BOON LAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION

2021

Name	
CCA	

Subject	:	**COMPUTING**
Paper No	:	**1**
Subject Code	:	**7155/01**
Level	:	**SECONDARY FOUR EXPRESS**
Date/Day	:	**30th AUGUST 2021 / MONDAY**
Time	:	**1100 – 1300**
Duration	:	**2 HOURS**

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Before you start your exam, check that you have received the correct paper and the number of printed pages are correct.

Write your name, index number, and CCA 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 or graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

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.

This document consists of **12** printed pages.

1 Digital systems make use of several different methods to store data.

a **(i)** Explain what is meant by “hexadecimal digits”.

Base 16, numbers are from 0 to 9, A to F.

……...[1]

(ii) Describe two examples where a hexadecimal storage system would be preferred over a denary system.

file compression, MAC addresses, colour codes, encryption [Any two]

……...[2]

(iii) Justify the use of hexadecimal storage systems in **one** of your examples in **a(ii)**.

Able to represent more data with the same number of bits. [1]

4-bit binary word: max – 1111 = 15. 4-bit hexadecimal word: FFFF = 65535 [1]

b **(i)** The character Omega, “Ω” is represented by the binary number 11101010 in ASCII. Convert 11101010 into a denary number. Show your working.

7	6	5	4	3	2	1	0
128	64	32	16	8	4	2	1
1	1	1	0	1	0	1	0
128	64	32	0	8	0	2	0

128 + 64 + 32 + 8 + 2 = 234

……...[1]

(ii) The character "j" is represented by the denary number 106 in ASCII. Describe a method to convert 106 into its hexadecimal representation.

1 – convert 106 to binary = 01101010

2 – break into words of 4-bits = [0010] [1010]

3 – convert the binary words into their hexadecimal equivalents = 6A

……

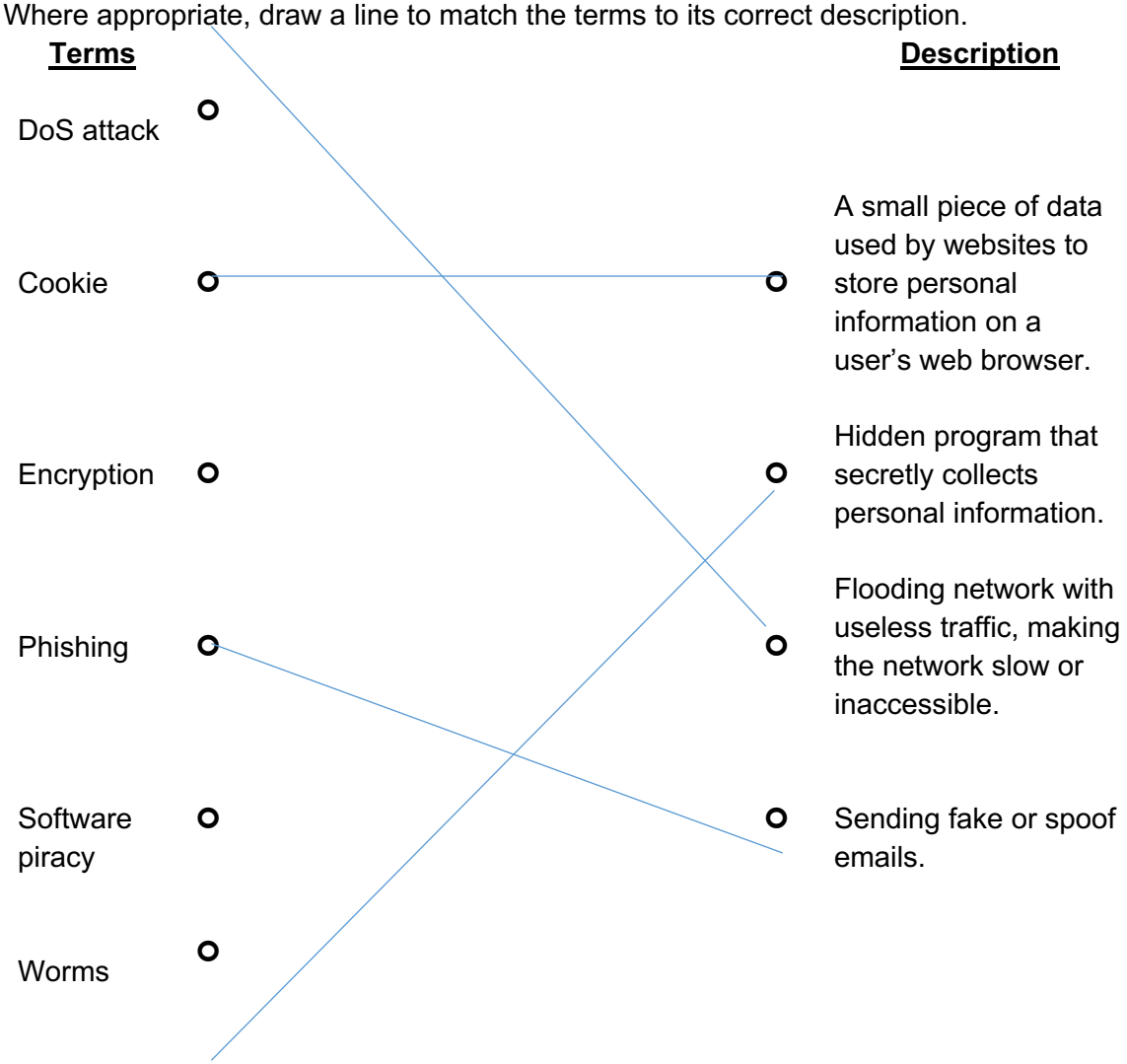
……

……

……

……...[3]

2 **a** Where appropriate, draw a line to match the terms to its correct description.



[4]

b **(i)** What are cybersecurity threats and how can they affect our data security?

They threaten our data security. Might lose personal or important data.

……...[2]

(ii) In the context of computer systems, explain the difference between a computer worm, and a computer virus.

A worm does not require a host program to replicate itself whereas a virus requires one before it can replicate itself and infect other programs.

……...[2]

(iii) A key-logger is software that records every keystroke that has been entered into a computer system. Explain how a key-logger can be used as a part of a system's security, or as spyware.

As a part of a system's security

It can be used to record unauthorised activities on the computer. In the event of a breach, the modifications or access can be tracked easily.

……

……...[2]

As a spyware

It can be used to record our login credentials and we might lose access to our online identities or our financial accounts.

……

……...[2]

(c) **(i)** What is 'software piracy'?

Unauthorised use or distribution of copyrighted software

……...[1]

(ii) Provide two possible reasons that causes software piracy to occur.

High or prohibitive costs. Lack of intellectual property rights. Lack of education.

……...[2]

(iii) Describe possible positive and negative effects of software piracy on the software industry.

Positive

Proliferation of the use of the software / gain in popularity.

……...[1]

Negative

Software company loses revenue and is unable to continue developing good products.

……...[1]

3 **a** Decomposition, Pattern Recognition and Generalisation are three common problem solving techniques.

(i) Describe how decomposition helps in problem-solving and algorithm design.

It helps to simplify the problem, breaking it into smaller ones or similar that can be solved more easily.

……...[1]

(ii) One approach to decomposing is modularity. Describe what this is.
Solve simple examples of the problem manually and identify tasks that are of different natures. Usually, these tasks can be separated from each other to become distinct (and sometimes unrelated) sub-problems.

……...[1]

(iii) What is Pattern Recognition? How is it useful in solving problems?

Identifying patterns among two or more problems. These problems may come from different situations or they may be sub-problems obtained from decomposition. These patterns are clues that the solutions to these problems will most likely be similar. Thus, if we already know the solution for one problem, we can probably modify that solution to solve other problems that follow a similar pattern.

……...[2]

b Read the following lines of code.

```
1  string_1 = 'this is a string 1234AZ!@#$%'
2  count = 0
3  for i in range(len(string_1)):
4      if string_1[i].isalpha():
           count += 1
5  print(count)
```

(i) What is the function of this code?

To count the number of characters in the string that are letters.

……...[1]

(ii) Explain how this code can be used for other similar situations with minimal modifications.

modifying line 4. .isalpha() can be changed to isdigit() or isspace() to output the number of digits or space in the string. [Accept other reasonable answers]

……

……...[2]

(iii) In the code provided, suggest a replacement for the variable name `count` that is more self-explanatory.

count_alpha [accept other reasonable answers]

……...[1]

4 **a** **(i)** Besides magnetic storage devices, name two other types of external storage technologies found in a computer system. List their corresponding example and describe each of them in terms of their advantage and disadvantage.

Type 1: Optical storage

Example: Compact disc

Advantage: Portable. Able to store large amounts of data (GBs)

Disadvantage: Vulnerable to scratches and fingerprints. Limited write/rewrite capacity[3]

Type 2: Solid-state

Example: Flashdrives / SD cards

Advantage: Faster than magnetic media. Not as vulnerable to mechanical shocks.

Disadvantage: Much more expensive than optical storage. [3]

(ii) State what RAM stands for, and explain how it differs from Read Only Memory.

RAM is Random Access Memory. It is “volatile” and can only store data while there is power connected to it. Read Only Memory stores data that can survive power cycles.

……

……...[2]

b Explain the difference between an address bus and a data bus in a computer.

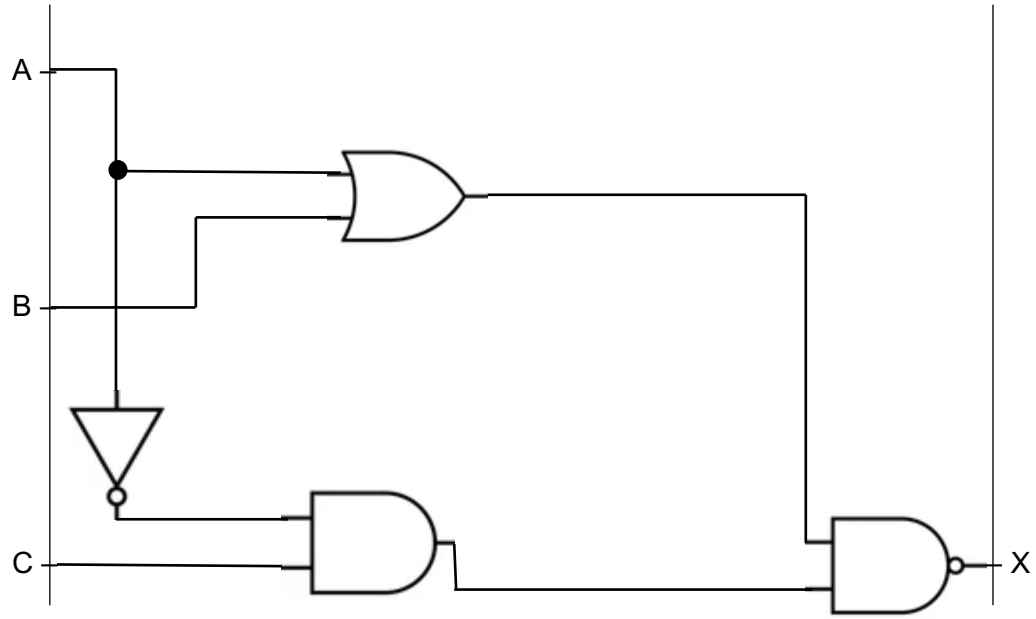
An address bus is unidirectional and only transfers the memory location from the CPU wherea a data bus is bi-directional and transfers data between the CPU and the memory.

……

……...[2]

5 **a** In the space below, construct the logic circuit diagram for the following Boolean statement.

X = (A OR B) NAND ((NOT A) AND C))



[4]

b Construct the truth table for the Boolean statement:

X = (A OR B) NAND ((NOT A) AND C))

A	**B**	**C**	A OR B	NOT A		X			
0	0	0		1		1			
0	0	1		1	1	1			
0	1	0	1	1		1			
0	1	1	1	1	1				
1	0	0	1			1			
1	0	1	1			1			
1	1	0	1			1			
1	1	1	1			1			

[4]

6 **a** **(i)** Suggest why a network of computing devices (computers, laptops, handphones, printers) could be useful at home.

It makes sharing of resources, internet access, software, data and communication much easier.

……...[1]

(ii) Suggest how the setup of a home network compares to the computer network in a school computer lab in terms of :

Data access control

A home network might have most resources shared / accessible by all users whereas a school computer lab would have most resources restricted from its users.

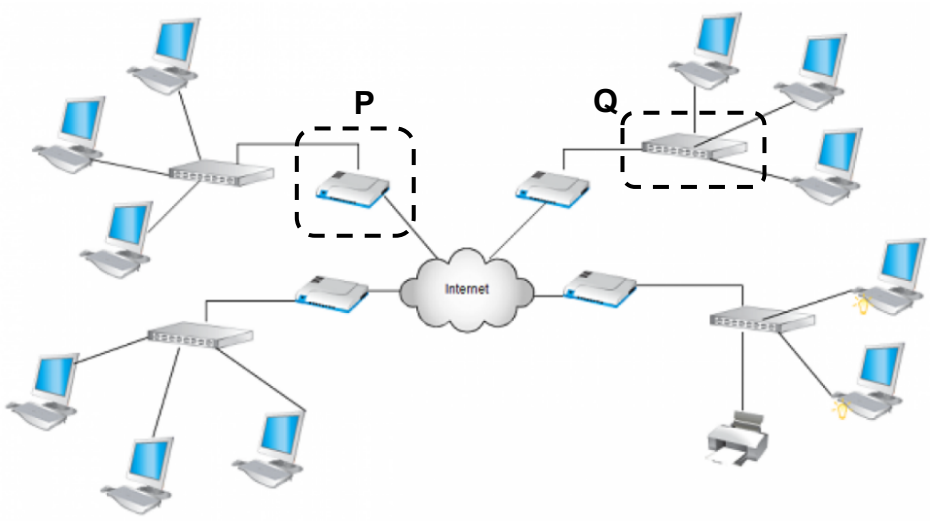
……...[1]

Preference for network interface (Wired or wireless connections)

Mobile devices at home would usually use wireless at home for ease of movement whereas devices in a computer lab are usually static and would use wired connections.

……...[1]

b **(i)** The diagram below shows a network of computers that are connected to the internet.



(i) Identify the network topology shown above and justify your answer.

Star. All terminals are connected to a central node.

……...[2]

(ii) What is a network interface card?

It is a network equipment that allows a device to be connected to the network

……...[1]

(iii) From the diagram shown, identify components P and Q and state their functions.

Component P

Name: Modem ……...[1]

Function: Modulates and demodulates signals between the external and internal network

……....[1]

Component Q

Name: Router / Hub ……...[1]

Function: Routes data to the correct terminal / Broadcasts incoming data packets to all terminals.

……....[1]

(c) **(i)** Why is there a need for checksums in data transmission?

Error checking. Data might be corrupted or modified during transmission. The checksum allows for quick error detection to determine if the data is correct.

……...[2]

(ii) Briefly explain how checksums are implemented in data transmission.

An algorithm is used to calculate a number based on the contents of a data packet.

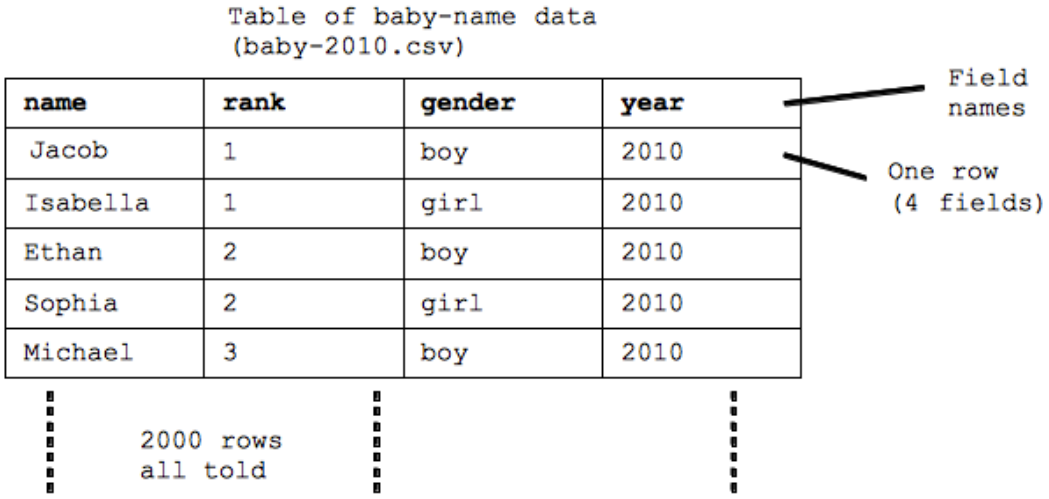
This number is transmitted along with the data packet.

The receiving terminal uses the same algorithm to generate the checksum based on the data packet to verify its accuracy.

……

……...[3]

7 The diagram below shows a table that tabulates information about the most popular names of babies in 2010.



a What data types should be used in the following columns?

(i) name: …string/text……[1]

(ii) rank: ……integer……..……[1]

b What function can be used to obtain the following information from the table?

(i) The rank of the name “Ethan” in 2010.

vlookup() ……....[1]

(ii) The number of characters in each name.

len() ……....[1]

(c) Describe an algorithm that can be implemented in the table to determine if any of the names is repeated.

Count the number of times each name appears in the “name” column. If the number is larger than 1, the name has been repeated. (countif())

……

……[2]

8 A particular computer program was designed to obtain numerical inputs from the user and output the following information:

- the number of items entered
- the smallest number
- the largest number
- the average of all the numbers

(a) Describe a validation check that should be implemented on the input so that the program runs correctly.

Check that the input is a valid digit. If the input is not a digit, prompt the user for another input.

……

……[2]

(b) Using either pseudocode or a flowchart, produce an algorithm for the computer program described above. You do not have to implement the validation check.

```
INPUT "NO_of_ITEMS" – 1M

ITEMS = [] - 1M

WHILE i < NO_of_ITEMS  - 1M  - 1M  - 1M

    ITEMS.append(INPUT digit) - 1M - 1M

    i += 1 - 1M

OUTPUT NO_OF_ITEMS - 1M

OUTPUT max(NO_OF_ITEMS) - 1M

OUTPUT min(NO_OF_ITEMS) - 1M

OUTPUT average(NO_OF_ITEMS) - 1M
```

[6]