Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4708712398

COMPUTER SCIENCE **9618/12**

Paper 1 Theory Fundamentals **May/June 2022**

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.

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1 **(a)** Draw **one** line from each image representation term to its correct definition.

Term	Definition
Pixel	The number of pixels wide by the number of pixels high
Bit depth	The smallest identifiable component of an image
Image resolution	Stores data about the image file, e.g. file format, number of bits per pixel, file size
File header	The number of bits used to represent each colour

[3]

(b) The following section of a bitmap image is 10 pixels wide and 5 pixels high. In this example, each colour is represented by a letter, e.g. B is blue.

B	B	B	B	B	B	B	B	B	B
Y	Y	P	Y	Y	Y	P	Y	Y	Y
R	R	M	R	P	K	T	T	R	R
B	O	P	Y	Y	Y	P	G	P	P
R	O	R	P	P	P	R	R	R	R

The complete image can have up to 256 colours.

(i) Identify the smallest number of bits that can be used to represent each colour in the complete bitmap image.

..... [1]

(ii) Calculate an estimate for the file size of the section of the bitmap image shown, giving your answer in bytes. Use your answer from **part (b)(i)**.

Show your working.

Working .....

.....

.....

.....

Answer ..... bytes

[2]

(c) Describe how changing the colour depth of an image affects its file size.

.....

.....

.....

..... [2]

(d) The first row of pixels in the image from **part (b)** is shown:

B	B	B	B	B	B	B	B	B	B

Explain how this row of pixels can be compressed using lossless compression.

.....

.....

.....

..... [2]

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[Turn over

2 A car has several features.

(a) One feature is a lane detection system. This system monitors the lines on either side of the lane. If the car gets too close to one line, the system automatically moves the car away from the line.

Explain why the lane detection system is an example of an embedded system.

.....

.....

.....

..... [2]

(b) Two other features:

- record the number of miles travelled in the current journey, from when the engine is turned on to when it is turned off
- record the total number of miles the car has travelled since it was built.

Identify the data that will be stored in the primary **and** secondary storage of the car for these **two** features.

Primary .....

.....

Secondary .....

.....

[2]

(c) The car has a resistive touchscreen for the user to select options.

Tick (✓) **one** box in each row to show whether each statement about a resistive touchscreen is true or false.

Statement	True	False
The screen always has five different layers		
A processor determines the horizontal and vertical coordinates of the point of contact		
The touchscreen will work if any object touches the screen		

[1]

3 The table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC).

Instruction		Explanation
Opcode	**Operand**	
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>
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>
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>
<address> can be an absolute or a symbolic address # denotes a denary number, e.g. #123		

(a) The ACC currently contains the following positive binary integer:

0	1	1	0	0	1	0	1

Write the bit manipulation instruction that would change the binary integer in ACC to:

1	1	1	1	1	1	1	1

Opcode ..... Operand .....

[2]

(b) The ACC currently contains the following positive binary integer:

0	1	1	0	0	1	0	1

Write the bit manipulation instruction that would change the binary integer in ACC to:

1	0	0	1	1	0	1	0

Opcode ..... Operand .....

[2]

(c) Convert the following positive binary integer into hexadecimal.

0 1 1 1 1 1 1 0

..... [1]

(d) A **three-place logical shift** to the **left** is performed on the following positive binary integer.

Show the result of this logical shift.

0 1 1 1 1 1 1 0

..... [1]

(e) Convert the denary numbers 127 and 12 to 8-bit binary and then perform the subtraction 12 − 127 in binary.

Show your working.

127 in binary .....

12 in binary .....

12 − 127 in binary .....

.....

.....

.....

.....

[3]

4 A school stores personal data about its staff and students on its computer system.

(a) Explain why the school needs to keep both its data **and** its computer system secure from unauthorised access.

Data .....

.....

Computer system .....

.....

[2]

(b) Complete the table by identifying **two** security threats to the data on a computer.

Describe each threat.

Give a different prevention method for each threat.

Threat	Description	Prevention method
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

[6]

(c) Data is encrypted when it is transmitted within the school network, or externally such as over the internet.

Describe what is meant by encryption **and** explain why it is used.

.....

.....

.....

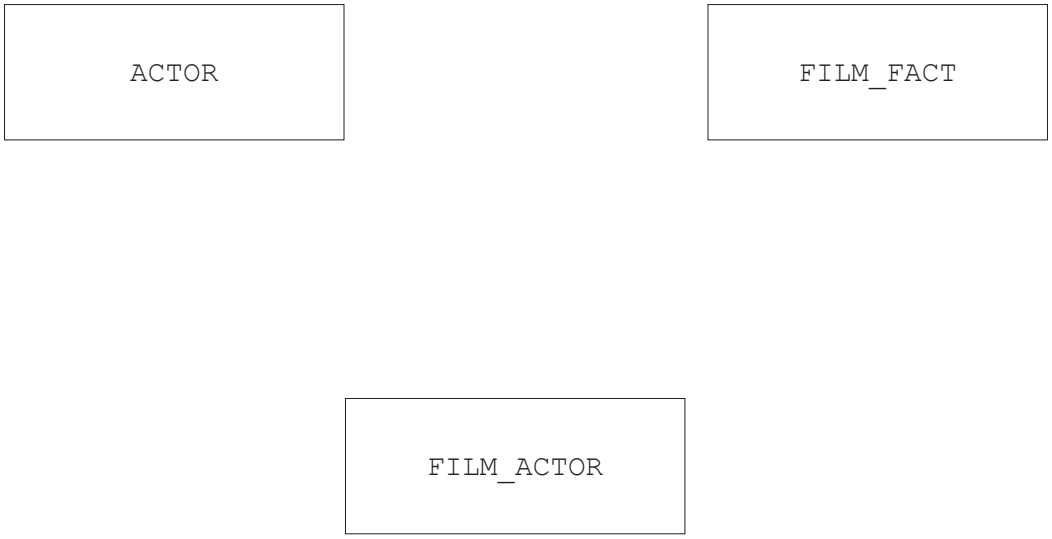
..... [2]

5 A database, FILMS, stores information about films and actors.

Part of the database is shown:

ACTOR(ActorID, FirstName, LastName, DateOfBirth)
FILM_FACT(FilmID, FilmTitle, ReleaseDate, Category)
FILM_ACTOR(ActorID, FilmID)

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



[2]

(b) A composite primary key consists of two or more attributes that together form the primary key.

Explain why the table FILM_ACTOR has a composite primary key.

.....

.....

.....

..... [2]

(c) Complete the SQL script to return the IDs of all the actors in the film with the title Cinderella.

```
SELECT .....

FROM FILM_ACTOR

INNER JOIN .....

ON FILM_FACT.FilmID = .....

WHERE FILM_FACT.FilmTitle = ..... ;
```

[4]

(d) Write an SQL script to count the number of films that were released in January 2022.

.....

.....

.....

.....

.....

..... [3]

(e) A Database Management System (DBMS) is used to create and manipulate the database.

Complete the descriptions of the features and tools found in a DBMS using the given terms. Not all terms will be used.

Boolean	**data dictionary**	**data redundancy**	**field names**
input	**interface**	**logical schema**	**normalisation**
operating system	**output**	**primary keys**	**query**
structure			

A DBMS provides data management. This includes the development of a

..... that stores information about the data stored, such as

..... and ..... .

The ..... uses methods, such as an E-R diagram, to show the structure of the database and its relationships.

The ..... processor allows a user to perform searches to find specific data. The DBMS also provides a developer ..... that allows the user to create tables, forms and reports.

[6]

6 A programmer uses language translators when writing and testing a program.

(a) Describe the operation of a compiler.

.....

.....

.....

..... [2]

(b) Describe the operation of an interpreter.

.....

.....

.....

..... [2]

(c) Explain how a programmer can make use of a typical Integrated Development Environment (IDE) when writing **and** testing a program.

Writing .....

.....

.....

.....

Testing .....

.....

.....

.....

[4]

7 Complete the truth table for the following logic expression:

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

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]

8 Describe **one** application of Artificial Intelligence (AI).

.....

.....

.....

.....

.....

..... [3]

9 **(a)** The following incomplete table contains four network devices and their descriptions.

Complete the table by writing the missing devices and missing descriptions.

Device	Description
.....	Receives and sends data between two networks operating on the same protocol
Wireless Network Interface Card (WNIC)	....
.....	Restores the digital signal so it can be transmitted over greater distances
Wireless Access Point (WAP)	....

[4]

(b) Describe **three** differences between fibre-optic cables and copper cables.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Ethernet uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD).

Describe CSMA/CD.

.....

.....

.....

.....

.....

.....

.....

..... [4]

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