SCHOOL OF SCIENCE AND TECHNOLOGY, SINGAPORE

SECONDARY 4
PRELIM EXAMINATION

COMPUTING
Paper 1 **7155/01**
Written

30 August 2019 (Friday) **2 hours**

CANDIDATE NAME			
CLASS		INDEX NUMBER	

READ THESE INSTRUCTIONS FIRST
Do not turn over the page until you are told to do so.
Write your name, class, and index number in the spaces provided above.
Write in dark blue or black pen.

You may use a pencil for any diagrams.

Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

Approved calculators are allowed.

Answer **all** questions.

The number of marks is given in brackets [ ] at the end of each question or part question.
You should show all your working.
The total number of marks for this paper is 80.

For Examiner's Use		
1	3	
2	5	
3	4	
4	3	
5	3	
6	4	
7	4	
8	7	
9	5	
10	4	
11	10	
12	12	
13	10	
14	6	
Total		/80

This document consists of 16 printed pages.

[Turn over

1 Fill in the blanks with the correct word(s) from the following list.

address bus *arithmetic logic unit* *control unit* *central processing unit*

data bus *memory* *secondary storage* *process register*

RAM *ROM* *hard disk*

(a) The _____ transfers data between memory and processor. It is bi-directional.

Answer: …… **[1]**

(b) The _____ is the part of the processor that processes data by performing mathematical operations.

Answer: …… **[1]**

(c) The _____ is where data and instructions that are needed for a computer to start up are stored.

Answer: …… **[1]**

2 Data is used in a computer program. It can be stored as bytes.

(a) What makes up one byte?

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..... **[1]**

(b) Larger amounts of data can be measured in terms of megabytes or mebibytes. Convert one mebibyte to megabytes.

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

(c) A camera SD card has 64 gigabytes of storage space. If the size of each low resolution image is 500 kilobytes, what is the maximum number of images the SD card can store before it is full?

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

3 Most webpages use the RGB (Red, Green, Blue) colour model. Hues of the three primary colours, red, green and blue, are added in various intensities to give a distinct colour representation which can be described by a colour code comprising 6 hexadecimal digits, #RRGGBB. RR, GG and BB are pairs of hexadecimal digits which represent the intensities of red, green and blue respectively. The intensity of each primary colour ranges from 00 for zero intensity to FF for maximum intensity. Therefore, #000000 represents black and #FFFFFF represents white.

(a) Including white and black, how many different colours can the RGB model represent in total?

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..... **[1]**

An object on a webpage has the colour #6B00D3.

(b) Convert $(6B)_{16}$ to a binary number. Show your working.

.....

..... **[1]**

(c) Convert $(D3)_{16}$ to a denary number. Show your working.

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

4 Jason is a programmer who uses Unicode often in his work.

State what Unicode is, what it is used for, and how it is represented in the computer system.

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..... **[3]**

[Turn over

5 Internet Protocol (IP) addresses are used to identify computers on the Internet. There are two versions of IP addresses used today, namely IP version 4 (IPv4) and IP version 6 (IPv6).

(a) State the main difference between a IPv4 address and IPv6 address.

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

(b) Explain the need to have IPv6 addresses.

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..... **[1]**

6 In computer networks, MAC addresses are very important and used extensively. They can be found in Ethernet, Wi-Fi and Bluetooth technologies. 00:0a:95:9d:68:16 is an example of a MAC address.

(a) What does the acroymn MAC stand for?

..... **[1]**

(b) State why MAC addresses are used.

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..... **[1]**

(c) Identify what the first six and last six hexadecimal digits of a MAC address represent.

First six digits: .....

Last six digits: ..... **[2]**

7 A private clinic holds records of its patients in a database. Apart from the names and medical conditions of the patients, the other fields include:

- Date of birth (DD/MM/YYYY)
- Gender (Male / Female)
- Height in metres
- Postal code (6 digits)

For each field, suggest a validation check that should be performed to ensure data is entered accurately. Provide an example of data which would fail your named validation check.

A different validation check should be used for each field.

Field Name	**Name of Validation Check**	**Example of data which would fail the validation check**
Date of birth		
Gender		
Height		
Postal code		

[4]

[Turn over

8 John plans to set up a new supermarket. He wants to have a wireless LAN in his supermarket so that orders can be processed quickly via point-of-sale terminals. He has about 15 employees working in the supermarket, while 5 other employees work from other locations while doing deliveries. The employees need to share order information among themselves and be able to connect to the supermarket's inventory list. John also has plans to expand his business in the near future.

(a) Which network topology is most suitable in this case? Why?

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

(b) State the inputs, outputs and processes required when taking stock of the inventory of the supermarket.

Inputs: .....

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Outputs: .....

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Processes: .....

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..... **[5]**

9 E-commerce has been on the rise over the last few years. According to Forbes[1], digital transactions are expected to grow globally to reach US$5.8 trillion in 2022. Despite the vast opportunities that E-commerce provides, there are also various challenges.

One such challenge is that personal information can be compromised through E-commerce. Therefore, there is a need to implement safety measures using authentication and ensure that privacy policies are understood.

(a) State two authentication methods that help to prevent unauthorised access. **[2]**

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(b) Explain how ensuring that privacy policies are understood reduces unauthorised sharing of personal information. **[1]**

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(c) State two other negative effects of an increase in the use of the internet for E-commerce on society. **[2]**

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[1]*Source: https://www.forbes.com/sites/jordanmckee/2018/09/11/global-digital-commerce-sales-to-near-6-trillion-by-2022/#62ddfa704c5a* (*Accessed in July 2019*)

[Turn over

10 Spreadsheet software is used by many companies to keep track of accounts.
State the spreadsheet function from the following list which fits the description.

```
CEILING, COUNT, COUNTA, COUNTBLANK, COUNTIF, FLOOR, FV,
HLOOKUP, IPMT, LEFT, LEN, MAX, MID, MIN, PMT, PPMT, PV,
RAND, RANDBETWEEN,  RATE, ROUND, VLOOKUP
```

(a) Looks for `lookup_value` in the first column of `table_range` and returns the value in `column_index_num` of the matching row.

Answer: …… **[1]**

(b) Returns a random number between two whole numbers (both inclusive).

Answer: …… **[1]**

(c) Returns `number` rounded down to an exact multiple of `significance`.

Answer: …… **[1]**

(d) Returns the number of empty cells in `range`.

Answer: ……. **[1]**

11 A power plant generates electricity using steam. There are three input parameters involved in the safety alarm system: rate of steam flow, temperature and pressure. Each parameter has a binary value of 0 or 1 depending on the process conditions.

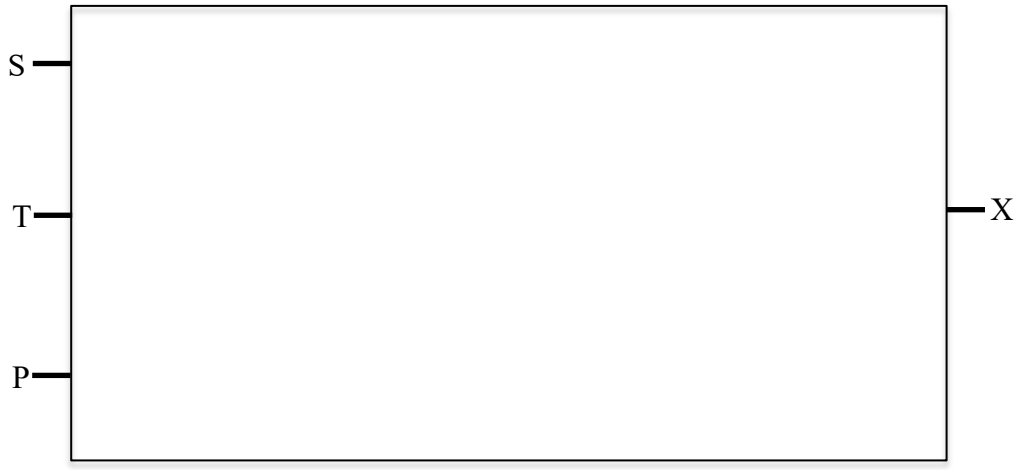
The inputs to the system are:

Input	**Description**	**Binary Value**	**Conditions**
S	Rate of steam flow	1	Rate of steam flow too slow.
		0	Rate of steam flow is normal.
T	Temperature	1	Temperature is > 200 °C
		0	Temperature is ≤ 200 °C
P	Pressure	1	Pressure is > 15 bar
		0	Pressure is ≤ 15 bar

The safety alarm system is made up of logic gates. The system is designed such that its logical output, X, will have a value of 1 and the alarm will activate when:

either the rate of steam flow is too slow and the temperature is > 200 °C;
or the temperature is ≤ 200 °C, the rate of steam flow is too slow, and the pressure > 15 bar.

(a) Draw a logic circuit for this safety system.



[3]

(b) Complete the truth table for the safety system.

S	T	P		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		

[5]

(c) Write a logic statement with only <u>two</u> logic gates that gives similar output to X.

X =

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

[Turn over

12 A company has issued identification numbers for its employees. Each identification number is made up with a 4-digit number, appended with a checksum. The checksum is calculated by taking the sum of the first 4 digits, and then dividing the total by 5. The resulting remainder is then used as the checksum.

For example, for the identification number that starts with 1234, the sum of 1, 2, 3 and 4 is calculated to be 10. 10 is then divided by 5, resulting in a remainder of 0. Thus the identification number becomes 12340.

(a) What is a checksum? How is it used? **[4]**

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(b) Explain briefly if the above method is a good way to derive a checksum. **[2]**

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(c) One day, the manager of the company received a document with a list of 20 identification numbers. He suspects that some of these identification numbers are invalid, and therefore fake.

Write an algorithm, using pseudocode, which

- inputs the 20 identification numbers,
- checks whether each identification number in the list is valid,
- outputs the total number of identification numbers that are valid,
- outputs the total number of identification numbers that are not valid. **[6]**

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[Turn over

13 Mary is playing a tabletop board game. The game has a manual dice roll system which is slow and cumbersome. Mary wants to write a program to computerise the dice roll system and automatically determine the outcome of each challenge.

The rules are as follows:
1. A challenge has a target number, TN
2. A player can roll X number of 6-sided unbiased dice, where $1 \leq X \leq 20$, per challenge.
3. For each dice roll of 5 or 6, the player gains a success.
4. For each dice roll of 1, the player gains a botch.
5. If the number of botches is greater than the number of successes, the player botches the challenge.
6. Else if the number of successes is greater than or equal to TN, player wins the challenge.
7. Else the player loses the challenge.

Mary's program takes in two inputs, TN and X. It then randomly generates X numbers between 1 to 6. It will then tell Mary if she wins, fails or botches the challenge.

```
01    import random
02    #random.randint(a,b) is used to generate a random int
       n,
03    #where a ≤ n < b
04
05    while true:
06          TN = input("Enter target number : ")
07          X = input("Enter number of dice : ")
08          if 1 ≤ int(X) ≤ 20 and X.isdigit() and
            TN.isdigit():
09                break
10          else:
11                print("Invalid input!")
12
13    success, botch = 0, 0
14    for _ in range(int(X)):
15          temp = random.randint(1,6)
16          if temp > 4:
17                success += 1
18          else if temp == 1:
19                botch += 1
20
21    if botch > success:
22          print("You botch the challenge!")
23    if success >= TN:
24          print("You win the challenge!")
25    else:
26          print("You fail the challenge!")
```

There are five errors in Mary's Python code. Locate the errors and state the correct Python code.

Error 1 ……

Correction ……..

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

Error 2 ……

Correction ……..

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

Error 3 ……

Correction ……..

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

Error 4 ……

Correction ……..

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

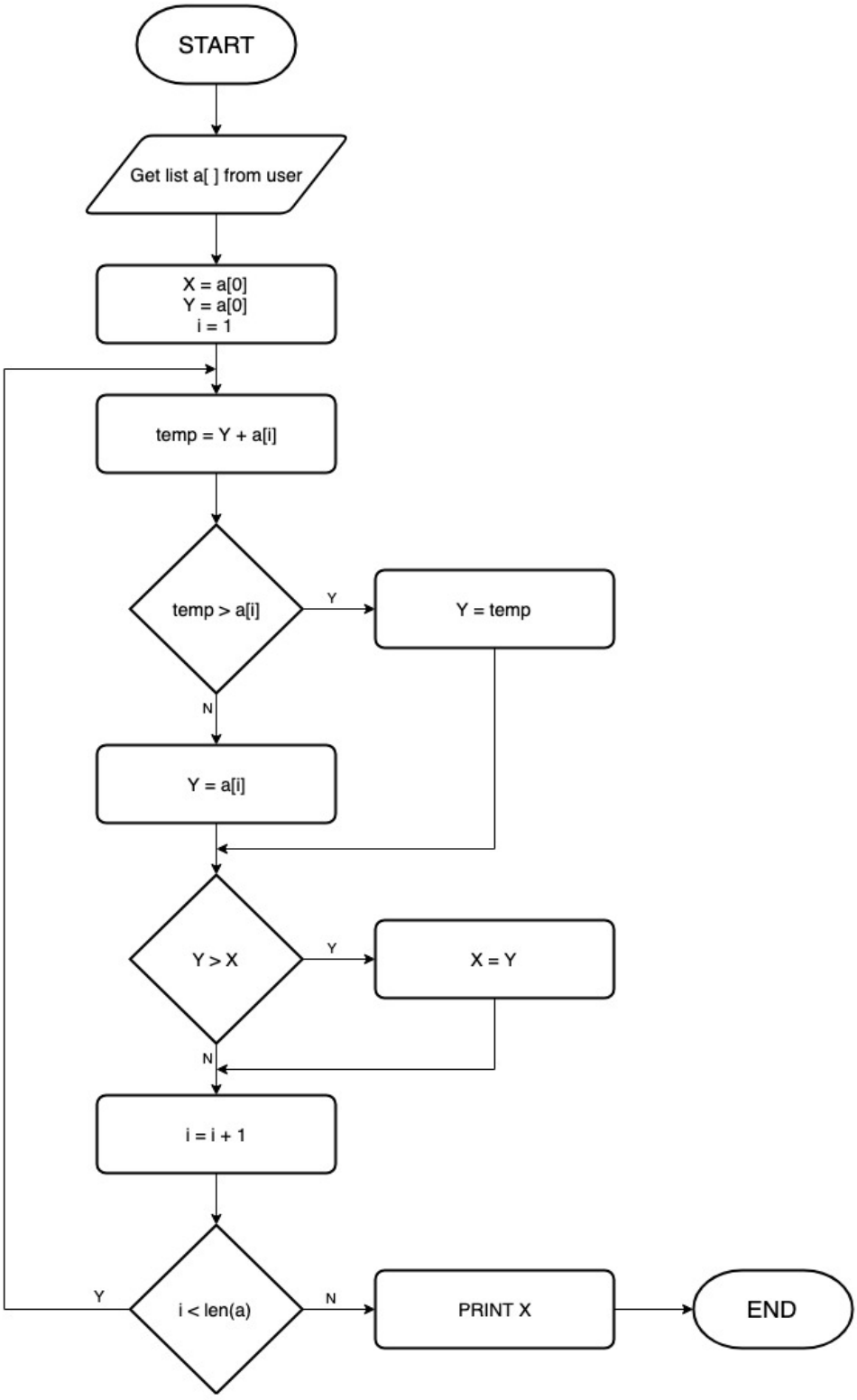
Error 5 ……

Correction ……..

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

[Turn over

14 Consider the following flowchart.



(a) Complete the trace table using the following list.

```
a = [-2, -3, 4, -1, -2, 1, 5, -3]
```

X	Y	i	temp	output

[5]

[Turn over

(b) What does this algorithm achieve?

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..... **[1]**

--- END OF PAPER ---