GradeMax

Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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*6186151027*

**COMPUTER SCIENCE** **9608/13**

Paper 1 Theory Fundamentals **May/June 2018**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

This document consists of **15** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

**[Turn over**

**1** A web page includes the following HTML and PHP code.

```
01 <?php
02    if(isset($_GET['mark'])) {
03       echo "Grade: " . calculateGrade($_GET['mark']);
04    } else {
05 ?>
06
07 <form action="#" method="get">
08    Enter Mark: <input type="text" name="mark" /><br />
09    <input type="submit" value="Calculate" />
10 </form>
11
12 <?php
13    }
14
15       function calculateGrade($inputMark) {
16          $gradeChar = "U";
17          if($inputMark >= 80) $gradeChar = "A";
18          else if($inputMark >= 70) $gradeChar = "B";
19          else if($inputMark >= 60) $gradeChar = "C";
20          else if($inputMark >= 50) $gradeChar = "D";
21          else if($inputMark >= 40) $gradeChar = "E";
22          return $gradeChar;
23    }
24 ?>
```

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

Identifier 1 .....

Identifier 2 .....
[2]

**(b)** Give the line number where the PHP code produces an output.

.....[1]

**(c)** Describe the purpose of the expression `$_GET['mark']` in line `03`.

.....

.....

.....

.....[2]

**(d)** State whether this PHP code will run client-side or server-side.

.....[1]

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**2** A company writes applications (apps) for smartphones. The company has a relational database, PURPLEGAME, which stores the information for one of its online game apps.

The database has three tables to store player's details, dates when they have logged into the app and in-app purchase details.

LOGIN(LoginID, PlayerID, Date)

PURCHASE(PurchaseID, PlayerID, PurchaseDate, Cost)

PLAYER(PlayerID, PlayerName, SkillLevel)

**(a)** Draw the entity-relationship (E-R) diagram to show the relationships between the three tables.

[2]

**(b)** The database manager is concerned about data integrity.

State what is meant by **data integrity**. Give an example of how the manager can ensure data integrity in the PURPLEGAME database.

.....

.....

.....

.....[2]

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**[Turn over**

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**(c)** The database designer states that the PURPLEGAME database is in Third Normal Form (3NF).

Tick (✓) **one** box to indicate whether this statement is true or false.

| True | False |
|---|---|
| | |

Justify your choice.

.....

.....

.....

.....

.....

.....[3]

**(d)** **(i)** The following table shows some sample data for the PLAYER table.

| PlayerID | PlayerName | SkillLevel |
|---|---|---|
| fly918 | Kylie | 3 |
| elephant11 | Mehrdad | 9 |
| candy22 | Suzi | 15 |
| greenGrass | Jason | 22 |

Write an SQL script to create the PLAYER table.

.....

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.....[5]

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**(ii)** The table, `PLAYER`, needs to be altered. A new field, `DateOfBirth`, needs to be added.

Write an SQL script to add the `DateOfBirth` field to the `PLAYER` table.

.....

.....

.....

.....[2]

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**3** A computer is designed using the Von Neumann model.

**(a)** Describe the role of the Arithmetic and Logic Unit (ALU) and Control Unit (CU) in the Von Neumann model.

ALU .....

.....

.....

.....

CU .....

.....

.....

.....

[4]

**(b)** Describe the role of the Status Register and Program Counter (PC).

Status Register .....

.....

.....

.....

PC .....

.....

.....

.....

[4]

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**(c)** H is a register. The current contents of H are:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |

The current contents of register H represent an unsigned binary integer.

**(i)** Convert the value in register H into denary.

.....[1]

**(ii)** Convert the value in register H into hexadecimal.

.....[1]

**(iii)** The current contents of register H represent a two's complement binary integer.

Convert the value in register H into denary.

.....[1]

**(iv)** State why register H does not currently contain a Binary Coded Decimal (BCD).

.....

.....[1]

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**4** Parity bits can be used to verify data.

**(a)** The following binary number is transmitted using **odd** parity.

Add the missing parity bit.

| **Parity bit** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 1 | 1 | 0 | 1 | 0 |

[1]

**(b)** In the following parity block, the first column contains the parity bits, and the last row contains the parity byte. A device transmits the data using **even** parity.

**Circle** the error in the data being transmitted.

| | **Parity bit** | **Data** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **0** | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| | **1** | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| | **1** | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| | **0** | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| **Parity byte** | **0** | **1** | **1** | **1** | **1** | **1** | **0** | **1** |

[1]

**(c)** Four error detection measures are shown.

Draw **one** line from each error detection measure to indicate whether it is verification or validation.

**Error detection measure**

Type check

Proof reading

Check digit

Checksum

Verification

Validation

[4]

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**Question 5 begins on the next page.**

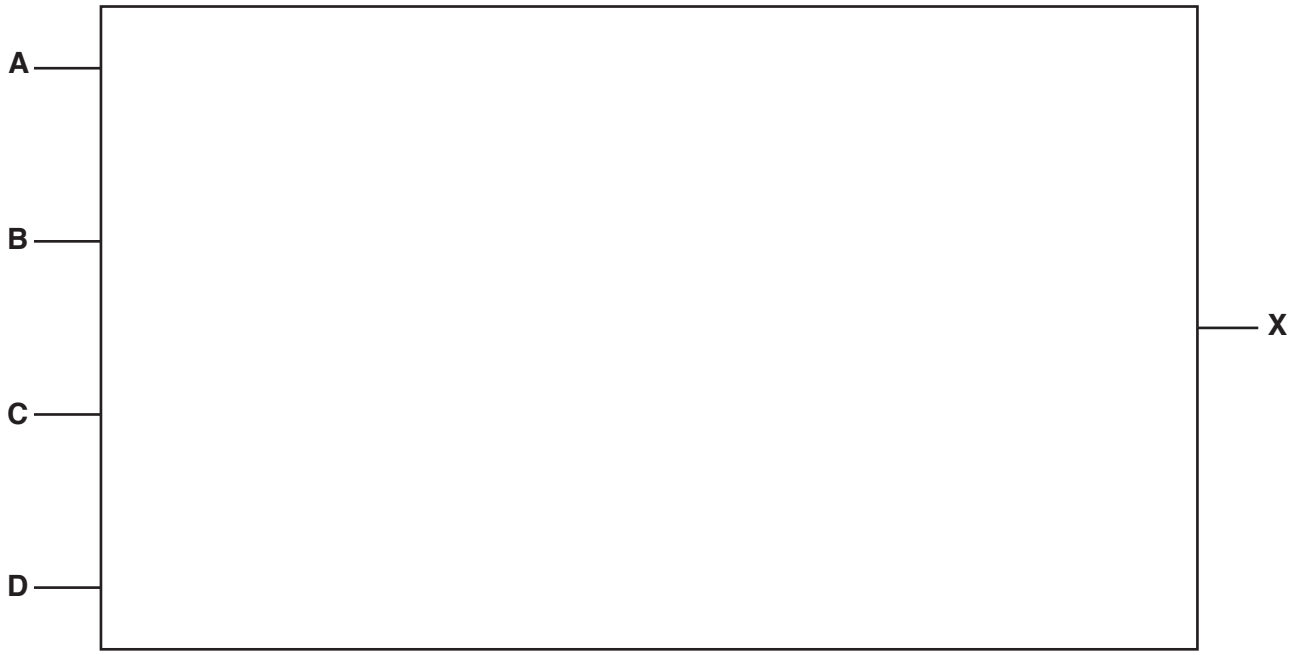
**5** **(a)** A student needs to design a logic circuit to model the requirements for membership of a snooker club. Membership (X) depends on four criteria, as shown in the table:

| Parameter | Description of parameter | Binary value | Condition |
|---|---|---|---|
| A | Over 18 | 1 | True |
| | | 0 | False |
| B | Recommended | 1 | True |
| | | 0 | False |
| C | Full-time | 1 | True |
| | | 0 | False |
| D | Retired | 1 | True |
| | | 0 | False |

Membership is approved (X = 1) if the person:

- is over the age of 18 **and** has been recommended by a pre-existing member **and**
- **either** is working full-time **or** is retired, but not both.

Draw a logic circuit to represent the membership requirements.




[3]

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**(b)** Complete the truth table for the 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 | | |

[4]

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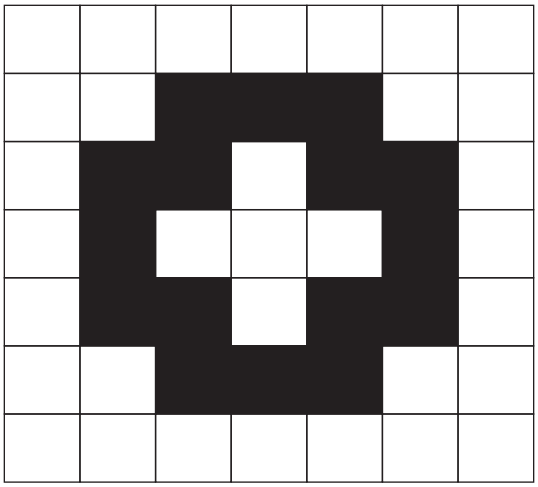
**6** A black and white bitmap image is shown.



**(a)** State the **minimum** number of bits needed to represent each pixel in this image.

.....[1]

**(b)** Run-length encoding (RLE) is used to store the image with the following colour codes.

| Colour | Code |
|---|---|
| Black | 1A |
| White | 3B |

Show how run-length encoding is used to store the image.

.....

.....

.....[3]

**(c)** An image has 30 different colours.

State the **minimum** number of bits needed to represent each pixel in the 30-colour image.

.....[1]

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**(d)** When the image is saved, a header is added to the file.

State the purpose of the **file header**. Give **two** examples of the file header contents.

Purpose .....

.....

Example 1 .....

.....

Example 2 .....

.....

[3]

**(e)** Graphics software is used to edit a digital photograph.

Give **three** features of graphics software that can be used to edit the photograph.

Describe the effect each has on the photograph.

Feature 1 .....

Effect .....

.....

.....

Feature 2 .....

Effect .....

.....

.....

Feature 3 .....

Effect .....

.....

.....

[6]

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**[Turn over**

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**7** A zoo has a computer system for the visitors to access multimedia content about the zoo and its animals.

**(a)** The users interact with the computer system through touchscreens.

Describe the internal operation of a **touchscreen**.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

**(b)** **(i)** Give **one** output device, other than a touchscreen, that may be part of this computer system.

.....[1]

**(ii)** Give **two** input devices, other than a touchscreen, that may be part of this computer system. State how each device will be used by the visitors.

Device 1 .....

Use .....

.....

Device 2 .....

Use .....

.....

[4]

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**(c)** Give the most appropriate secondary storage device for this computer system.

Describe **two** reasons for your choice.

Device .....

Reason 1 .....

.....

.....

.....

Reason 2 .....

.....

.....

.....

[5]

**(d)** This computer system has Random Access Memory (RAM) and Read Only Memory (ROM).

State what will be stored in RAM and ROM for this computer system.

RAM .....

.....

ROM .....

.....

[2]

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