Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2080127195

COMPUTER SCIENCE **9608/12**

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.

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1 A computer has Random Access Memory (RAM) and Read Only Memory (ROM).

Tick (✓) **one or more** boxes in each row to identify whether each statement refers to RAM, ROM or both.

Statement	RAM	ROM
Stores data permanently		
It is volatile		
Stores the start-up instructions for the computer		
Directly accessed by the CPU		
Type of main memory		
Stores currently running applications		
Can be static or dynamic		

[3]

2 A travel company is designing a website.

(a) The bitmap logo for the travel company is shown.

Each colour is represented by a letter, for example, R = red, B = black, W = white.

Bitmap Logo

R	R	R	R	R	R	R	R
R	B	B	B	B	B	W	R
R	B	W	W	W	B	W	R
R	B	W	W	W	W	W	R
R	B	W	W	B	B	W	R
R	B	W	W	W	B	W	R
R	B	B	B	B	B	W	R
R	R	R	R	R	R	R	R

(i) State the minimum number of bits needed to represent each pixel in the bitmap logo.

..... [1]

(ii) Calculate the minimum file size, in bytes, of the bitmap logo. Show your working.

Working .....

.....

.....

.....

File size .....
[3]

(b) The travel company uploads a video to its website. The video is stored as an MP4 file. MP4 is an example of a multimedia container format.

Describe what is meant by a **multimedia container format**.

.....

.....

.....

..... [2]

(c) Complete the following sentences that describe two terms related to videos.

..... is when a sequence of consecutive pixels in the same frame have the same value.

..... is when a pixel in the same location in two consecutive frames has the same value.
[2]

3 Upali travels for his work and uses his mobile phone to access the World Wide Web (WWW) and to communicate with his office by email. His office has a fixed connection to the Internet.

(a) Identify **two** types of communication systems that support the transmission of his data.

1 .....

.....

2 .....

.....

[2]

(b) Upali connects his computer to the Local Area Network (LAN) when he is in the office.

The network uses both copper cables and fibre optic cables.

Identify **two** other examples of network hardware that can be used in a LAN.

1 .....

.....

2 .....

.....

[2]

(c) Checksum is one method used for verification of transmitted data within a network.

Name **and** describe **one other** method of verifying transmitted data.

Method .....

Description .....

.....

.....

.....

.....

[3]

(d) Upali works for a company that stores data on a web server.

Describe **two** security measures that can be used to protect a web server from unauthorised access.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

4 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**	
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
CMP	<address>	Compare the contents of ACC with the contents of <address>
SUB	<address>	Subtract the contents of the given address from the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
DEC	<register>	Subtract 1 from the contents of the register (ACC or IX)
STO	<address>	Store contents of ACC at the given address
END		Return control to the operating system

(a) The instructions in the processor's instruction set can be grouped according to their function.

(i) Identify **three** different instruction groups from the instructions given in the table.

1 .....

2 .....

3 .....

[3]

(ii) Identify **one** instruction group **not** given in the table.

..... [1]

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(b) The following are four special purpose registers used in the processor:

- Program Counter (PC)
- Memory Data Register (MDR)
- Memory Address Register (MAR)
- Current Instruction Register (CIR)

Describe the purpose of any **three** registers from the four given.

Register 1 .....

Description .....

.....

.....

Register 2 .....

Description .....

.....

.....

Register 3 .....

Description .....

.....

.....

[6]

5 Jackie is writing a program in a high-level language (HLL). The program makes use of Dynamic Link Library (DLL) files.

(a) Complete the following sentences about DLL files by writing the missing words from the list given below.

closed	**corrupted**	**directory**	**edited**
errors	**executable**	**opened**	**recompile**
running	**tested**	**validated**	**verified**

The ..... file does not contain the library routines.

A DLL file can be ..... without having to ..... the calling program.

One drawback of a DLL file is that the main program could stop working if the DLL file is ..... .

[4]

(b) Jackie will use language translation software to run her HLL program.

Identify **and** describe **one** type of language translator.

Translator .....

Description .....

.....

.....

.....

.....

.....

.....

[4]

(c) Explain the reasons why Jackie should copyright her program.

.....

.....

.....

..... [2]

6 A computer has file compression and defragmenter software.

Describe these utility programs.

File compression .....

.....

.....

.....

Defragmenter .....

.....

.....

.....

[4]

7 Complete the truth table for the logic expression:

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

[4]

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8 An employment agency keeps records of its contracts with employers and workers in a relational database.

These are some of the tables in the database:

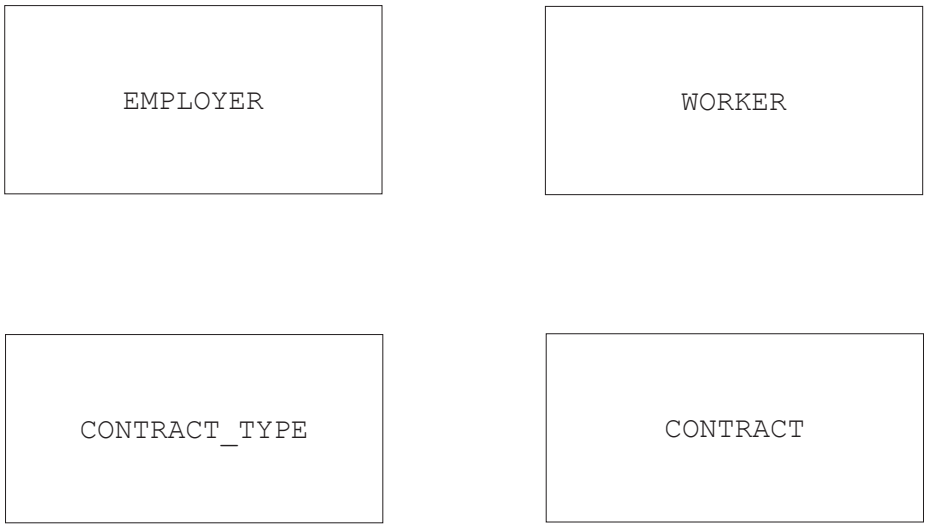
```
EMPLOYER(EmpId, EmpName, EmpAddress, EmpPhoneNumber)

WORKER(WkId, WkFirstName, WkLastName, WkAddress, WkPhoneNumber)

CONTRACT_TYPE(ConTypeId, ConName)

CONTRACT(ConId, ConTypeId, EmpId, WkId, RefConNumber)
```

(a) Complete the entity-relationship (E-R) diagram for this part of the database.



[3]

(b) Write a Data Definition Language (DDL) statement to change the `CONTRACT` table to remove the attribute `RefConNumber`.

.....

.....

.....

..... [2]

(c) The following table has examples of DDL and Data Manipulation Language (DML) statements.

Tick (✓) **one** box in each row to identify whether each statement is an example of DML or DDL.

Statement	DML	DDL
`ADD PRIMARY KEY`		
`ALTER TABLE`		
`SELECT FROM`		
`INNER JOIN`		
`CREATE DATABASE`		

[2]

(d) The field `WkPhoneNumber` cannot be empty **and** must have a maximum of 14 characters.

Describe **two** ways the field `WkPhoneNumber` can be validated.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(e) State what is meant by a **candidate key**.

.....

..... [1]

(f) Describe what is meant by a **secondary key**.

.....

.....

.....

..... [2]

(g) The database is stored on a magnetic hard disk.

Describe the basic internal layout and operation of a magnetic hard disk drive.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

9 The sequence of operations shows, in register transfer notation, the fetch stage of the fetch-execute cycle.

```
1 MAR ← [PC]

2 PC ← [PC] + 1

3 MDR ← [[MAR]]

4 CIR ← [MDR]
```

Write a description of each of the three register transfer notations given in the following table.

Register transfer notation	Description
`MAR ← [PC]`	....
`PC ← [PC] + 1`	....
`MDR ← [[MAR]]`	....

[3]

10 An 8-bit binary number can be interpreted in many ways.

(a) State the number of different values that an 8-bit unsigned binary integer can represent.

..... [1]

(b) Give the smallest **and** largest denary values that an 8-bit two's complement integer can represent.

Smallest .....

Largest .....
[2]

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