Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0250780768

COMPUTER SCIENCE **9608/12**

Paper 1 Theory Fundamentals **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

This document consists of **13** printed pages and **3** blank pages.

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[Turn over

1 Computers on the Internet have IP addresses.

(a) IP addresses can be in either IPv4 or IPv6 format.

(i) Give an example of a valid IPv4 address.

.....

..... [1]

(ii) State why there is a need for IPv6 addressing.

.....

..... [1]

(iii) A computer's IPv6 address is:

C100:2235::1000:25AA:AA50

Explain why this IPv6 address would be an invalid IPv4 address.

.....

.....

.....

..... [2]

(b) A company has computers in two separate buildings that communicate using the Internet over a Public Switched Telephone Network (PSTN).

(i) Describe the transmission of data using a PSTN.

.....

.....

.....

..... [2]

(ii) The company wants to install a dedicated line between the two buildings.

Identify **one** benefit and **one** drawback of installing a dedicated line between the two buildings.

Benefit .....

.....

Drawback .....

.....

[2]

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(c) A network can use routers and gateways.

Explain the role of routers **and** gateways in a network.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) The company has an email server.

Identify **three** other types of server.

1 .....

2 .....

3 .....

[3]

2 Biyu is writing a computer program in a high-level language.

(a) Biyu uses a language translator.

(i) State the purpose of a language translator.

.....

..... [1]

(ii) Biyu uses an interpreter.

State **two** benefits of Biyu using an interpreter instead of a compiler while writing the program.

1 .....

.....

2 .....

.....
[2]

(iii) Name a translator other than an interpreter and a compiler.

..... [1]

(b) Biyu uses library files in the program.

Explain why software is often developed using library files.

.....

.....

.....

..... [2]

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3 The fetch-execute cycle is shown in register transfer notation.

```
01      MAR ← [PC]

02      PC ← [PC] - 1

03      MDR ← [MAR]

04      CIR ← [MAR]
```

(a) There are **three** errors in the fetch-execute cycle shown.

Identify the line number of each error and give the correction.

Line number .....

Correction .....

Line number .....

Correction .....

Line number .....

Correction .....

[3]

(b) A processor's instruction set can be grouped according to their function. For example, one group is the input and output of data.

Identify **two** other groups of instructions.

1 .....

.....

2 .....

.....

[2]

(c) The following table shows assembly language instructions for a processor which has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Op code	**Operand**	
LDM	#n	Immediate addressing. Load the denary number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given 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 denary number n to IX
STO	<address>	Store contents of ACC at the given address
ADD	<address>	Add the contents of the given address to ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
CMP	#n	Compare contents of ACC with denary number n
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
JMP	<address>	Jump to the given address
OUT		Output to the screen the character whose ASCII value is stored in ACC
END		Return control to the operating system

The current contents of the main memory, Index Register (IX) and selected values from the ASCII character set are:

Address	Instruction
50	LDM #0
51	STO 401
52	LDX 300
53	CMP #0
54	JPE 62
55	ADD 400
56	OUT
57	LDD 401
58	INC ACC
59	STO 401
60	INC IX
61	JMP 52
62	END
...	
300	2
301	5
302	0
303	4
...	
400	64
401	

IX	0

ASCII code table (Selected codes only)

ASCII code	Character
65	A
66	B
67	C
68	D
69	E

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Trace the program currently in memory using the following trace table.
The first instruction has been completed for you.

Instruction address	ACC	Memory address						IX	OUTPUT
		300	301	302	303	400	401		
		2	5	0	4	64		0	
50	0								

[8]

(d) The ASCII character code for 'A' is 65 in denary.

(i) Convert the denary ASCII character code for 'A' into 8-bit binary.

[1]

(ii) Convert the denary ASCII character code for 'A' into hexadecimal.

..... [1]

(iii) The Unicode character code for 'G' is 0047 in hexadecimal.

State, in hexadecimal, the Unicode character code for 'D'.

..... [1]

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4 Shazia is creating a computer program that will be released to the public. The program includes a video.

(a) Shazia uses a microphone to record a sound track for the video.

(i) Describe the internal operation of a microphone.

.....

.....

.....

.....

.....

..... [3]

(ii) The script for the sound track is printed using a laser printer.

Describe the internal operation of a laser printer.

.....

.....

.....

.....

.....

..... [3]

(b) The video is recorded using progressive encoding.

Describe **progressive encoding**.

.....

.....

.....

..... [2]

(c) Shazia's computer has Dynamic RAM (DRAM) and Static RAM (SRAM).

Explain the differences between Dynamic RAM and Static RAM.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Shazia wants to make sure her computer program is copyrighted.

(i) Define the term **copyright**.

.....

..... [1]

(ii) Shazia does not want to release the software as open source.

Explain why Shazia does **not** want to use an open source licence.

.....

.....

.....

..... [2]

(iii) Name **and** describe **two** software licences, other than open source that Shazia could use.

Licence 1 .....

.....

.....

Licence 2 .....

.....

.....

[2]

5 Moheem is creating a relational database to store data about his customers.

(a) Moheem has been told a relational database addresses some of the limitations of a file-based approach by reducing data redundancy.

(i) State what is meant by the term **data redundancy**.

.....

..... [1]

(ii) Explain **how** a relational database can help to reduce data redundancy.

.....

.....

.....

.....

.....

..... [3]

(b) Moheem uses a Database Management System (DBMS) to ensure the security and integrity of the data.

(i) Explain the difference between security and integrity.

.....

.....

.....

..... [2]

(ii) Name **and** describe **two** security features provided by a DBMS.

Feature 1 .....

.....

.....

.....

Feature 2 .....

.....

.....

.....

[4]

(iii) The DBMS provides software tools for the database developer.

Fill in the names of the missing software tools in the following statements.

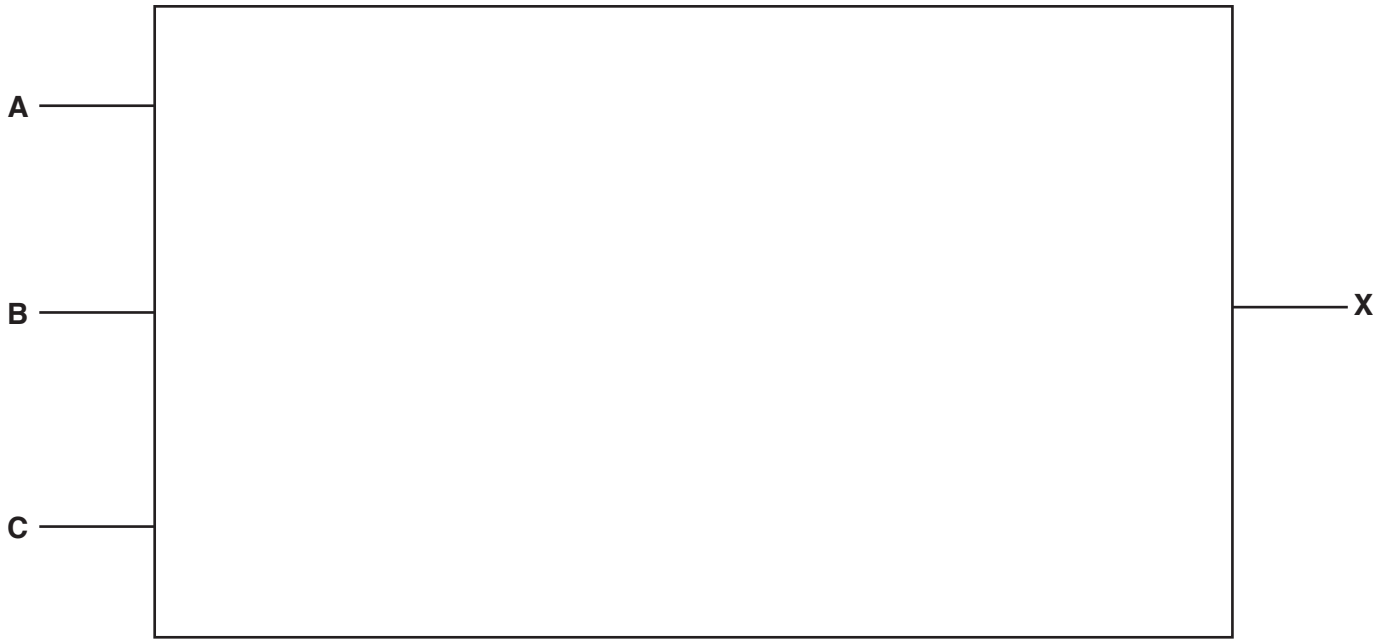
A ..... allows a developer to extract data from a database.

A ..... enables a developer to create user-friendly forms and reports.

[2]

6 **(a)** Draw a logic circuit to represent the logic expression:

X = **A** OR (**B** AND NOT **C**) OR (**A** AND **B**)



[5]

(b) Complete the truth table for the logic expression in **part (a)**.

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]

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