ZHONGHUA SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2019
SECONDARY 4 EXPRESS

Candidate's Name	Class	Register Number
MODEL ANSWER and TOS		

COMPUTING

7155/01

Paper 1

19 September 2019
2 hours

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

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

Answer **all** the questions.
Write your answers in this question booklet.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of a scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

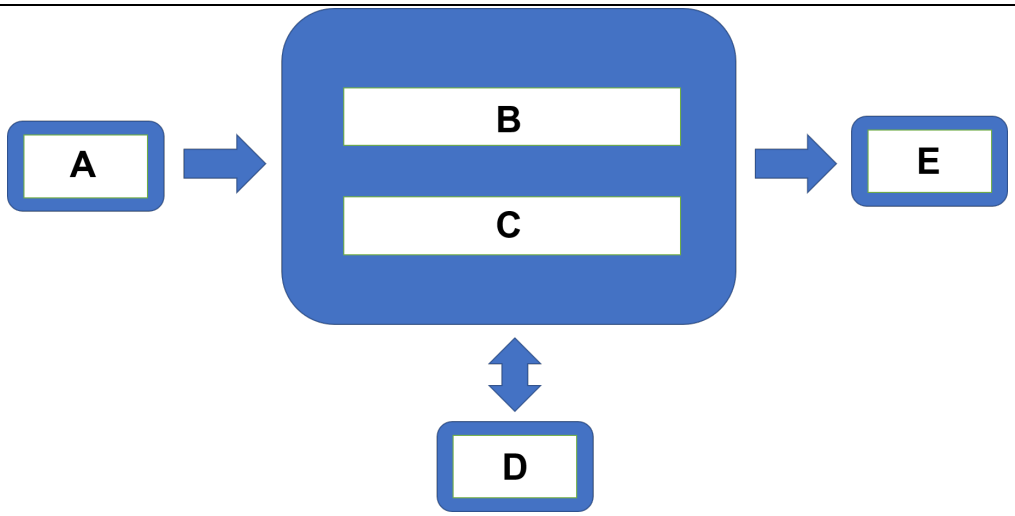
At the end of the presentation, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **80**.

For Examiner's Use:

Setter: Mr. Calvin Heng
Vetter: Mr. Low Kee Ley

1 The following is a simplified computer architecture diagram.



Complete the Table:

Label	Name of Device	Purpose of Device	
A	INPUT	Allows users to enter data and instructions into a computer.	[2]
B	ALU	Processes data by performing basic math and logical operations.	[2]
C	CU	Processes data and follows instructions.	[2]
D	MEMORY	Store data for immediate use in a computer	[2]
E	OUTPUT	Used to display, project or print processed data from a computer.	[2]

2 (a) Describe one difference between a LAN and a WAN. [2]

Geographical: LAN is small, usually in the same building. WAN is large-scale, typical across multiple geographical locations.

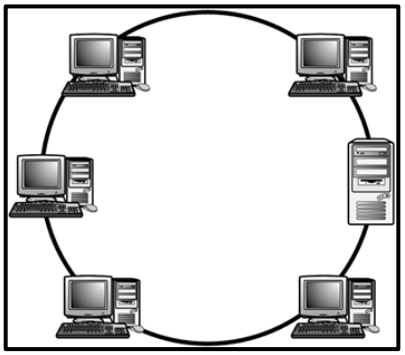
_____

_____

(b) Topology describes the physical layout of a computer network. Name each of the topologies shown below.

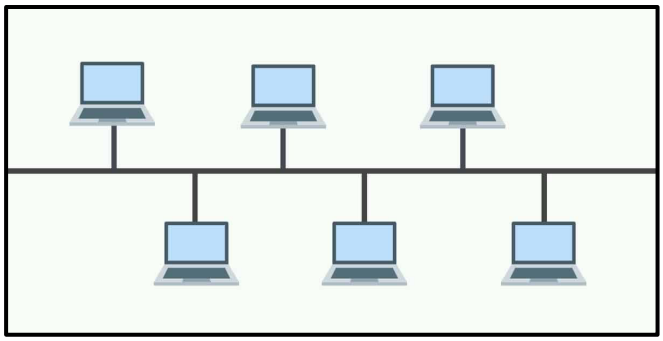
(i) [1]

RING TOPOLOGY



(ii) [1]

BUS TOPOLOGY



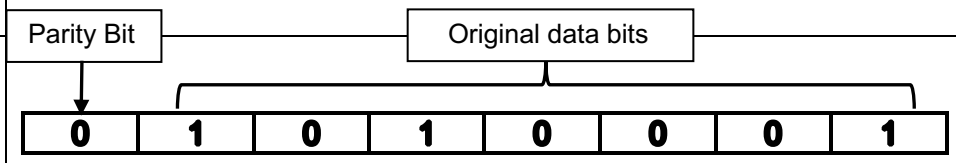
(c) With respect to **cabling**, describe one advantage and one disadvantage in a Star Topology network.

(i) Advantage [1]

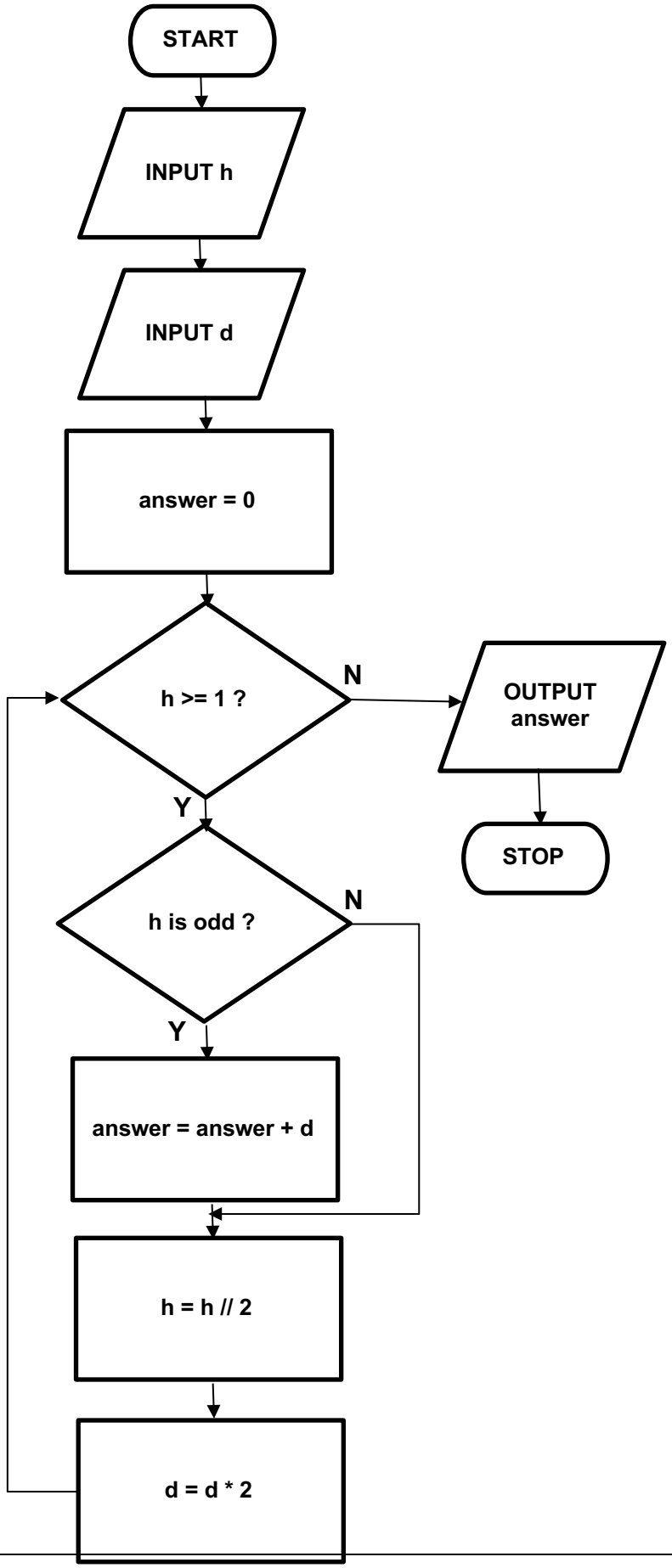
Load on each section of cabling is reduced so each computer uses a separate cable from the rest.

(ii) Disadvantage [1]

Uses more cabling than other topologies and hence costs more.

	(d)	Explain the concept of the Parity Check.	[2]
		An additional bit is either appended or prepended to a string of	
		binary data for transmission. This parity bit can be either 0 or 1,	
		depending on whether an odd or even parity system is used.	
	(e)	Using the example of the bit string below, indicate what the parity bit should be, based on the system of odd parity.	[1]
			
	(f)	What is a shortcoming of the parity check?	[1]
		It can detect an error but cannot determine where the error occurred.	
		OR	
		It cannot detect errors where multiple bits are changed	

3	Study the flow chart and answer the questions.	



(a) Complete the Trace Table for 2 runs: h=11, d=8 and h=5, d=12

[6]

h	d	answer	h >= 1?	h is odd?	output
11					
	8				
		0			
			Y		
				Y	
		8			
5					
	16				
			Y		
				Y	
		24			
2					
	32				
			Y		
				N	
1					
	64				
			Y		
				Y	
		88			
0					
	128				
			N		
					88

5					
	12				
		0			
			Y		
				Y	
		12			
2					
	24				
			Y		
				N	
1					
	48				
			Y		
				Y	
		60			
0					
	96				
			N		
					60

(b) What does the algorithm do? [1]

The algorithm multiplies the numbers h and d and outputs the result.

(c) Based on the algorithm described by the flowchart, write a python function that will return the result as computed by the algorithm. The starting statement has been given. [5]

```
def function_m(h, d):
    answer = 0
    while h >= 1:
        if is_odd(h):
            answer += d
        h = h // 2
        d = d * 2
    return answer
```

if h % 2 != 0:

4 When conducting Program Testing, a good programmer will consider the following Types of Conditions:

Normal Conditions

Boundary Conditions

Error Conditions

Consider the following Python Program:

```
number = 0
while number < 1 or number > 9:
    number = int(input('Please enter a number between 1 and 9 inclusive '))
if number % 2 == 0:
    print('Number ', number, ' is even')
else:
    print('Number ', number, ' is odd')
```

Complete the table for Test Conditions to test the above Python Program.

Test Condition Type	Sample Input Data	Expected Output	
Normal	**{1, 3, 5, 7, 9}**	**Number {} is odd**	[1]
Normal	**{2, 4, 6}**	**Number {} is even**	[1]
Boundary	**{< 1}**	**Please enter a number between 1 and 9 inclusive**	[1]
Boundary	**{> 9}**	**Please enter a number between 1 and 9 inclusive**	[1]
Error	**Enter Key**	**{System Error Message}**	[1]
Error	**{Any alpha?**	**{System Error Message}**	[1]

5 All the sheep belonging to Farmer Miles have escaped from his farm to a nearby hillside, where they have joined other sheep. Farmer Miles wishes to recover all his sheep and knows the following:

- Not one of his sheep is black as he believes these to be unlucky.
- All his sheep are branded 'G', or have a collar.

Use the following:

B = black sheep
G = branded 'G'
C = has a collar
F = belongs to Farmer Miles

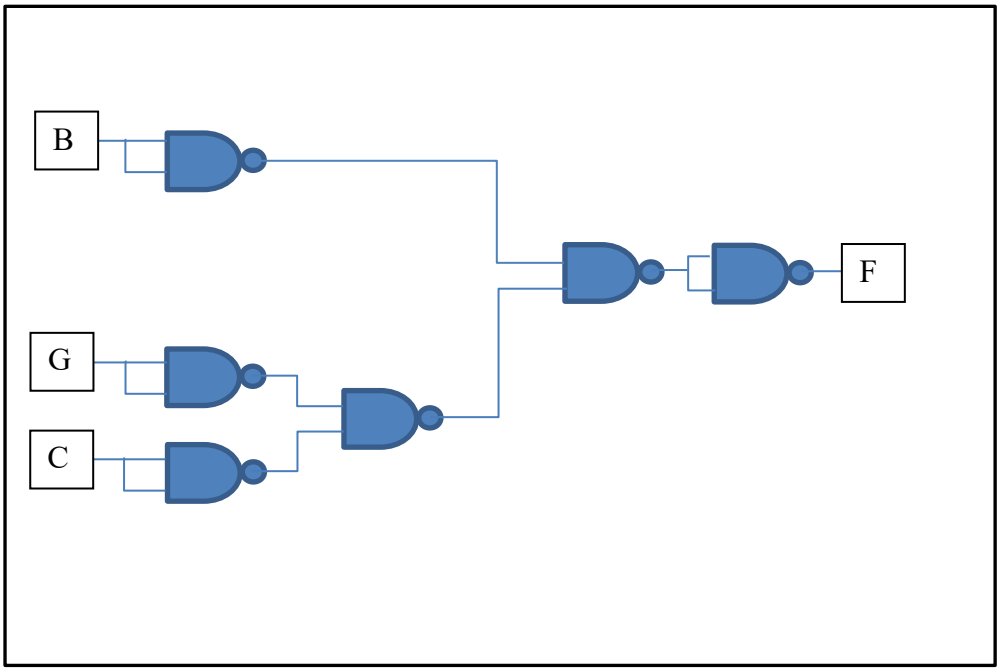
(a) Draw a Truth Table from these conditions to show those sheep owned by Farmer Miles.

Truth Table: [4]

B	G	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

(b) From your Truth Table, produce a Boolean expression to represent those sheep owned by Farmer Miles. [2]

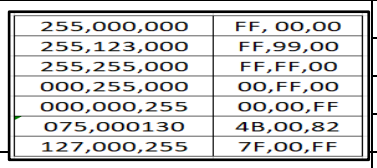
F = **NOT B AND (G OR C)**

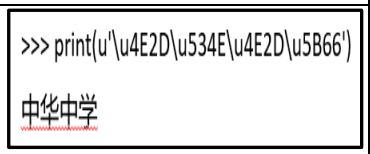
	(c)	Using only **NAND** gates, draw a logic circuit diagram capable of carrying out the Boolean expression.	
			[4]

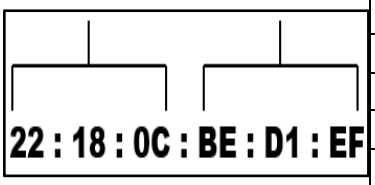
6	(a)	Denary numbers are represented as binary numbers inside a computer.				
		Note: all workings must be clearly shown.				
		(i)	Convert the denary number (**123**)$_{10}$ into 8-bit binary.			[2]
			(123)$_{10}$ = (01111011)$_2$			
		(ii)	Convert the positive whole binary number (**10001010**)$_2$ into a Hexadecimal number.			[2]
			(10001010)$_2$ = (8A)$_{16}$			
		2	123 - 1	1000 = 8	1010 = A	
		2	61 - 1			
		2	30 - 0			
		2	15 - 1			
		2	7 - 1			
		2	3 - 1			
			1			

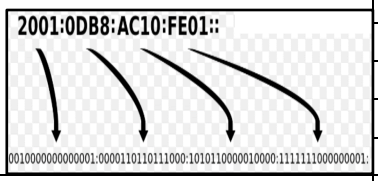
	(b)	Hexadecimal numbers are used as a form of shorthand to represent binary numbers. Draw a line to connect the Practical Usage (left side) of Hexadecimal numbers to the Example graphic (right side).	[3]

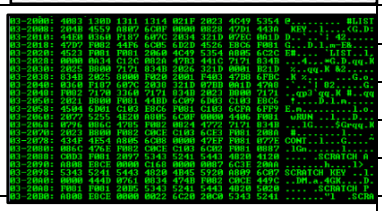
Practical Usage	Example Graphic
(b) Memory Dump	
(c) Unicode	
(d) RGB Color Code	











7 Study the problem statement below and answer the questions:

Problem Statement

Evemach is the world's largest maker of health sensing instruments. Their flagship product is a smartphone app which provides a Body Mass Index (BMI) calculator with health advisory guidance to the user.

The user enters the height (metres) and the weight (kilograms), and the app will calculate and display the BMI based on this formula:

BMI = weight / height^2

Next, the app will refer to a table containing BMI values corresponding to health advisory messages and display them:

BMI	Health Advisory Message
< 18.5	Please see doctor for possible nutritional deficiency diseases and osteoporosis
< 23	Healthy Range! Keep up with your exercise and eating!
< 27.5	Please see doctor for possible risk of Type 2 diabetes and chronic diseases.
>= 27.5	Please see doctor for high risk of heart disease and Type 2 diabetes.

(a) What are the inputs for this problem statement? [2]

Height in centimeters.

Weight in kilograms.

(b) What are the outputs for this problem statement? [2]

Calculated BMI.

Medical advisory statement.

(c) Describe the process from this problem statement. [2]

BMI is calculated using formula weight / height^2.

Medical advisory is displayed based on BMI value,

As described in the table.

8 Arnold has a taken a $60,000 study loan from the Developmental Bank of Wakanda. The loan is to be repaid over 4 years. The interest rate is 8% per year. He has a spreadsheet to keep track of the repayments and the amount he owes.

	A	B	C	D	E	F
1	**Initial Loan**	$60,000.00		**Total Paid to Date**	($9,844.83)	
2	**Interest Rate**	8%		**Amount Owed**	$71,785.00	
3	**Loan Length (months)**	48		**Number of Payment Made**	2	
4	**Monthly Payment**	-$4,922.42				
5	**Total to Pay**	($81,629.34)				
6						
7	**Date**	**Amount Paid**				
8	1/8/2022	-$4,922.42				
9	1/9/2022	-$4,922.42				
10						

(a) State the type of data that is held in each of the following cells.

A1= **Text data** [1]

A8= **Date data** [1]

B1= **Currency data** [1]

(b) (i) The cell B4 shows the monthly payment amount.

Identify the most appropriate function to use in cell B4, if the interest rate and monthly payment amount remain the same.

The PMT function [1]

(ii) The cell E1 shows the total amount that Arnold has paid to date. The payments are entered in cells B8 to B56.

Identify the most efficient function to use in cell E1.

The SUM function [1]

(iii) The formula in cell E3 calculates the number of payments made. Identify the most appropriate function to use in cell E3.

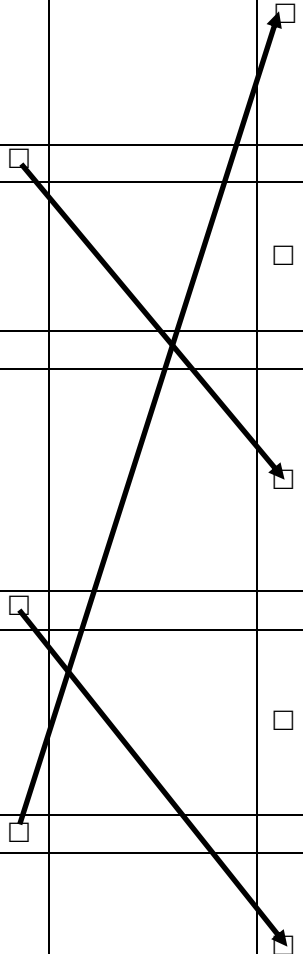
The COUNTA function [1]

(iv) Cell E2 shows the amount owed to the nearest whole number. Identify the most appropriate function used in cell E2 to convert the value to the nearest dollar.

The ROUND function [1]

9 (a) Match the term with the Cyberattack description by drawing a line. [3]

Term		Description
Spyware	☐	The use of emails and fake websites that appear to be from reputable companies in order to steal personal information such as passwords and credit card numbers from users.
Worm	☐	A small piece of data used by websites to store personal information on a user's web browser.
Phishing	☐	A hidden program that secretly collects personal information about its users and sends this information to attackers without the users' knowledge.
	☐	A computer program that attaches itself to a normally harmless program and modifies it.
	☐	A computer program that runs automatically and attempts to spread by sending copies of itself to other computers.



(b) Explain what is **Pharming**? [2]

The interception of requests sent from a computer to a legitimate website and redirection to a fake website to steal personal data or credit card details.

(c) State two measures that can be taken to protect against Pharming.

(i) **Use public key encryption when submitting credit card or other sensitive information via the internet.** [1]

(ii) **Use two-factor authentication for all bank transactions.** [1]

	(d)	Describe how technology has had a positive impact economically on the Healthcare industry.	[1]
		It has created new areas of growth such as telemedicine	
		solutions such as secure transmission of sensitive medical	
		information and automated processes using robots.	
	(e)	Describe how technology has had a negative impact socially on the Finance industry.	[1]
		Cyberattacks and ease of getting false information on the	
		internet has made some people more vulnerable to financial	
		scams and get-rich-quick schemes.	
	(f)	Describe two ethical issues arising from the use of technology in the Education industry.	[2]
		(i) The controversy about allowing or not allowing students to use	
		smart devices on campus has led to challenging policy crafting.	
		(ii) The ongoing discussion on whether technology can be	
		effective than a good human teacher.	
	(g)	Discuss an ethical issue arising from the use of technology in the Entertainment industry.	[1]
		The morality behind making money from those who are addicted	
		to playing computer games.	

	End of Paper	