Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMPUTER SCIENCE

0478/12

Paper 1 Theory

February/March 2021

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- 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.
- 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.

(d) Electronic data about the final score for the match is transmitted to a central computer 30 kilometres away, using serial transmission.

(i) Explain why serial transmission is more appropriate than parallel transmission in this scenario.

The data transmitted, once it reaches the other destination is not skewed

The data transmitted will be more accurate on the other side.

It will be cheaper to use a single wire over a long distance than to use multiple for parallel [3]

(ii) The data transmission is also half-duplex.

Describe half-duplex data transmission.

Data is transmited from both sides but not at the same time

[2]

(iii) The data transmission uses checksums.

Describe how checksums are used to detect errors in data transmission.

A value (checksum) for the data is calculated by the sending side. This value together with the data is sent to the recepient. The recepient will recalculate this value from the data received. The receipient will compare the two checksum values to check if they are the same. [3]

2 Gurdeep takes high definition photographs using a digital camera. She has set up a website where users can view thumbnails of her photographs. A thumbnail is a small version of the high definition photograph.

(a) Gurdeep compresses the high definition photographs to create the thumbnails. She uses lossy compression.

Describe how lossy compression creates the thumbnails.

lossy compression will use an algorithm to reduce the number of ~~pixels~~ bits in the pixels. It may also reduce the resolution of the image. It may also remove bits and patterns that are fairly close to each other.

[3]

(b) Gurdeep sets up a web server to host her website. She reads about an Internet Protocol (IP) address, a Media Access Control (MAC) address and a Uniform Resource Locator (URL).

Draw a line to connect each term to the correct example.

Term	Example
IP address	192.168.0.255
MAC address	https://www.cambridgeinternational.org
URL	00:15:E9:2B:99:3C

[2]

(c) Users can buy the high definition photographs from the website. When a user buys a high definition photograph, a Secure Socket Layer (SSL) connection is created.

(i) Give **one** benefit of using an SSL connection.

The data is encrypted so if it is intercepted it will not make sense [1]

(ii) Explain how the SSL connection is created.

A request is made from the web client to the web server for its digital certificate. Once sent to the browser, it will again be sent to a certification authority to check for authenticity.
If it is valid, the client and server will agree on an encryption method. A session key is generated and transmission can begin. [4]

3 The given table shows the name or description of four devices. The table is incomplete.

Complete the missing device names and descriptions.

Device name	Description
Inkjet Printer	Uses either thermal bubble or piezoelectric technology
Actuator	Operated by ~~ph~~ signals to cause a physical movement
Digital Sense DLP projector	Uses thousands of tiny mirrors that can move very quickly to create an image
Mouse	Uses a rolling ball at its bottom to detect motion on ~~table~~ and mimic the same using a cursor on the screen

[4]

4 A supermarket sells many products. Each product has a barcode.

(a) Explain how the barcode is read at the supermarket checkout and how the price of the product is found.

The barcode is scanned using a red laser. The pattern is interpreted into a code. The code is sent to the server. The server checks if that code is in the database. If it is the details of that item are sent back to the POS terminal The number of items is reduced by one in the server database. The system checks if the new number of items is below the re-order level. If it is then an automatic order for new stock is made and the flag is raised to show that a reorder has already been made.

[6]

(b) The supermarket stores data using a Solid State Drive (SSD).

(i) Explain how an SSD stores data.

SSD uses flash storage.
It uses transistors that can be made using NAND or NOR technology.
Data is flashed into the chips
The electric current is taken to the control gate

[3]

(ii) One advantage of an SSD rather than a Hard Disk Drive (HDD) is that it has no moving parts, so it is more durable.

State **one** other advantage of the supermarket using SSD rather than HDD.

SSD are faster than HDD

[1]

5 Computers use logic gates.

(a) State the **single** logic gate that produces each truth table.

Truth table	Logic gate
A | B | Output 0 | 0 | 1 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0	NAND
A | B | Output 0 | 0 | 0 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0	XOR
A | B | Output 0 | 0 | 1 0 | 1 | 0 1 | 0 | 0 1 | 1 | 0	NOR

[3]

(b) An aeroplane has a warning system that monitors the height of the aeroplane above the ground, whether the aeroplane is ascending or descending, and the speed of the aeroplane.

Input	Binary value	Condition
Height (H)	1	Height is less than 500 metres
	0	Height is greater than or equal to 500 metres
Ascending or Descending (A)	1	Aeroplane is ascending or in level flight
	0	Aeroplane is descending
Speed (S)	1	Speed is less than or equal to 470 knots
	0	Speed is greater than 470 knots

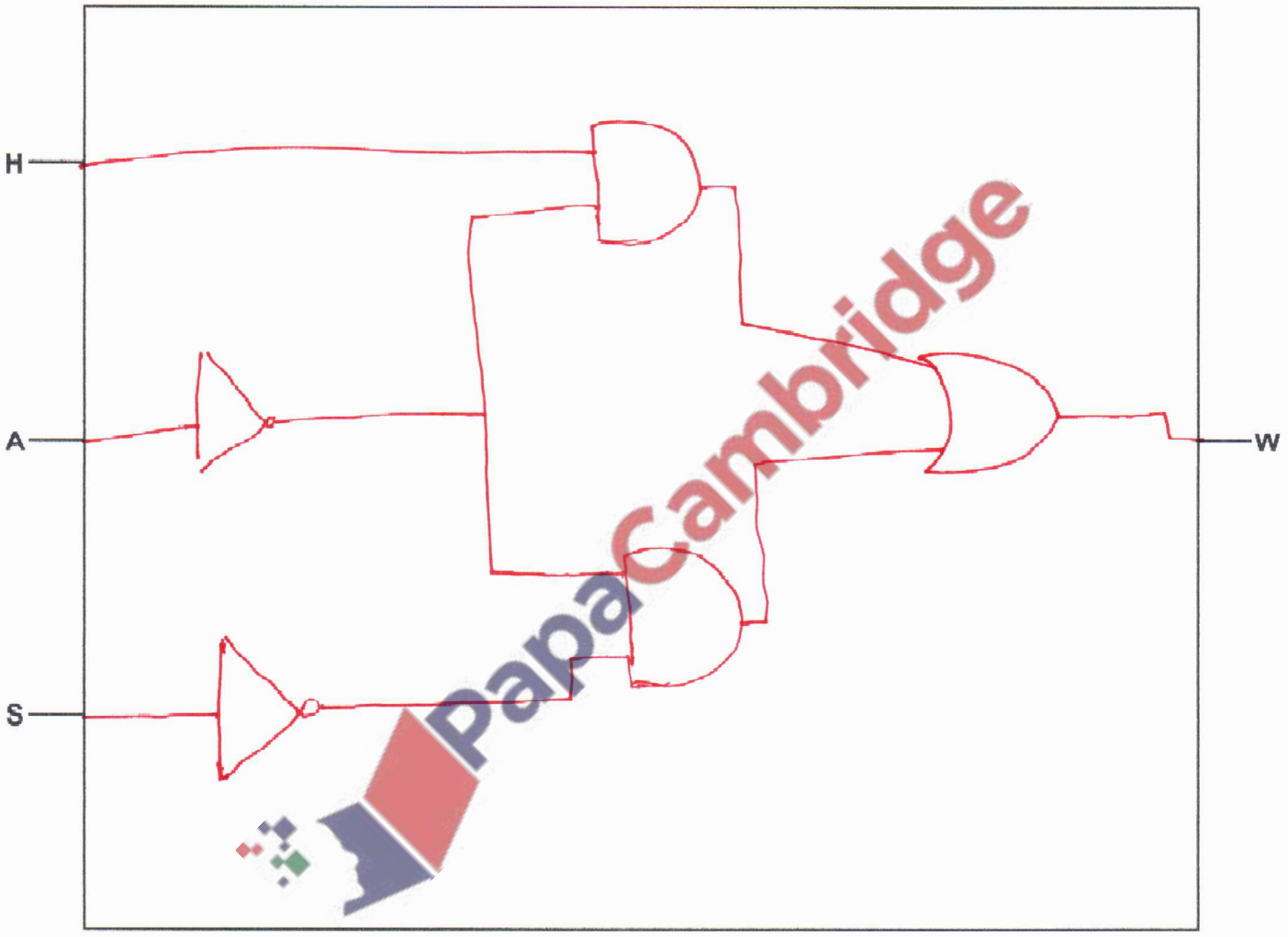
The warning system will produce an output of 1 that will sound an alarm (W) when either of these conditions apply:

Height is less than 500 metres and the aeroplane is descending

or

The aeroplane is descending and speed is greater than 470 knots

Draw a logic circuit to represent the warning system.



[5]

6 Hacking is one type of Internet risk used to obtain personal data that is stored on a computer.

(a) Explain how a firewall can help prevent hacking.

A firewall monitors incoming and outgoing traffic to check if it meets a certain criteria. If the traffic does not meet the criteria then it is blocked. The firewall can block entry of data into certain ports. It can also prevent/block certain applications from accessing the internet.

[4]

(b) Identify and describe **two** other types of internet risk that are used to obtain personal data.

Internet risk 1 Phishing

Description a legitimate looking email address is sent to the victim. A link is clicked that will take the victim to a page that will request them to enter their personal data.

Internet risk 2 Pharming

Description a program (malware) is stored on the server or user hard drive. It detects when you open a browser. It will open a webpage that will ask you for your personal data.

[6]

7 Adeel has used a high-level language to program a mobile application.

(a) Describe what is meant by a high-level language.

This is a programming language that uses codes/ words that closely match the natural language that the programmer speaks. It is easy to read and debug [2]

(b) Adeel uses an interpreter while developing and testing the application.

Adeel uses a compiler when the application is ready to be shared with others.

Compare the features of interpreters and compilers.

Both will translate the high level language from high level to low level.
The interpreter will translate line by line and as soon as an error is encountered then it stops.
The compiler will translate the whole code and present all the errors at the end of translation. [4]

(c) Adeel is considering distributing his application as free software or shareware.

Explain the difference between free software and shareware.

Free software is free for download, it can be changed as per the users request The user can modify its code, redistribute it with the changes.
Shareware is protected by copyright laws but it is free for use for a specific period or only certain features of the software are available. [5]

(d) Adeel is concerned about his application being plagiarised.

Define the term plagiarism.

This is when you take one's work and claim it to be your own [1]

(e) Adeel copyrights his application.

State why Adeel copyrights his application.

To protect it from being plagiarised. To reap all the benefits from commercialization [1]

8 The Von Neumann model, for a computer system, uses the stored program concept.

(a) Describe what is meant by the stored program concept.

Instructions and data are stored in main memory. The instructions are fetched, decoded and executed in order by the processing unit. [2]

(b) The fetch-execute cycle of a Von Neumann model, for a computer system, uses registers and buses.

(i) Describe the role of the Program Counter.

This register holds the address of the next instruction to be fetched in the fetch cycle [2]

(ii) Describe the role of the Control Bus.

This bus is used to transfer data related to instructions between the components of the processor [2]

(c) Computers based on the Von Neumann model, for a computer system, use interrupts.

Explain why interrupts are needed.

This will allow for multitasking. It will allow for efficient use of hardware in the computer. [2]