COMMONWEALTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022

COMPUTING
Paper 1 (Theory) Mark Scheme

Name: _____ ( ) Class: _____

SECONDARY FOUR EXPRESS/NORMAL ACADEMIC **Wednesday 31 August 2022**
7155/1 **1130 – 1330**
2 hours

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Approved calculators are allowed.
Candidates will answer on the question paper.

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.

Name of setter: Mr Cheong HS

For Examiner's Use	
Total	**80**

Parent's Signature: _____

This paper consists of **15** printed pages including the cover page.

[Turn over

1 A loan company uses a spreadsheet to record their loan database.

	A	B	C	D	E	F	G	H	I	J
1	Date	ID	Plan	Loan	Term (Yrs)	Interest	Grant Eligibility		Plan	Rate
2	3-Jan-14	LOA-332	A	$2,000.00	2	$ 160.00			A	4%
3	5-Dec-15	LOA-354	B	$1,500.00	3	$ 225.00	Y		B	5%
4	23-Jun-18	LOA-398	A	$1,200.00	1	$ 48.00			C	6%
5	30-Aug-18	LOA-423	C	$1,400.00	2	$ 168.00				
6	13-Sep-18	LOA-435	B	$2,400.00	2	$ 240.00	Y			
7	8-May-19	LOA-462	A	$2,200.00	3	$ 264.00	Y			
8	24-Feb-20	LOA-522	C	$1,800.00	1	$ 108.00				
9	14-Mar-20	LOA-534	B	$1,700.00	2	$ 170.00				
10	31-Jul-20	LOA-556	A	$2,600.00	3	$ 312.00	Y			
11										

(a) Identify the **most appropriate** data type for the data in the following cell references:

Cell	Data type
A3	**Date**
B6	**Text**

[2]

(b) The cells in the **Loan** column are highlighted if the loan is above $2000. This is done using a feature found in the spreadsheet.

Describe how a feature can be used to perform this operation.

Conditional formatting [1]. Formats the cell to fill a certain colour [1] if the

.....

content in the cells is greater than 2000 [1].

.....

.....

[3]

(c) The cell **F2** is calculated by multiplying the loan with the loan term and the interest rate that is based on the loan plan.

Describe the formula that will need to be entered in cell **F2**.

vlookup is used [1] to find the interest rate based on the plan and multiplied

.....

to the product of D2 (loan) and E2 (term) [2]

.....

.....

[3]

(d) The cell **G2** will indicate "Y" in the cell should the interest be more than $200.

Identify the function that will need to be entered in cell **G2**.

IF

.....

[1]

2 Nikki sets up a new tele-communication company. As most of the staff is new to the company's privacy policies, she decides to brief them on intellectual property.

freeware	**piracy**	**authorise**	**domain**	**expire**
demonstrate	**share**	**cracks**	**infringe**	**shareware**
copyright	**courseware**	**license**	**illegal**	**open**

(a) Some of the following words need to be used to complete her presentation on intellectual property.

The legal right of owners to control the use and distribution of their intellectual property is called ……copyright……. . They have to apply for a …license…….. which is an official description of activities that are authorised or forbidden by the owners.
The public …domain… software refers to software where legal protections have expired while the free and open-source software refers to software where users are free to change, copy, study and …share…… the software.
Proprietary software refers to commercial software that is …illegal…….. to copy, modify or distribute.

[5]

The company's data is partially lost due to poor authorisation. There are no signs of unauthorised access, and the installed firewall showed no signs of irregularity in terms of the transmission of data.

(b) Explain authorisation and how it can cause data to be lost.

Authorisation is a user's ability to control the access of data and resources ……..... once he/she has been authenticated [1]. It is also known as access control ..... [1]. Data can be lost due to misuse of permissions [1] set by the ..... administrator who has the rights to perform tasks related to authentication ..... and authorisation. [1]

[4]

(c) Nikki wants to explore the feasibility of focusing on communication and healthcare technology by finding out how they can impact on society in their company.

Complete the table by describing **one** economical and social impacts on **each** area of technology.

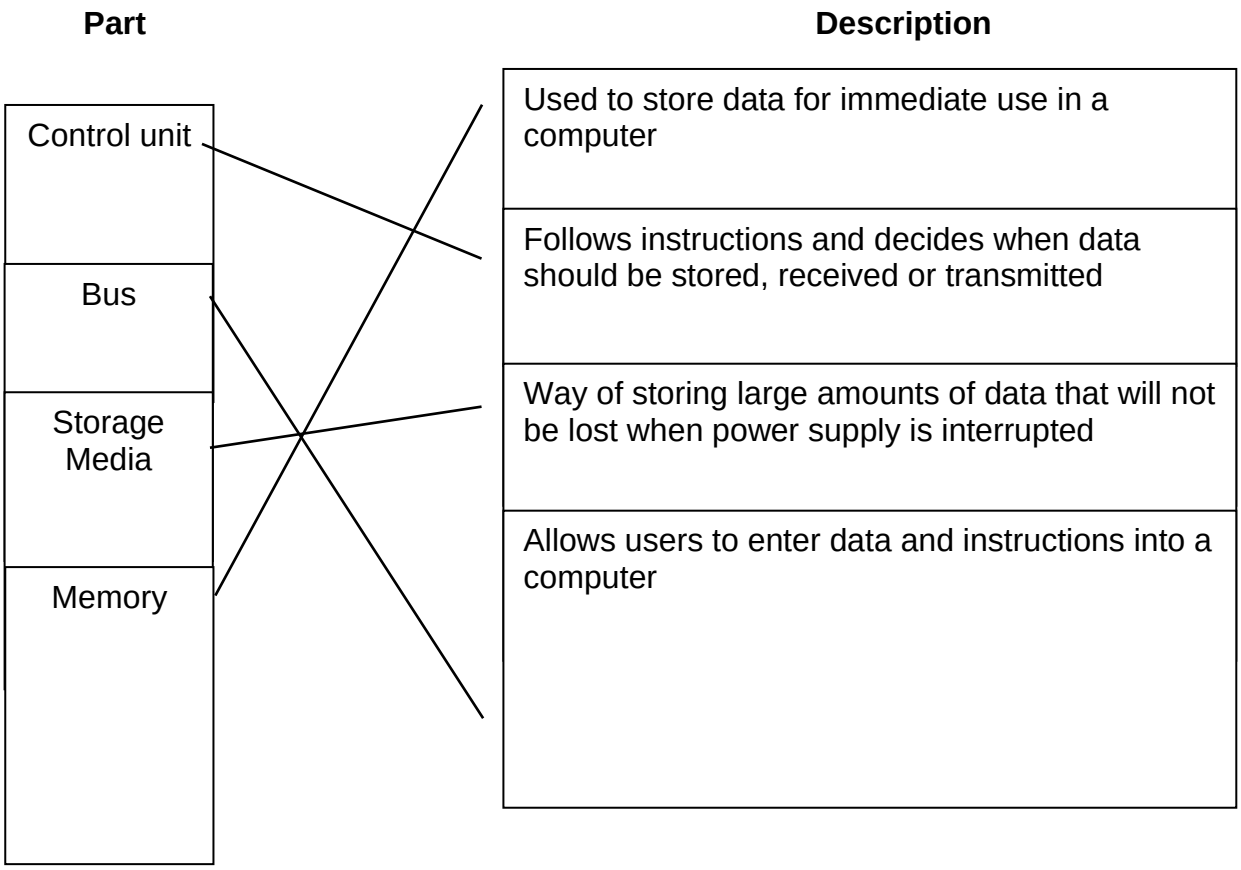
Area	**Impact**	
	Economical	**Social**
Communi-cation (Any one)	• Rise of smart phones increase focus in mobile devices and applications • Rise of social media increases use of social media for marketing purposes • Improvement in communication technology reduces business costs (Accept only if related to telecommunication)	• Diverse cultures can interact and share ideas with each other • Social networking sites allow users to remain connected • AI make it possible to automatically subscribe and translate speech • Use of internet to reinforce existing opinions or spread rumours or misinformation

Healthcare (Any one)	• New areas of growth such as provision of telemedicine solutions to businesses (Cannot accept below, not related to telecommunication) • Increase focus in automating healthcare processes through use of robots • Rise of 3-D printing lead to opportunities in creating and customising prosthetic limbs, hearing aids and dental fixtures	• Telemedicine gives patients who live in remote places or have limited mobility better access to healthcare • Misuse of information from internet can lead to dangerous decisions based on incorrect diagnosis • May feel uncomfortable with the collection of data to improve AI (Cannot accept below, not related to telecommunication) • AI can identify warning signs of possible health problems and provide doctors with accurate diagnosis • Use of robots impersonal and untrustworthy

[4]

3 Four parts of the computer architecture are on the left, and five descriptions on the right.

Draw **one** line to link each part to its correct description.



Collection of wires that serves as a highway for data to travel on

[4]

4 Hossan is asked to set up a network in his base company in Singapore and connect it to the network in his parent company in Japan.

(a) The base company comprises 4 workers including Hossan. He is considering setting up a peer to peer network.

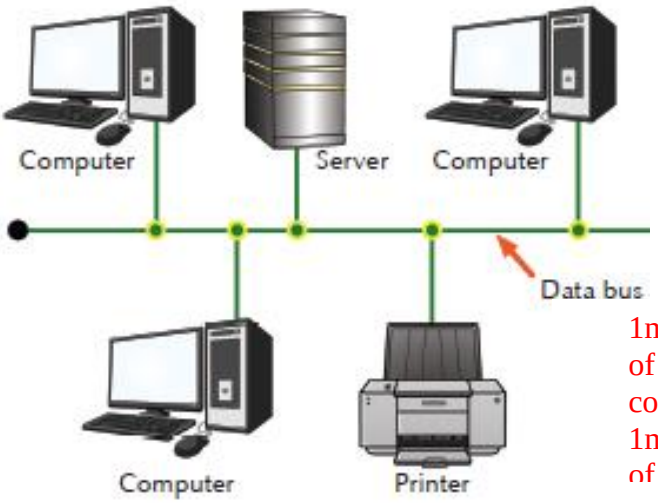
Explain what is meant by a peer to peer network.

Peer to peer network is a type of network where all computers are considered as equals and the load is distributed among all computers [1]. Each computer can act as both a client and a server, communicating directly with other computers [1]. Users are able to share files and resources located on their computers and access shared resources in other computers in the network [1]. It is low in cost [1].

[4]

(b) Hossan's parent company's network is formed using a bus topology. It has a server, three computers and a network printer.

Show, by drawing a diagram in the box below, how the devices may be connected in the topology.



1m: drawing of bus correctly
1m: drawing of all devices

[2]

(c) State whether Hossan's base and parent companies should be a LAN or WAN, and explain why.

They should be a WAN [1] as WAN covers a large scale geographical area

.....

[1]. Since one company is in Singapore and the other is in Japan, the

.....

geographical area is big [1].

.....

.....

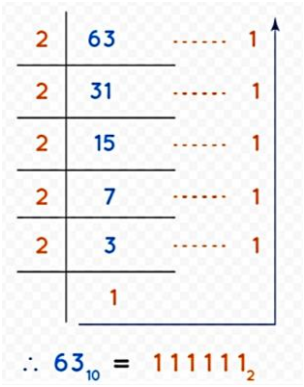
.....

.....

[3]

5 **(a)** Convert the

(i) denary number **63** into a 8-bit binary number.



[1]

(ii) hexadecimal number **4F** into a denary number.

$4F_{16} = 4x16^1 + Fx16^0 = 79_{10}$

……

……

[1]

(iii) binary number **11010111** into a hexadecimal number.

$1101_2 = D_{16}$, $0111_2 = 7_{16}$

……

$11010111_2 = D7_{16}$

……

[1]

(b) IPv4 and IPv6 are network addresses used to allow computers to communicate and exchange data over a computer network.

State **two** differences between the two types of network addresses.

IPv4 is made up of 4 bytes while IPv6 is made up of 16 bytes [1].

……

IPv4 uses denary while IPv6 uses hexadecimal [1] (Accept 2^{32} addresses

……

vs 2^{128} addresses) [2]

6 A collision avoidance system in a car monitors the distance between the car and the car ahead of it, and the speeds of the car and the car ahead. If the distance between the two cars is too close with reference to the two speeds, it will sound an alarm to alert the driver.

(a) Identify the inputs required for the system.

Distance between two cars and their corresponding speeds. (2m for all correct; 1m for partial)

[2]

(b) One of the stages in program development is testing and refining the codes. Explain briefly the types of test conditions that should be designed to ensure that the program executes as expected.

Under normal test conditions where the program should work as intended with the correct input of data [1], the alarm should sound if the distance is too close based on the speeds of the two cars, and should not sound if the distance is acceptable [1]. Under boundary test conditions where the program should work at the limit of the input data [1], the alarm should sound when the distance just fall short based on the speeds of the two cars and not sound if the distance is right at the limit [1]. Under error conditions where the program should behave where the input data should be rejected by the program [1], the alarm should not sound off if the input data is invalid [1].

[6]

(c) Describe **two** common debugging techniques that can be used to find errors in a program.

The use of intermittent print statements [1] is used to keep track of how variables changes as the program runs. Print statements that output the values of important variables are added in loops to see how the variables change over time [1]. Another way is to test the program in chunks or parts [1]. Lines of code are temporarily disabled by inserting the # symbol at the start of these lines to test only one part of the program [1]

[4]

7 Study the following pseudo-code.

```
01    N = 5
02    K = 0
03    INPUT NAMES
04    WHILE K < N - 1
05          TEMP = NAMES[K]
06          NAMES[K] = NAMES[N - K - 1]
07          NAMES[N - K - 1] = TEMP
08          OUTPUT NAMES
09          K = K + 1
10    ENDWHILE
```

Complete the trace table for the following set of input data.

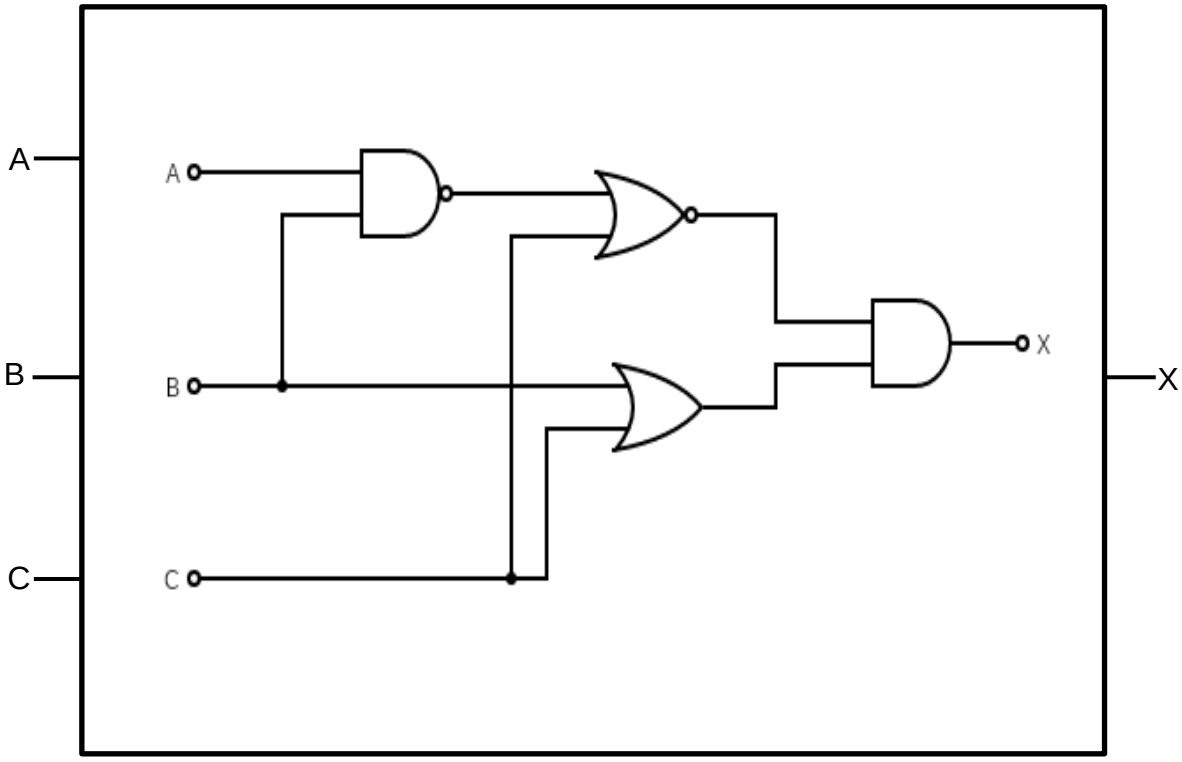
NAMES = [“Ali”, “James”, “Amy”, “Devash”, “Tat Hin”]

N	K	K < N	NAMES
5	0		“Ali”, “James”, “Amy”, “Devash”, “Tat Hin”
5	0	TRUE	“Tat Hin”, “James”, “Amy”, “Devash”, “Ali”
5	1	TRUE	“Tat Hin”, “Devash”, “Amy”, “James”, “Ali”
5	2	TRUE	“Tat Hin”, “Devash”, “Amy”, “James”, “Ali”
5	3	TRUE	“Tat Hin”, “James”, “Amy”, “Devash”, “Ali”
5	4	FALSE	

[4]

8 **(a)** Draw the logic circuit to represent the following Boolean statement. Do not simplify the statement.

X = ((A NAND B) NOR C) AND (B OR C)



[4]

(b) Complete the truth table for the Boolean statement:

X = ((A NAND B) NOR C) AND (B OR C)

A	B	C	Working space			X
			A NAND B	(A NAND B) NOR C	B OR C	
0	0	0	1	0	0	0
0	0	1	1	0	1	0
0	1	0	1	0	1	0
0	1	1	1	0	1	0
1	0	0	1	0	0	0
1	0	1	1	0	1	0
1	1	0	0	1	1	1
1	1	1	0	0	1	0
			[1]	[1]	[1]	[1]

[4]

9 The “Rock”-“Paper”-“Scissors” game is a game between a player and the computer. The player first decides the number of rounds to play.

During each round, the player is asked to decide whether to choose “R”, “S” or “P”. The game generates a random number between 1 and 3 inclusive using a function called random. If the number is 1, the computer’s selection is “R”; if the number is 2, the computer’s selection is “S”; otherwise, the computer’s selection is “P”.

The winner is decided based on the following rules:

“R” ***beats*** *“S”; “S”* ***beats*** *“P”; “P”* ***beats*** *“R”*

A tie break if both selections are the same.

The result is declared after comparing the final score at the last round.

The function `random(a,b)` returns a number between `a` and `b`, both inclusive.

The game is shown in pseudo-code.

```
01   round, PW, CW = 0, 0, 0
02   INPUT no_of_rounds
03   WHILE no_of_rounds < round
04        comp_select = "   "
05        INPUT user_select
06        comp_choice = RANDOM(1,3)
07        IF comp_choice == 1 THEN
08             comp_select = "R"
09        ELSEIF comp_choice == 2 THEN
10             comp_select = "S"
11        ELSE
12             comp_select = "P"
13        ENDIF
14        IF user_select == comp_select THEN
15             OUTPUT "IT'S A TIE!"
16        ELSEIF user_select == "R" AND comp_select == "S"
THEN
17             OUTPUT "PLAYER WINS!"
18             PW = PW + 1
19        ELSEIF user_select == "S" AND comp_select == "R"
THEN
20             OUTPUT "PLAYER WINS!"
21             PW = PW + 1
22        ELSEIF user_select == "P" AND comp_select == "R"
THEN
23             OUTPUT "PLAYER WINS!"
24             PW = PW + 1
```

```
25          ELSE
26               OUTPUT "COMPUTER WINS!"
27          CW = CW + 1
28          ENDIF
29          round = round + 1
30     ENDWHILE
31     IF CW > PW THEN
32          OUTPUT "Computer Wins!"
33     ELSEIF CW < PW THEN
34          OUTPUT "Player Wins!"
35     ELSE
36          OUTPUT "A Tie in the end"
37     ENDIF
```

There are **four** logic errors in this pseudo-code. Locate the errors and suggest the appropriate corrections.

Error 1

Line 3

.....

Correction

`WHILE round < no_of_rounds`

.....

Error 2

Line 4 Line 06

.....

Correction

`comp_select = ""` `comp_choice = random(1,3)`

.....

Error 3

Line 19

.....

Correction

`ELSEIF user_select = "S" AND comp_select = "P"`

.....

Error 4

Line 27

.....

Correction

`CW = CW + 1` (Indent)

.....

[8]

10 A restaurant has eight 2-seater tables, six 4-seater tables, four 6 seater-tables, four 8-seater-tables and six 10-seater tables.

A system is created to help the restaurant monitor the occupancy of each type of tables. This is done by creating a list with the original number of tables for each type, i.e. [8,6,4,4,6].

If the size of a group of customers is 1 or 2, the 2-seater table is offered to them and the number of 2-seater tables is reduced by 1. The rest of the table types are offered similarly based on the number of customers. If any type of tables is fully occupied, an output stating that "`Occupancy is full`". The restaurant does not intent to provide bigger tables for smaller number of customers, i.e. the restaurant will not let a group size of 6 customers occupy an 8-seater or 10-seater table.

A pre-defined function called `bill_table()` is created to return an integer between 0 and 5. The integer 0 means that one 2-seater table has been freed and the number of the 2-seater table in the list is incremented by 1. An integer 5 means that there are no customers making any payment.

The whole system is expected to run throughout 24 hours a day.

Write an algorithm, using pseudo-code, to create the system. You do **not** need to validate the input.

1m: Initialise variables
1m: Infinite loop
1m: INPUT group size
1m: function bill_table called
2m: Correct condition and decrement for table occupancy
2m: Correct condition and increment for table freed

```
table = [8,6,4,4,6]
table_num = 5
WHILE TRUE
        INPUT grp_size
        IF grp_size <= 2 THEN
                IF table[0] != 0 THEN
                        table[0] = table[0] – 1
                ELSE
                        OUTPUT “Occupancy is full
                ENDIF
        ELSEIF grp_size <=4 THEN
                IF table[1] != 0 THEN
                        table[1] = table[1] – 1
                ELSE
                        OUTPUT “Occupancy is full
                ENDIF
        ELSEIF grp_size <=6 THEN
                IF table[2] != 0 THEN
                        table[2] = table[2] – 1
                ELSE
                        OUTPUT “Occupancy is full
                ENDIF
        ELSEIF grp_size <=8 THEN
                IF table[3] != 0 THEN
                        table[3] = table[3] – 1
                ELSE
                        OUTPUT “Occupancy is full
                ENDIF
        ELSEIF grp_size <=10 THEN
                IF table[4] != 0 THEN
                        table[4] = table[4] – 1
                ELSE
                        OUTPUT “Occupancy is full
                ENDIF
        ENDIF
        table_num = bill_table()
        IF table_num = 0 THEN
                table[0] = table[0] + 1
        ELSEIF table_num = 1 THEN
                table[1] = table[1] + 1
        ELSEIF table_num = 2 THEN
                table[2] = table[2] + 1
        ELSEIF table_num = 3 THEN
                table[3] = table[3] + 1
        ELSEIF table_num = 4 THEN
                table[4] = table[4] + 1
        ENDIF
ENDWHILE
```

[8]

END OF PAPER