SECONDARY 4 PRELIMINARY EXAMINATION

COMPUTING Paper 1 Written

7155/01

| 27 August 2021 (Friday) | | | 2 hours |
|--|------------|---------|---------|
| CANDIDATE NAME | | | |
| CLASS IND NUL | EX MBER | | |
| READ THESE INSTRUCTIONS FIRST | For Exa | aminer' | s Use |
| Do not turn over the page until you are told to do so. | 1 | 8 | |
| Write your name, class, and index number in the spaces provided above. | 2 | 3 | |
| Write in dark blue or black pen. | 3 | 6 | |
| You may use a pencil for any diagrams or graphs. | 4 | 6 | |
| Do not use staples paper clips highlighters glue or | 5 | 4 | |
| correction fluid/tape. | 6 | 10 | |
| Approved calculators are allowed. | 7 | 6 | |
| ··· | 8 | 14 | |
| Answer all questions. | 9 | 9 | |
| The number of marks is given in brackets [] at the end of each question or part question | 10 | 6 | |

You should show all your working.

The total number of marks for this paper is 80.

This document consists of **18** printed pages, including this Cover Page.

| For Examiner's Use | | | |
|--------------------|----|-----|--|
| 1 | 8 | | |
| 2 | 3 | | |
| 3 | 6 | | |
| 4 | 6 | | |
| 5 | 4 | | |
| 6 | 10 | | |
| 7 | 6 | | |
| 8 | 14 | | |
| 9 | 9 | | |
| 10 | 6 | | |
| 11 | 8 | | |
| Total | | /80 | |



1 (a) Computers use collections of wires called buses to transport data from one part of the computer to another.

Draw **one or more lines** from each type of bus on the left to the description that applies to it on the right.



[2]

(b) Computers also require one or more hardware devices for input and output.

(i) State what is meant by an input device.

(ii) Besides the mouse and keyboard, name two input devices that are required when making a video conference call on a computer.

Page 2 of 18

- (c) The operating system of a computer is usually stored on its hard drive. However, its data and instructions are loaded into the random access memory (RAM) after booting up the computer.
 - (i) Suggest why the operating system is not stored in the RAM.

.....

(ii) Explain why the operating system's data and instructions are loaded into the RAM instead of the read-only memory (ROM) after booting up the computer.

| [1] |
|---------|

2 IP and MAC addresses are used to identify individual computers so that data transmitted over a network can be directed to the correct destination.

The table contains statements about IP and MAC addresses.

Tick (\checkmark) one or more boxes in each row to indicate if the statement is about IPv4, IPv6 or MAC addresses.

| Statement | IPv4 Address | IPv6 Address | MAC Address |
|--|-----------------|-----------------|----------------|
| Also known as a physical address. | | | |
| Used to direct data transmitted over the | | | |
| Internet to a device. | | | |
| Used by a switch to forward data to the intended recipient device. | | | |
| Represented by more than 4 bytes. | | | |
| Usually represented in hexadecimal. | | | |

[3]

[2]

- **3** Technology has made it easy for people to remain connected and communicate with one another no matter where their physical location is.
 - (a) Give one social benefit and one social drawback of using technology to communicate.

- (b) The rise of the use of social media to share original content such as photos and videos has also led to an increase in plagiarism and violation of intellectual property rights.
 - (i) Define the term intellectual property.

[1]

(ii) Plagiarism is often confused with copyright infringement.

By comparing the difference between plagiarism and copyright infringement, conclude whether a social media influencer who uploads a public domain photo onto his own social media account and pretends it was taken by himself is guilty of plagiarism, copyright infringement, or both.

[3]

- 4 Malicious software, or malware, refers to software that is intentionally used to damage, disrupt or gain unauthorised access to a computer system.
 - (a) Name two types of malware and describe their distinguishing features.

| Malware 1 | |
|---|-----|
| Description | |
| | |
| | |
| Malware 2 | |
| Description | |
| | |
| | [4] |
| (b) Explain the role of updating software regularly in preventing attacks from malware. | |
| | |
| | |
| | |
| | [2] |

5 Web addresses follow the syntax rules of a Uniform Resource Locator (URL) so that a web browser can extract various pieces of information from it. A web address may contain several reserved characters that need to be URL encoded.

URL encoding comes in the form "%XX", where XX are hexadecimal digits.

(a) State what the hexadecimal digits in the URL encoding represent.

(b) The URL encoding for the semicolon character (";") is %3B. Convert the number into denary.
[1]
(a) The URL are diag for the right and hence (") ") is %7D. Convert the number

(c) The URL encoding for the right curly brace ("}") is %7D. Convert the number into a 2-byte binary number.

- 6 Mr Yeo is the founder of a new company, SSTea Inc, which sells bubble tea and offers discounts to customers who are registered on their membership programme. He wants to set up a company network for his head office that allows him and his four employees to share files easily and yet is secure from external threats. Mr Yeo has plans to hire more employees as he sets up more retail stores.
 - (a) When setting up a firewall for his network, Mr Yeo considers the option to configure it such that a private network is set up. While a private network is secure from external threats, it is still vulnerable to internal threats.
 - (i) State the purpose of a firewall.

.....[1]

(ii) Describe the ethical principles that the employees must abide by to ensure the security of a private network from within.

......[1]

- (b) Mr Yeo must also decide between using a wired or wireless setup for his head office.
 - (i) By considering the needs of Mr Yeo's office and comparing each type of network, suggest which one he should choose.

[2] (ii) Give one disadvantage of the type of network you have suggested in part (i).

.....[1]

(c) Complete the following paragraph by filling in the missing words.

A/an should be connected to a modem. This device forwards packets between the office network and the Internet. The of the above device also needs to be configured to allow office devices to detect and log in to the wireless network. Furthermore, each computer needs to have a piece of hardware known as a/an to enable the transfer of data between the computer and the network. The most common wireless network protocol is

[4]

(d) The head office is situated on the second floor of a shophouse, with SSTea Inc.'s first retail store on the first floor. After three months, SSTea Inc. decides to open their second retail store at a location with a 10-minute drive away from their head office. The two retail stores have to be connected to the head office's network to wirelessly transmit data to and from the office.

Classify SSTea Inc.'s network by its geographical coverage.

.....[1]

7 The SSTea Inc. bubble tea stores are open 7 days a week. The company pays their part-time retail staff according to the number of hours worked. Each employee taps their staff pass against a card reader at the start and end of their shift and the data is stored on a computer.

The following pseudo-code represents an algorithm that reads the stored data and calculates the weekly salary of an employee.

```
01 hourly_rate = 9
02 total_hours = 0
03 FOR day = 1 to 8
04 INPUT time_in, time_out
05 hours_worked = time_out - time_in
06 round hours_worked down to nearest whole number
07 total_hours = total_hours + hours_worked
08 NEXT
09 OUTPUT hours_worked
```

(a) There are two errors in the given algorithm. State the line in which each error occurs and write the correct pseudo-code.



- 8 A computer game stores its highest achieved score as a text file on the hard drive of the computer it is installed on. Whenever a player plays the game, the game uses an algorithm to compare the player's score to the stored highest score and update the text file if necessary. A message is also displayed in the game to inform the player if he or she has successfully obtained a new highest score.
 - (a) Suggest why the highest score should be stored as a text file on the computer instead of as a value in the program.

......[1]

(b) State the input(s), the output(s) and the process(es) that are required by the program that determines and stores the highest score.

| Input(s) | |
|-------------|-----|
| | |
| Output(s) | |
| | |
| Process(es) | |
| | |
| | |
| | [4] |

- (c) To ensure there are no glitches, the algorithm needs to validate the player's score immediately after it is received from the game's score computation function.
 - (i) The score must be an integer and must not be a negative.

Identify an appropriate data validation technique that can be used to validate this input.

.....[1]

(ii) Name three different types of test case conditions. For each type, give an example of test data for the player's score.

| Test case condition | Test data | | |
|---------------------|-----------|--|--|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

(iii)Write pseudo-code for the algorithm to receive the player's score from the get_score() function, store it as a variable, and perform this validation check on the value. The algorithm should continually call the get_score() function until a valid score is received.



[3]

(a) A laboratory is synthesising a certain chemical substance. The chemical is placed in a water bath and put into a pressure jar. The pressure in the jar, temperature of the water bath and the pH value of the substance is monitored with sensors.

Either of the following conditions must be met to synthesise the chemical substance:

- When the temperature of the water bath is less than 5°C, the pressure in the jar must be higher than atmospheric pressure.
- When the temperature of the bath is more than or equal to 5°C, the pH value of the substance has to be maintained below 7.0.

A logic circuit is set up to connect the sensors with an alarm, which should sound when neither of the above conditions are met.

| Input | Description | Binary Value | Conditions |
|-------|-------------|-----------------|--------------------------------------|
| Р | Pressure | 1 | Pressure is higher than atmospheric |
| | | | pressure. |
| | | 0 | Pressure is lower than or equivalent |
| | | | to atmospheric pressure. |
| Т | Temperature | 1 | Temperature < 5°C |
| | | 0 | Temperature $\geq 5^{\circ}C$ |
| Н | pH value | 1 | pH value < 7.0 |
| | | 0 | pH value ≥ 7.0 |

The table below shows the inputs into the circuit.

The output, \mathbf{X} , will have a value of 1 when the alarm is ringing and 0 when the alarm is not ringing.

(i) Draw the logic circuit for the above scenario.



9

(ii) Write down the logic statement for X.

(b) Complete the truth table for the following Boolean statement.

| Α | В | С | Working Space | Ζ |
|---|---|---|---------------|---|
| | | | | |
| 0 | 0 | 0 | | |
| 0 | 0 | 1 | | |
| 0 | 1 | 0 | | |
| 0 | 1 | 1 | | |
| 1 | 0 | 0 | | |
| 1 | 0 | 1 | | |
| 1 | 1 | 0 | | |
| 1 | 1 | 1 | | |

$\mathbf{Z} = \mathbf{A} \text{ OR NOT } (\mathbf{B} \text{ AND } \mathbf{C}) \text{ NAND } \mathbf{A}$

[4]

10 Study the following flowchart.



- List1 List2 OUTPUT x У
- (a) The algorithm in the flowchart needs to be tested.Complete the trace table for the input data of 3.

[5]

(b) State the purpose of the algorithm in the flowchart.

.....[1]

- 11 Students in a certain secondary school study eight subjects. The subjects are:
 - Two Languages (L1 and L2)
 - Two Mathematics (M1 and M2)
 - Two Sciences (S1 and S2)
 - Two Humanities (H1 and H2)

The school wants to give out an all-rounder award. An All-Rounder Score is computed to determine the students who are eligible for the award.

- Grades A1 to F9 are awarded for each subject, with A1 being the best and F9 being the worst.
- The All-Rounded Score is calculated by adding the grades of the better subject in each subject category (Languages, Mathematics, Sciences and Humanities), then adding on the grade of the best subject that has not yet been used in the calculation.

(a) Write an algorithm, using a flowchart, to take the 8 grades as input and then output the All-Rounder Score.

(b) Suggest how your algorithm can be modified to calculate the All-Rounder Score for a number of subject categories known only to the user.

.....

[1]

END OF PAPER