Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMPUTER SCIENCE **9608/13**

Paper 1 Theory Fundamentals **May/June 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.

[Turn over

1 An adventure sports company has a website.

(a) Customers can book courses using an online booking form. The booking form contains a number of fields.

The following table gives a description of the validation for each field.

Write the validation type for each validation description in the table.

Field	Validation description	Validation type
Name	A name must be entered	
Date of Birth	Entered as dd/mm/yyyy	
Telephone Number	A limit of 15 characters can be entered	
Experience Level	Only values between 1 and 5 can be entered	

[4]

(b) **(i)** Validation is one way to protect the integrity of input data.

Identify **one other** method to protect the integrity of input data.

..... [1]

(ii) The data input will be transferred to a central server.

Identify **two** measures to protect the integrity of the data during transfer.

1 .....

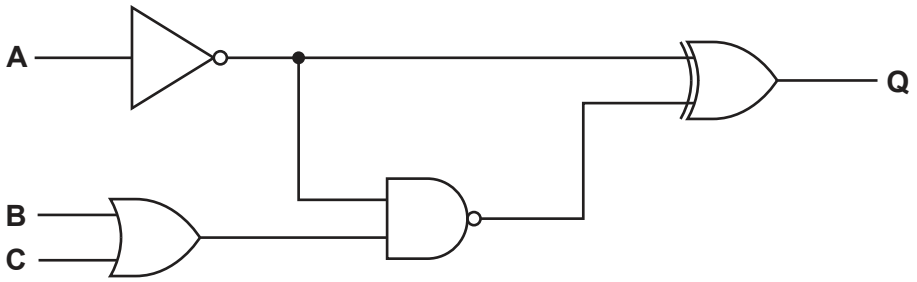
.....

2 .....

.....

[2]

2 Consider the following logic circuit:



(a) Complete the truth table for the logic circuit.

A	B	C	Working space	Q
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 **four** logic gates used in the logic circuit above.

1 .....

2 .....

3 .....

4 .....

[1]

3 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
Op code	**Operand**	
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 number n to IX.
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.
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 and selected values from the ASCII character set are:

Address	Instruction
75	LDR #2
76	LDX 180
77	CMP #0
78	JPE 82
79	OUT
80	DEC IX
81	JMP 76
82	END
…	
180	0
181	41
182	71
183	40
184	70
185	43
186	69

ASCII code table (selected codes only)

ASCII code	Character
36	$
40	(
41	)
43	+
69	E
70	F
71	G

(a) Complete a trace table for the execution of the program.

Instruction address	IX	ACC	Memory address							Output
			180	181	182	183	184	185	186	
			0	41	71	40	70	43	69	

[5]

(b) Identify **two** modes of addressing that are **not** used in the assembly language program given.

1 .....

2 .....

[2]

(c) Each instruction in the assembly language program is encoded in 16 bits (8-bit op code followed by an 8-bit operand).

(i) The instruction `LDX 234` has the operand `234`.

Convert the operand `234` into 8-bit binary.

[1]

(ii) Convert the denary value `234` into hexadecimal.

..... [1]

(iii) The contents of memory address `190` represent a two's complement binary integer.

Address								
190	1	1	0	1	1	0	0	1

Convert the value in memory address `190` into denary.

..... [1]

(d) The fetch-execute (FE) cycle is shown in register transfer notation.

Complete the FE cycle using register transfer notation.

..... ← [PC]

PC ← ..... + 1

MDR ← [[MAR]]

..... ← [MDR]

[3]

4 An operating system (OS) is installed on a computer.

(a) The OS performs a number of different tasks such as device management and error detection and recovery.

(i) State **three** device management tasks the OS performs.

1 .....

2 .....

3 .....

[3]

(ii) State **three** error detection and recovery management tasks the OS performs.

1 .....

2 .....

3 .....

[3]

(iii) State **two** tasks, other than device management and error detection and recovery management that are carried out by an OS.

1 .....

2 .....

[2]

(b) Utility programs are installed on a new computer.

(i) The following table lists six programs.

Tick (✓) **one** box in each row to identify whether the program is a utility program or not a utility program.

Program	Utility	Not utility
Language translator		
Backup		
Integrated Development Environment (IDE)		
Graphics		
Defragmenter		
Spreadsheet		

[2]

(ii) Identify **two other** utility programs.

1 .....

2 .....

[2]

5 A web page `staff.html` contains the following HTML and PHP code.

```
01 <html>
02 <body>
03 <p><b>Current Staff</b></p>
04
05 <?php
06   echo "<h1>Staff list</h1>";
07   echo "<p>";
08
09   $first_name="Jason";
10   $last_name="Chan";
11
12   $result = $first_name." ".$last_name;
13   echo $result;
14 ?>
15
16 </body>
17 </html>
```

(a) Give the identifier of **two** variables used in the PHP code.

1 .....

2 .....
[2]

(b) The PHP code produces multiple outputs.

Give **all** the line numbers where the PHP code produces an output.

..... [1]

(c) Describe the purpose of line `12` of the code.

.....

.....

.....

..... [2]

6 **(a)** A customer completes a booking form on a web page and clicks a submit button to submit the form.

The following sequence (1 to 6) describes the steps that take place when the form is submitted.

1 .....

2 The form data is transmitted to the web server

3 .....

4 .....

5 The HTML code is returned to the browser

6 .....

Write **one** of the letters A to D in each row (1, 3, 4 and 6) to complete the sequence.

A	The browser displays the web page
B	Server-side code is processed
C	Client-side code is processed
D	The web server produces the HTML code

[3]

(b) The web page `9608.html` is accessed from the URL:

```
https://www.cambridgeinternational.org/9608.html
```

An employee of the company states, “A Domain Name and an IP address are exactly the same thing”.

State whether this statement is true or false **and** justify your choice.

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..... [3]

7 Patrick is writing a new software application. He is using a compiler to develop the software application.

(a) Describe the drawbacks of using a compiler instead of an interpreter.

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.....

.....

.....

..... [3]

(b) Patrick has completed the application. He needs to choose whether to distribute the software application using an open source licence or a commercial licence.

Describe **open source** and **commercial** software licensing.

Open source .....

.....

.....

.....

Commercial .....

.....

.....

.....

[4]

(c) Patrick works for a company that has a code of conduct for its employees.

Explain the reasons why the company needs a professional code of conduct.

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.....

.....

..... [3]

8 A charity has a relational database, CHARITY_PROJECT.

The database has three tables to store information about the charity's employees, the projects and the project teams.

EMPLOYEE(EmployeeID, FirstName, LastName, Salary, DOB)

PROJECT(ProjectID, Name, Location, ProjectStartDate)

PROJECT_TEAM(EmployeeID, ProjectID, JoinedProjectDate)

(a) Complete the entity relationship (E-R) diagram to show the relationships between these tables.

[2]

(b) Explain how primary and foreign keys are used to link the tables in CHARITY_PROJECT.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) The database needs to store the gender of each employee (either `M` for Male or `F` for Female).

Write a Data Definition Language (DDL) statement to add the attribute `Gender` to the `EMPLOYEE` table.

.....

.....

.....

.....

.....

..... [2]

(d) Part of the `EMPLOYEE` table is shown:

EmployeeID	FirstName	LastName	Salary	DOB	Gender
001	Jasmine	Chen	25000	25/12/2000	F
002	Kenton	Archer	20000	01/04/1993	M
003	Michael	Roux	10000	10/03/1990	M
004	Conrad	Slavorski	15000	30/03/1989	M

Each employee is paid a salary in dollars ($).

Write a Data Manipulation Language (DML) statement to return the first name, last name and salary of all employees that are paid more than $17 500.

.....

.....

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.....

..... [3]

9 A website streams music and videos.

(a) Two descriptions about how sound is encoded and represented on a computer are given.

Give the correct term for each description.

(i) "The number of samples taken per unit time"

Term ..... [1]

(ii) "The number of bits used to encode each sample"

Term ..... [1]

(b) Videos on the website are compressed. Compression algorithms can use spatial redundancy or temporal redundancy.

Describe **spatial redundancy** and **temporal redundancy**.

Spatial .....

.....

.....

.....

Temporal .....

.....

.....

.....

[4]

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