Name: Register no:

Class:

NGEE ANN SECONDARY SCHOOL

Marking Scheme

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PRELIMINARY EXAMINATION

COMPUTING

7155/01

Paper 1 Written

25 August 2022

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

Instructions to Candidates

Write your name, register number and class at the top of this page.
Answer ALL questions.
Write in dark blue or black pen.
You may use pencil for any diagrams, graphs, tables or rough working.
The use of an approved scientific calculator is expected, where appropriate.

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

Checked by student: _____ Date: _____

This document consists of **16** printed pages and **2** blank pages.

1 **(a)** The bus topology and the star topology are two possible physical layouts of a network. Give **one** feature that is the same for both a bus topology and a star topology, and **one** difference between the two.

Feature that is the same:

Both networks can still continue to operate even when one of the computers breaks down. The replacement can be done without affecting the rest of the network. [1]

Difference:

Setting up a star topology typically costs more as it uses more cabling as compared to a bus topology which is easy and cheap to install as it uses less cabling. [1] [2]

(b) A home network typically requires a network interface controller and a router. Identify and describe the function of **one other** network device that could be part of the home network.

Device: **Modem** [1]

Function: **A modem is responsible for modulation and demodulation which is the conversion of digital data into a form suitable for transmission and vice versa.** [1] [2]

2 Ms Anna attempts to use a spreadsheet to record the gender ratio of each class. She records:

- the number of girls and boys in each class
- the ratio of girls to boys in each class
- the classes

	A	B	C	D	E
1	**Girls**	**Boys**	**Ratio**	**% Girls**	**Class**
2	14	25	14:25		A
3	4	9	4:09		B
4	24	8	0:08		C
5					
6			Class A boys too many ?		
7			class with most number of girls:		

Upon keying the ratio from cells **C2 to C4**, the spreadsheet detects the input and automatically changes the data type into something other than the expected ratio.

(a) Identify the data type which cells **C2 to C4** are changed into.

TIME [1] [1]

(b) Describe how Ms Anna can make the spreadsheet display the expected ratio.

She can select cells C2 to C4 [1] **and change their data type into TEXT** [1]**. OR**
she can type in an apostrophe in front of the data [1] **like this: '20:20** [1] **describe + example** [2]

(c) Cell D2 needs to show the percentage of girls in each class.
Identify the most appropriate function that will need to be entered into D2 and copied to cells D3 and D4.

=A2/SUM(A2,B2) [1] [1]

(d) Cell E6 needs to show a boolean value which indicates if the number of boys in class A is more than the number of girls in class A and more than the combined total number of boys from the other two classes.
Identify the most appropriate function that will need to be entered into E6.

=IF(AND(B2>SUM(B3,B4),B2>A2),TRUE,FALSE) [2]
[1 for IF 1 for AND with correct conditions]

(e) Cell E7 needs to show the class with most number of girls.
Identify the most appropriate function that will need to be entered into E7.

=VLOOKUP(MAX(B2:B4),B2:E4,4,FALSE) [2]
[1 for max, 1 for vlookup]

3 Devon is developing a single-player computer game. The objective of the game is to harvest as many crops as possible within a time limit in order to score the most number of points possible. The player is able to customise the look of the sprite, and buy any tools that can help to speed up the process of harvesting before the start of the game using the points the player has accumulated. The game will save the points achieved by the player after every round.

Before the program is written, Devon decomposes the problem using a modular approach.

(a) Describe what is meant by a modular approach. [2]

In a modular approach, we will solve simple examples of the problem manually and identify the tasks that are of different natures. [1]
These tasks can usually be separated from each other to become distinct sub-problems that are different from each other. [1]

(b) One of the modules is to save the points achieved by the player after each round. [3]
Identify three other modules that can be decomposed from the problem.

Module 1:
This module includes options for player to change the appearance of the sprite in the program. [1]

Module 2:
This module includes a variety of tools for the player to purchase to enhance his harvesting speed. /
This module has an interface that displays the tools available for purchase. [1]
(or module to track the harvesting speed of player based on tools he has)

Module 3:
This module keeps track of the running time during each game and ends game once time is up. [1]

(c) Devon eventually completes writing the code as well as testing and refining the code. Describe the remaining stage of program development that is necessary for him to complete the program development. [2]

The final stage is to deploy the code. [1]
This is the stage where the game program is "rolled out" to the intended audience and he will inform users on how to play the game and gather any further feedback for improvement. [1]

4 A local bank has recently developed a mobile application that allows its users to make digital payments by scanning a QR code when shopping overseas. The user can review the price in either currency before confirming payment.

(a) State and explain one positive impact that this mobile application may have on businesses.

Increase sales as it provides convenience for its customers from other countries. OR
As the payment is done digitally, businesses will be able to reduce cost and effort needed for payments. [1] [1]

(b) Transaction data from payment applications could be analysed further with Artificial Intelligence (AI) to benefit the user.
Describe how transaction data from such a mobile application can be analysed further with AI.

The transaction data from this mobile application can be analysed with Artificial Intelligence to reveal spending patterns or habits[1], **so as to suggest possible items that my interest the user for purchase**[1].
OR

The transaction data from this mobile application can be analysed with Artificial Intelligence to identify unusual spending patterns [1], **so as to automatically detect financial fraud**. [1]. [2]

(c) Payment using mobile application is often accompanied with biometric authentication.
Explain the benefit of using biometric authentication when making payment.

Biometric authentication is based on the measurement of human physical characteristics such as fingerprint or iris. [1]
As it cannot be easily replicated and is easily accessible by the user, it provides a quick and secure way to authenticate the user during payment. [1] [what is it, benefits of it + linking to qns] [2]

5 A ransomware attack typically works by tricking a target into clicking a malicious link by using a fake email that appears to be from reputable companies.

(a) State another form of cyberattack which works in a similar way.

Phishing [1] [1]

(b) Once the attackers have access to critical files on the computer, they will encrypt the files and render the files inaccessible to the owners, unless a ransom is paid.
Define the term encryption.

It is the process of encoding data so that a secret key is required to read the file. [1] [1]

(c) Suggest **one** method to prevent the occurrence of ransomware attacks.

Install, update and run anti-virus programs. OR
Identify phishing mails and not click on the links provided. [1] [1]

6 Match each of the following types of hardware to its purpose.

Hardware	**Purpose**
Address bus	• to send address information is sent from memory to processor.
Data bus	• to send address information from processor to memory.
Input device	• to send data between processor and memory
Control unit	• allows users to enter data and instructions into a computer
	• To display, project or print processes data from a computer
	• Follows instructions and decides when data should be stored, received or transmitted [4]
	• Part of the computer that processes data and follows instructions

7 Whenever a computer needs to store data, it uses memory. The type of memory used depends on how the data stored inside is meant to be used.

(a) Describe how the Random Access Memory (RAM) is used.

RAM is where data and instructions are stored temporarily so that they can be quickly accessed by the processor. [1]
For instance, when an application is started, its instructions may be loaded into the RAM. [1]
Data stored on RAM can be easily changed and is lost once the power supply to the computer is interrupted.[1] (accept also **volatile**)

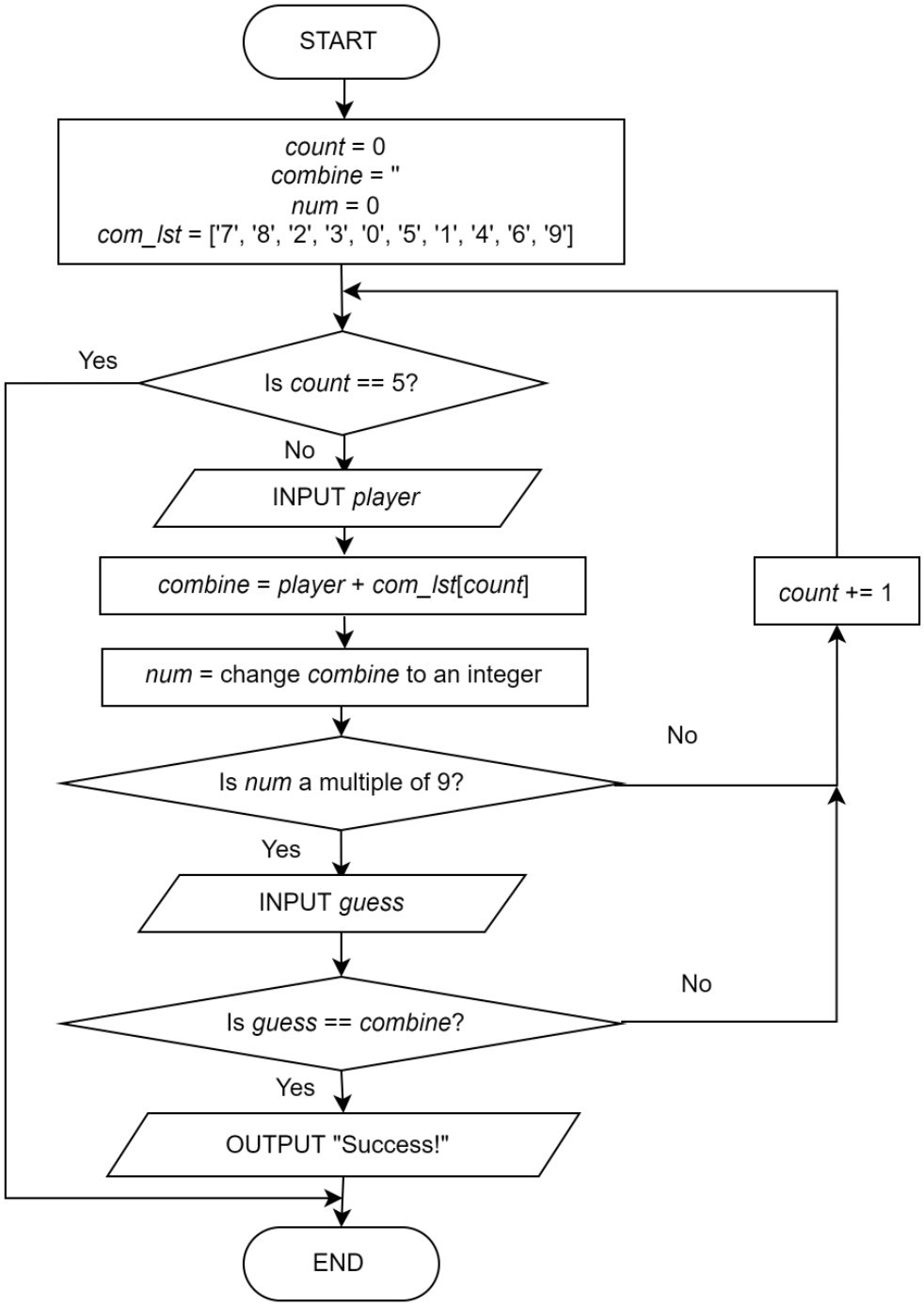
[1, what is RAM 1, an example 1, volatility]

[3]

(b) State **one** advantage and **one** disadvantage that the Solid-state storage media has, when compared to the magnetic storage media.

Advantage: **faster than magnetic storage media** [1]
Disadvantage: **much more expensive than magnetic storage media**. [1] [2]

8 Study the following flowchart.



(a) The algorithm needs to be tested.
Complete the trace table for the following set of input data.

'2', '37', '3', '7', '75', '6', '63', '9', '90'

count	*combine*	*num*	*player*	*guess*	OUTPUT
0	''	0			
1	'27'	27	'2'	'37'	
2	'38'	38	'3'		
3	'72'	72	'7'	'75'	
	'63'	63	'6'	'63'	
					"Success!"
* Quotation marks must be included for strings					

[5]

(b) Describe the purpose of the algorithm. Assume *player* is always a string containing a single digit and *guess* is always a string of containing a positive integer.

The purpose of the algorithm is to prompt the user to guess the first digit of a two-digit number, *player*, correctly to form a number string, *combine* and *num*, that is a multiple of 9 with a preset list of numbers, *com_lst*.
[Inputs] [1]

If a number that is a multiple of 9 is formed, the user is given a chance to input his guess of the multiple (*guess*).
User has a total of 5 tries to guess the first digit and multiple correctly.
[Process] [1]

The algorithm will output "Success" if this happens. If not, the algorithm ends. [3]
[Outputs] [1]

9 Wordilo is a single-player word game where a player attempts to correctly guess a five-letter word within five attempts.

In every attempt that the player makes, the algorithm is supposed to give feedback on the player's guess.

1) If a correct letter in the guess is found in the correct position as well, the response string will show a "O"
2) If a letter in the guess can be found in the correct answer but is situated at the wrong position, the response string will show a "-"
3) If a letter in the guess cannot be found in the correct answer at all, the response string will show a "X"

A player that manages to guess the correct word within five attempts will see a congratulatory message.

The algorithm ends when a player has used up his attempts without getting the correct answer.

There are four logic errors in the psedo-code.

State the line number of each error and write the correct pseudo-code.

```
01  answer = "SWING"
02
03  count = 0
04  response = ""
05
06  WHILE count <= 5
07
08    INPUT word
09    count = count + 1
10
11    IF word == answer
12        count = 5
13
14    ELSE
15        FOR x = 1 to length(word) - 1
16
17            IF word[x] == answer[x]
18                response = response + "O"
19            ELSEIF word[x] is found in answer
20                response = response + "-"
21            ELSE
22                response = "X"
23            ENDIF
24        NEXT
25
26    ENDIF
27
```

```
28  ENDWHILE
29
30  IF count == 5 and word == answer
31      OUTPUT "You have used up all tries!"
32  ELSEIF word == answer
33      OUTPUT "Correct! Well done!"
34  ENDIF
```

Error 1 Line 6
Correction
`WHILE count < 5`

Error 2 Line 15
Correction
`FOR x = 0 to length(word) - 1`

Error 3 Line 22
Correction
`response = response+"X"`

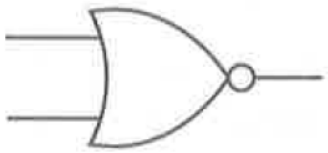
Error 4 Line 30
Correction
`IF count == 5 and word != answer`

[8]

10 **(a)** Draw the logic gates that the following truth tables represent.

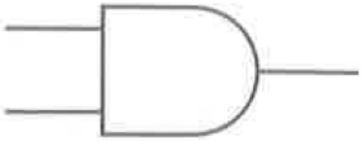
(i)

A	B	X
0	0	1
0	1	0
1	0	0
1	1	0

Logic Gate


(ii)

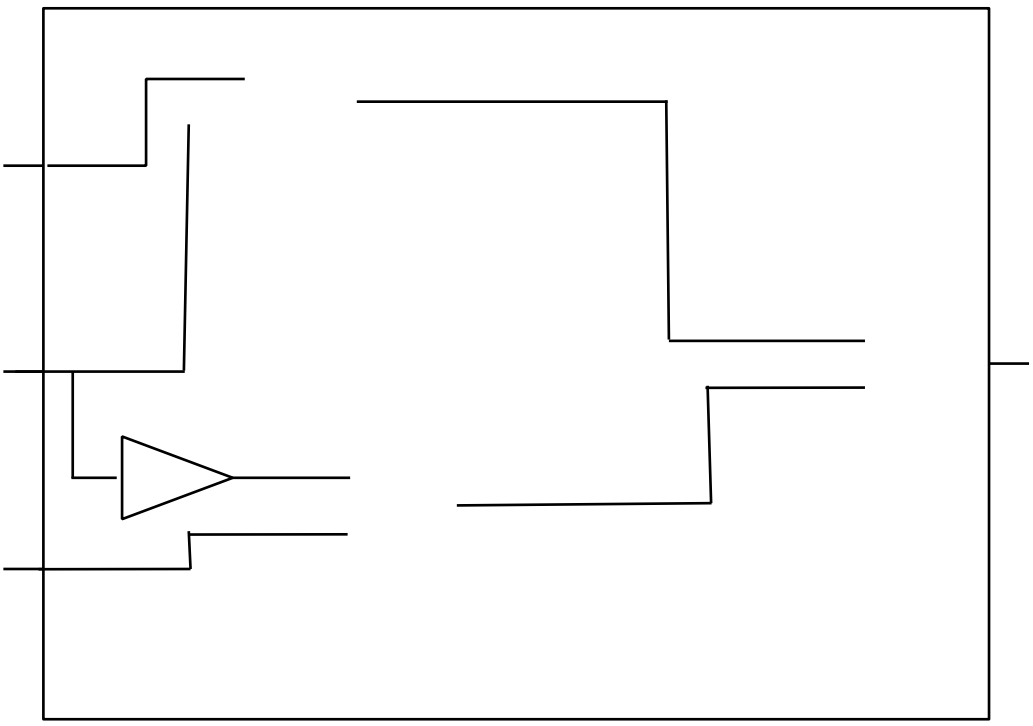
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

Logic Gate


[2]

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

X = (A NOR B) NAND (NOT B AND C)



A
B

C

X

[4]

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

X = (A NOR B) NAND (NOT B AND C)

A	B	C	Working space A NOR B	Working space NOT B	Working space NOT B AND C	X
0	0	0	1	1	0	1
0	0	1	1	1	1	0
0	1	0	0	0	0	1
0	1	1	0	0	0	1
1	0	0	0	1	0	1
1	0	1	0	1	1	1
1	1	0	0	0	0	1
1	1	1	0	0	0	1

[4]

11 **(a)** An RGB colour code is represented in the form #RRGGBB, where RR, GG and BB are the two-digit hexadecimal numbers that represent the red (R), green (G) and blue (B) components of the colour.

The RGB code of a certain paint colour is defined as #A5D700.

Convert each digit from the hexadecimal number A5D7 as a 4-bit binary.

Hexadecimal	**A**	**5**	**D**	**7**
Binary	1010	0101	1101	0111

[2]

(b) State **one** other application of hexadecimals.

IPv6 addresses
Media Access Control (MAC) address of a computer or device
ASCII codes [1]

(c) Convert the denary number 41 into an 8-bit binary number.

Denary	Quotient	Remainder
41	20	1
20	10	0
10	5	0
5	2	1
2	1	0
1	0	1

[2]

0010 1001_2

(d) Describe how the binary number 1110 0011 is converted to hexadecimal. Give the hexadecimal value in your answer.

Description
Each 4-bit binary sequence corresponds to a hexadecimal

0000	**0**	**0110**	**6**	**1100**	**C**
0001	**1**	**0111**	**7**	**1101**	**D**
0010	**2**	**1000**	**8**	**1110**	**E**
0011	**3**	**1001**	**9**	**1111**	**F**
0100	**4**	**1010**	**A**		
0101	**5**	**1011**	**B**		

[4]

1110 corresponds to E
0011 corresponds to 3.

Hexadecimal value: **E3**

12 A ticketing company uses a computer program to check on the validity of ticket serial numbers.

The correct format of a serial number is such that it:
- starts with “PER”, followed by a hyphen (-)
- contains a 6-digit number in between two hyphens
- ends with a valid check character that is a letter between A to C in alphabetical order.

To verify if the check character is correct,
- refer to the 6-digit number in between the input string
- find the absolute difference between the first 2 digits and the last 2 digits
- find the remainder when the absolute difference is divided by 3
- convert the remainder to a check character using the table below.

Remainder	0	1	2
Check character	A	B	C

If the check character corresponds to the last letter in the serial number, the serial number is a valid number.

Example, given that the serial number is PER-152234-B,

6-digit number in the string: 152234

Absolute value of (15 – 34) = 19

Remainder when 19 is divided by 3 = 1

Since 1 corresponds to the letter “B”, the check character is “B”
⇒ The serial number is valid

The program needs to:
- take a serial number as input
- check if the format of the serial number is correct
- output a suitable error message if the format of the serial number is wrong
- output if the serial number is valid or not, if the input format is correct

Write an algorithm, using pseudo-code or flowchart, to request input on the serial number, check the format and validity of the serial number and output the required results.

[9]

```
INPUT serial                                        # INPUT
abc = “ABC”                                         # initialization


IF length(serial) != 12 OR                          # IF Condition
   first 4 chars != “PER-” OR
   fifth to tenth char of serial is not a digit OR
   last second char != “-” OR
   last char is not a letter in abc                 # conditions

      OUTPUT “The format of the input is wrong”  # error msgs

ELSE

   absolute_diff = absolute difference(serial[4:6] – serial[8:10])    # difference

   remainder = absolute_diff % 3                                      # remainder

   check_char = abc[remainder]

   IF check_char == serial[11]                      # check equivalence
      OUTPUT “Serial number is valid”

   ELSE
      OUTPUT “Serial number is invalid”                               # Output

   ENDIF

ENIF
```

***** End of Paper *****

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