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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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**[Turn over**

**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]

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**(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]

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**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]

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**(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]

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**[Turn over**

**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]

**(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]

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**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]

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**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:

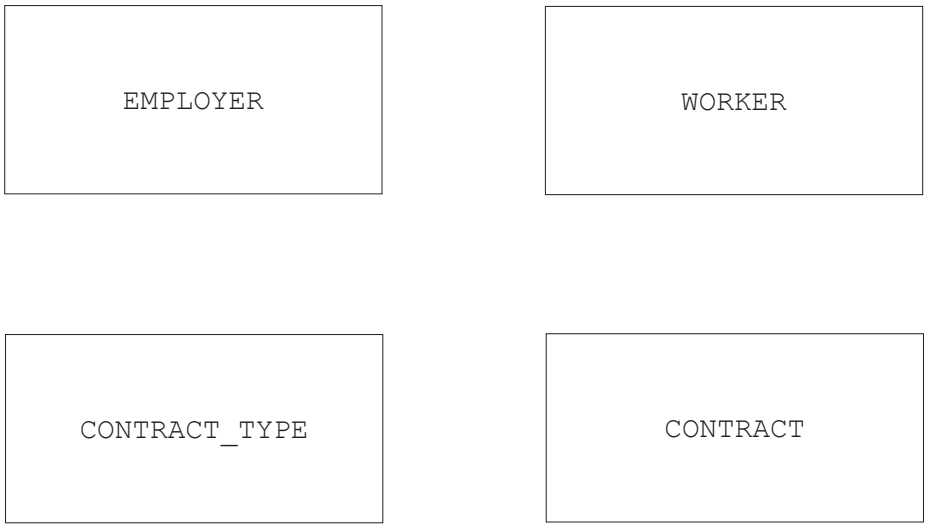
EMPLOYER(EmpId, EmpName, EmpAddress, EmpPhoneNumber)

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]

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**(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]

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**(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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