

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]

- 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]

(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]

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]

(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]

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]

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.



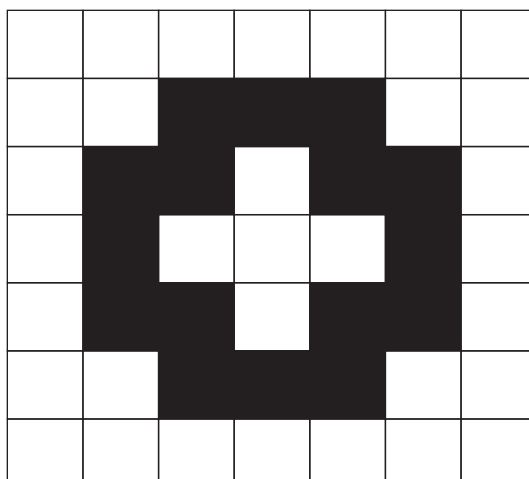
[3]

(b) Complete the truth table for the logic expression: $X = (A \text{ XOR } B) \text{ AND NOT } C$

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]

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]

(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]

(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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