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IGCSE 0478 | O Level 2210

Computer Science

Paper 1

with Solution

for CAIE 2023-25 Syllabus

2015 to 2023

WITH ADDITIONAL PRACTICE QUESTIONS FOR NEW SYLLABUS

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Salient Features

1. This book also contains the past papers of Cambridge IGCSE Computer Science (0478) conducted in 2023 on new syllabus.
2. It includes extra questions based on topics added in the new syllabus in each chapter.
3. All the parts of a question of past papers are divided topic wise i.e. each part of each question is only available in the relevant unit.

Important Notes

1. In case a question has a missing part, it can only mean that either the missing part is in some other unit/topic OR the part was based on a topic eliminated from the new syllabus.
2. A list of all the question parts which are no longer in the new syllabus is available in Annexure A (at the end of the book).

TOPIC

Question
Numbering
in the Topic's
Section

Exam Session
MJ: May/June
ON: October/November

Original
question number
in Past Paper

Year

Variant

Locating Errors & Inefficiencies **Q1** **(MJ15/21)**

2 Read this section of program code that should input 10 positive numbers and then output the smallest number input.

```

1  Small = 0
2  Counter = 0
3  REPEAT
4  INPUT Num
5  IF Num < Small THEN Num = Small
6  Counter = Counter + 1
7  PRINT Small
8  UNTIL Counter < 10

```

There are four errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

1

2

3

4

.....[4]

PAPER 1

TOPIC 1

DATA REPRESENTATION

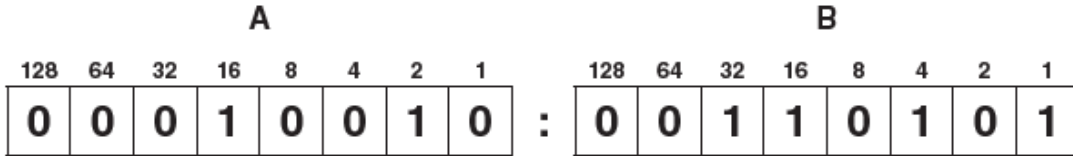
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8 An alarm clock is controlled by a microprocessor. It uses the 24 hour clock. The hour is represented by an 8-bit register, A, and the number of minutes is represented by another 8-bit register, B.

(a) Identify what time is represented by the following two 8-bit registers.



Hours

Minutes

[2]

(b) An alarm has been set for 07:30. Two 8-bit registers, C and D, are used to represent the hours and minutes of the alarm time.

Show how 07:30 would be represented by these two registers:



Hours

Minutes

[2]

9 Draw a line to connect each question to the correct answer.

Question	Answer
What is the denary (base 10) equivalent to the hexadecimal digit E?	8
If $1 \text{ GB} = 2^x$ then what is the value of X?	12
How many bits are there in one byte?	14
If the broadband data download rate is 40 megabits per second, how many seconds will it take to download a 60 MB file?	19
What is the denary (base 10) value of the binary number 00100100?	30
What hexadecimal value is obtained when the two hexadecimal digits C and D are added together?	36

[5]

5 (c) Give the denary (base 10) value of the byte: 1 0 1 1 1 1 1 0

.....
[1]

10 Letters from the alphabet are represented in a computer by the following denary (base 10) values:

- A = 97
- G = 103
- I = 105
- L = 108
- N = 110

The word "A L I G N" is stored as: 97 108 105 103 110

(a) Convert each of the five values to binary. The first one has been done for you.

Letter	Denary value							
A (97):	0	1	1	0	0	0	0	1
L (108):								
I (105):								
G (103):								
N (110):								

[2]

(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0
---	---	---	---	---	---	---	---

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

hexadecimal

L:							
G:							

[4]

2 Seven computer terms and seven descriptions are shown below.

Draw a line to link each computer term to its most appropriate description.

Computer term**Description**

Interface

Reduction of file size by permanently removing some redundant information from the file

Interrupt

File compression format designed to make photo files smaller in size for storage and for transmission

JPEG

File compression system for music which does not noticeably affect the quality of the sound

Lossless
compression

Hardware component that allows the user to communicate with a computer or operating system

Lossy
compression

The file is reduced in size for transmission and storage; it is then put back together again later producing a file identical to the original

MIDI

Signal sent to a processor which may cause a break in execution of the current routine, according to priorities

MP3 format

Standard adopted by the electronic music industry for controlling devices such as synthesisers and sound cards

[6]

4 (a) (i) Convert the following **two** hexadecimal numbers into binary:

FA7
D3E

FA7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D3E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[4]

(ii) Now perform the AND (logic) operation on each corresponding pair of binary bits in the two numbers from **part (i)**.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

[2]

(iii) Convert your answer in **part (ii)** into hexadecimal.

.....

.....

[2]

(b) (i) The following code shows HTML 'tag' pairs on either side of the text stating the colour that each creates.

```
<font color " # F F 0 0 0 0 " > RED </font>
<font color " # 0 0 F F 0 0 " > GREEN </font>
<font color " # 0 0 0 0 F F " > BLUE </font>

<font color " #      X      " > YELLOW </font>
<font color " #      Y      " > MAGENTA </font>
<font color " #      Z      " > CYAN </font>
```

Yellow is a combination of red and green, magenta a combination of red and blue and cyan a combination of green and blue.

State what 6-digit hexadecimal values should replace X, Y and Z in the above code.

X

Y

Z

[3]

Unit 1: Data Representation

(ii) Describe how other colours, such as a darker shade of blue, are created.

.....
.....
.....

[2]

Unit 1: Data Representation	Q7	(ON15/12)
------------------------------------	-----------	------------------

5 A security system uses sensors, a camera and a microprocessor to capture images of each person entering a large shopping mall.

(b) Each image taken requires 1 MB of storage. If the camera captures an image every 5 seconds over a 24 hour period, how much storage is required?

Give your answer in **gigabytes** and show all your working.

.....
.....
.....
.....

[2]

Unit 1: Data Representation	Q8	(ON15/13)
------------------------------------	-----------	------------------

5 A security system records video footage. One minute of video requires 180MB of storage. The recording system can store several hours of video footage.

(b) Calculate how much storage would be needed for 2 hours of video footage.

Show your working and give the answer in Gigabytes (GB).

.....
.....
.....
.....

[2]

9 MP3 file compression reduces the size of a music file by 90%.

(a) A music track is 80 MB in size.

Calculate the file size after compression.

.....

How many MP3 files of the size calculated above could be stored on an 800MB CD?

.....

[2]

(b) (i) Explain how MP3 files retain most of the original music quality.

.....

.....

.....

.....

..... [2]

(ii) State the type of file compression used in MP3 files.

..... [1]

(iii) Name another file compression format.

..... [1]

- 7 Each seat on a flight is uniquely identified on an LCD above the seat. For example, seat 035C is shown as:



The first three characters are digits that represent the row.

The fourth character is the seat position in that row. This is a single letter, A to F, that is stored as a hexadecimal value.

Each of the four display characters can be stored in a 4-bit register. For example, 0 and C would be represented as:

	8	4	2	1
0:	0	0	0	0
C:	1	1	0	0

- (a) Show how the 4-bit registers would store the remaining two characters, 3 and 5.

3				
5				

[2]

- (b) Identify which seat is stored in the following 4-bit registers.

0	0	0	1	→	
1	0	0	1	→	
0	1	0	0	→	
1	1	1	0	→	

[2]

12

(b) The barcode in part (a) contains the denary value 2 6 4 0

Convert this value to hexadecimal.

.....

.....

Write the value as a 12-bit binary number.

--	--	--	--

--	--	--	--

--	--	--	--

[4]

3 (a) Convert the following hexadecimal number into 12-bit binary:

4 A F

--	--	--	--	--	--	--	--	--	--	--	--

[3]

(b) The 2016 Olympic Games will be held in Rio de Janeiro. A timer that counts down to the opening of the Games is shown on a microprocessor-controlled display.

The number of hours, minutes and seconds until the Games open are held in three 8-bit registers.

The present register values are:

0	1	1	0	1	0	0	1
---	---	---	---	---	---	---	---

105 hours

0	0	1	0	0	0	0	0
---	---	---	---	---	---	---	---

32 minutes

0	0	0	1	0	1	0	0
---	---	---	---	---	---	---	---

20 seconds

The timer will count **down** in seconds.

(i) Show the values in each 8-bit register **30 seconds** after the time shown above:

--	--	--	--	--	--	--	--

hours

--	--	--	--	--	--	--	--

minutes

--	--	--	--	--	--	--	--

seconds

[3]

(ii) Write the hexadecimal value of the **minutes** register from **part (b)(i)**.

.....[1]

5 A computer uses an 8-bit register.

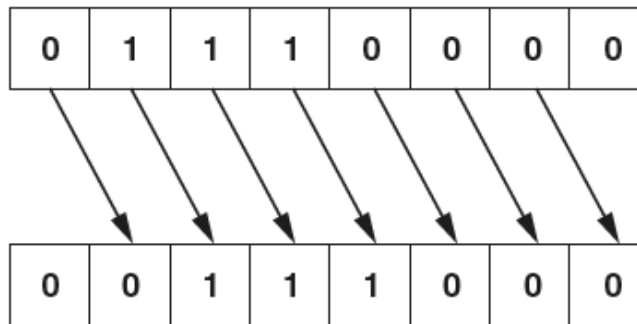
The 8-bit register contains binary integers.

(a) Write the denary (base 10) value represented by:

128	64	32	16	8	4	2	1
0	1	1	1	0	0	0	0

.....[1]

(b) All the bits in the register are shifted **one** place to the **right** as shown below.



Write the denary number that is represented after this shift.

.....[1]

(c) State the effect the shift to the right had on the original denary number from **part (a)**.

.....[1]

(d) The original number in **part (a)** is shifted **three** places to the **right**.

(i) Show the new binary number:

--	--	--	--	--	--	--	--

[1]

(ii) Write the equivalent denary number.

.....[1]

Unit 1: Data Representation

- (e) Describe the problems that could be caused if the original binary number in **part (a)** is shifted **five** places to the **right**.

.....

.....

.....

.....

.....

.....[2]

Unit 1: Data Representation	Q16	(ON16/12)
------------------------------------	------------	------------------

- 8** Identify whether the **four** statements about file compression are correct by writing TRUE or FALSE in the following table.

Statement	TRUE or FALSE
MIDI files store the actual music notes in a compressed format	
JPEG files are examples of lossless file compression	
MP3 files are, on average, 90% smaller than the music files stored on a CD	
MP4 files are examples of lossy file compression	

[4]

Unit 1: Data Representation	Q17	(ON16/12)
------------------------------------	------------	------------------

- 11** A security system is installed in a house. A hexadecimal number is entered to activate or deactivate the alarm.

- (a) The alarm code is set to hexadecimal number **2 A F**

Show how this number would be stored in a 12-bit binary register.

--	--	--	--	--	--	--	--	--	--	--	--

[3]

10 (a) A manufacturer of aeroplane engines assigns a denary identification number (ID) to each engine.

One engine has the ID: 0431

(i) Convert this denary number to a 12-bit binary format.

--	--	--	--	--	--	--	--	--	--	--	--

[2]

(ii) Show how this number would be represented in hexadecimal.

.....

.....

[3]

(b) The current status of the engine is sent to a computer in the aeroplane.

Each piece of data collected is 8 bytes in size. Data collection occurs every 30 seconds.

Calculate the number of kilobytes that would be needed to store the data collected during a 10-hour flight. Show your working.

.....

.....

.....

.....

..... kilobytes
[3]

Unit 1: Data Representation

- (c) At the end of the flight, all of the data are sent to the aeroplane engine manufacturer using the Internet.

The computer in the aeroplane has a MAC address and an IP address.

State what is meant by these two terms.

MAC address

.....

.....

IP address

.....

.....

[2]

1 The memory of a computer contains data and instructions in binary.

The following instruction is stored in a location of the memory.

0	0	1	0	1	0	0	1	1	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

(a) Convert the instruction into hexadecimal.

.....
.....
..... [2]

(b) Explain why a programmer might prefer to read the instruction in hexadecimal rather than in binary.

.....
.....
.....
..... [2]

(c) Give two other uses of hexadecimal.

Use 1

.....

Use 2

..... [2]

3 Steffi has a number of files of different sizes that contain her work.

Tick (✓) to show whether each statement is **true** or **false**.

Statement	true (✓)	false (✓)
47KB is larger than 10MB.		
250bytes is smaller than 0.5MB.		
50GB is larger than 100MB.		
1TB is smaller than 4GB.		

[4]

13 (a) Gurdeep wants to send a large file to Jennifer over the Internet.

State two benefits of compressing the file to send it.

Benefit 1

.....

.....

Benefit 2

.....

.....

[2]

(b) Two types of compression are lossy and lossless.

Choose the most suitable type of compression for the following and explain your choice.

(i) Downloading the code for a computer program:

Type of compression

Explanation

.....

.....

.....

[3]

(ii) Streaming a video file:

Type of compression

Explanation

.....

.....

.....

[3]

5 (a) The denary number 57 is to be stored in two different computer registers.

Convert 57 from denary to binary and show your working.

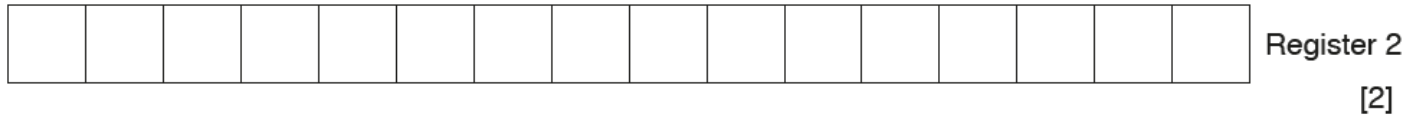
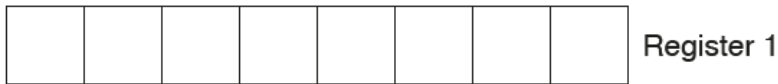
.....

.....

.....

.....[2]

(b) Show the binary number from part (a) as it would be stored in the following registers.



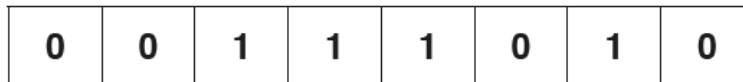
(c) A binary number stored in a register can have many different uses, for example an address in main memory.

Give two other uses for a binary number stored in a register.

Use 1

Use 2 [2]

(d) A register in a computer contains binary digits.



The contents of the register represent a binary integer.

Convert the binary integer to hexadecimal.

.....

.....[1]