to support the Internet.

System 1 .....

Description .....

.....

System 2 .....

Description .....

.....

[4]

(c) A web page contains PHP code.

(i) Complete the following table by writing a description of the function of each line of PHP code.

PHP code	Description
`echo "Hello World";`	
`$number1 = 22;`	
`$newValue = $_GET["number"];`	
`print "Hello " . $name . " ";`	

[4]

(ii) PHP is a server-side scripting language.

Give an example of a client-side scripting language.

.....

..... [1]

(d) The laptop includes a parity bit in each byte it transmits.

Explain how parity checks protect the integrity of the data.

.....

.....

.....

..... [2]

5 The fetch-execute cycle is used when a computer processor runs a program.

(a) (i) Complete the table by writing the register transfer notation for each of the descriptions.

Letter	Description	Register transfer notation
A	The Memory Address Register (MAR) stores an address. The contents of this stored address are copied to the Memory Data Register (MDR).	
B	The contents of the Program Counter (PC) are copied to the Memory Address Register (MAR).	
C	The contents of the Memory Data Register (MDR) are copied to the Current Instruction Register (CIR).	
D	The contents of the Program Counter (PC) are incremented.	

[4]

(ii) Write one of the letters **A**, **B**, **C** or **D** (from the table above) on each row (1 to 4), to show the correct order of the fetch-execute cycle.

1 .....

2 .....

3 .....

4 .....

[2]

(b) Buses are used to transfer data between various components of the computer system.

Tick (✓) **one or more** boxes on each row to identify the bus(es) each statement describes.

Statement	Address bus	Control bus	Data bus
Receives data from the MAR			
Carries an address or an instruction or a value			
Transmits timing signals to components			
Bidirectional			

[2]

(c) The following table shows assembly language instructions for a processor that has one general purpose register, the Accumulator (ACC).

Instruction		Explanation
Op code	**Operand**	
INV		Input a denary value from the keyboard and store it in ACC.
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC.
LDM	#n	Immediate addressing. Load the denary number n 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.
ADD	<address>	Add the contents of the given address to ACC.
OUT		Output to screen the character whose ASCII value is stored in ACC.
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>.
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False.
STO	<address>	Store contents of ACC at the given address.
END		Return control to the operating system.

(i) The assembly language instructions are grouped according to their function.

Write **one** example of an op code from the table of instructions for each of the following groups.

Arithmetic .....

Data movement .....

[2]

(ii) The current contents of the main memory are:

Address	Instruction
500	INV
501	STO 901
502	INV
503	STO 900
504	ADD 902
505	STO 902
506	LDD 903
507	INC ACC
508	STO 903
509	CMP 901
510	JPN 502
511	END
…	
900	
901	
902	0
903	0

Trace the program currently in memory using the following trace table when the values 2, 10 and 3 are input.

The first instruction has been completed for you.

Instruction address	ACC	Memory address			
		900	901	902	903
				0	0
500	2				

[6]

(d) The current contents of a general-purpose register **X** are:

X	1	1	0	0	1	0	1	0

(i) The contents of **X** represent an unsigned binary integer.

Convert the contents of **X** into denary.

..... [1]

(ii) The contents of **X** represent a two's complement binary integer.

Convert the contents of **X** into denary.

..... [1]

(iii) State why the binary number in **X** cannot represent a Binary Coded Decimal (BCD).

.....

..... [1]

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6 Lara is managing a team of software developers who are writing a computer program.

(a) Benedict is one of the developers. He is struggling to keep up with his workload.

Describe the ways in which Lara can ethically support Benedict.

.....

.....

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..... [2]

(b) Lara has identified that when a specific sequence of actions is performed in the program, a run-time error causes the program to crash.

She has decided there is not enough time to debug the code because the client needs the system urgently, and there is a possibility that the client may never perform this sequence of actions.

Explain the reasons why Lara is not acting ethically.

.....

.....

.....

..... [2]

(c) The client wants to copyright the final program so that no one else can copy or amend it.

(i) State the purpose of copyrighting the computer program.

.....

..... [1]

(ii) Identify **two** software licences that would be appropriate for the program.

Licence 1 .....

Licence 2 .....
[2]

(iii) Identify **one** software licence that would **not** be appropriate for the program. Justify your choice.

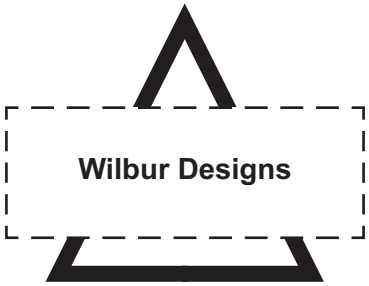
Software licence .....

Justification .....

.....

.....
[2]

7 Wilbur uses vector graphics to create a logo for his company.



(a) Describe how the logo is represented and encoded by the computer.

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.....

.....

..... [4]

(b) Wilbur scans a hand drawn image. The scanned image uses 8 bits to store the colour for each pixel. The image is 2048 pixels wide by 1024 pixels high.

(i) Calculate an estimate of the file size of the scanned image. Give your answer rounded to the nearest MB.

Show your working.

.....

.....

.....

.....

Answer ..... MB

[2]

(ii) Wilbur wants to compress the scanned image before emailing it to his colleague.

Describe **one** lossy compression technique that Wilbur can use to compress this image.

.....

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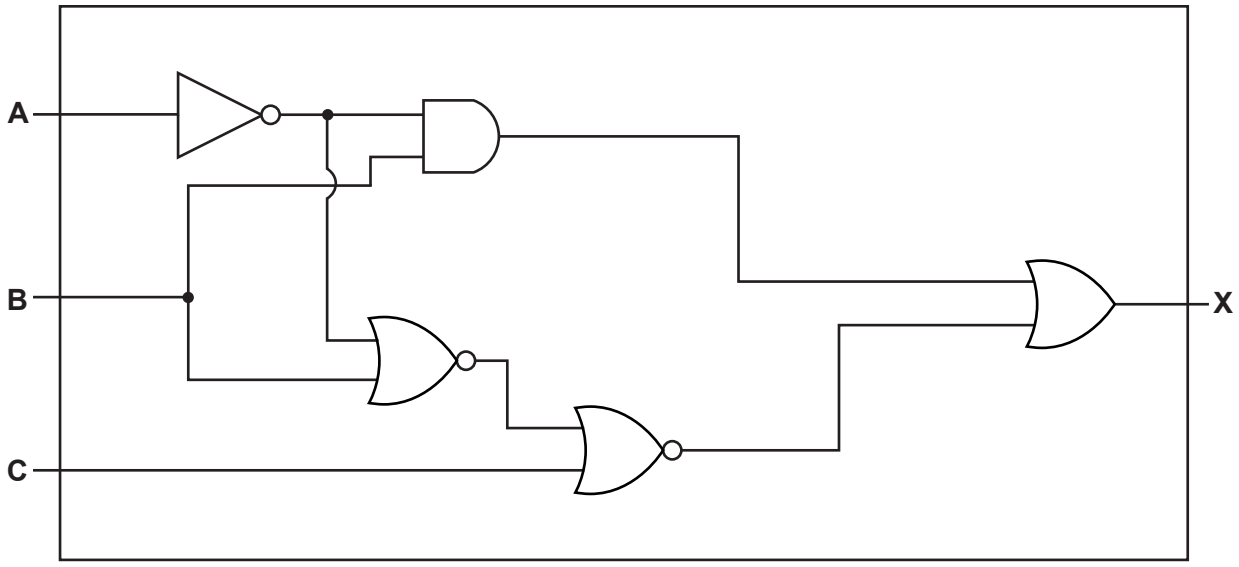
.....

.....

.....

..... [3]

8 Consider the following logic circuit.



(a) Complete the truth table for the 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		

[4]

(b) Identify **one** logic gate **not** used in the logic circuit shown. Complete the truth table for this logic gate with the inputs **A** and **B**.

Logic gate .....

A	B	Output
0	0	
0	1	
1	0	
1	1	

[2]

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