SCHOOL OF SCIENCE AND TECHNOLOGY, SINGAPORE

SECONDARY 4
PRELIMINARY EXAMINATION

COMPUTING
Paper 1 7155/01
Written

29 August 2018 (Wednesday) **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	4	
2	3	
3	6	
4	7	
5	5	
6	6	
7	7	
8	6	
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11	3	
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13	9	
14	7	
15	4	
16	4	
Total		/80

1 Computer data are represented as bytes.

(i) Describe what is meant by a byte and how it is related to a bit.

_____

_____ [1]

(ii) The number of bytes in a **gibibyte** can be written as 2^x. What is the value of x?

_____ [1]

(iii) Convert the following amounts of data in the unit.

256 000 000 000 B (bytes) = _____ GB (gigabytes). [1]

4 TB = _____B (bytes). [1]

2 The terms **32-bit** and **64-bit** refer to the way a computer's central processing unit (CPU) handles memory addresses. Using byte-addressing, the processor can access one byte for each of the possible permutation of the 32 or 64 bits.

(i) Dave thinks that a 64-bit computer handles twice as much random-access memory (RAM) than a 32-bit computer. State if Dave is correct. Explain.

_____

_____

_____ [2]

(ii) A modern computer is likely to have 8 _____ of RAM installed.

(A) gigabytes

(B) megabytes

(C) kilobytes

(D) bytes

Choose the correct option: _____ [1]

3(a) Convert the hexadecimal number $(2E7)_{16}$ to denary.

Answer: _____ [2]

3(b) Convert the binary number $(10\ 1011\ 1101\ 0000\ 0100)_{2}$ to hexadecimal.

Answer: _____ [2]

3(c) Convert the denary number $(3172)_{10}$ to hexadecimal.

Answer: _____ [2]

4 Study the following problem:
A group of five friends booked a karaoke room for an evening and wanted to split the total bill equally among them. The rental fee for the room is $25 nett per hour and they spent $$x$ on food and beverages (F&B). The cost on F&B is subjected to a service charge of 10% and a Goods and Services (GST) tax of 7%.

A suggested input and output specification are included in the table below.

Input	Output
hours : number of hours spent, rounded up to smallest integer greater or equal to itself. *x*: Amount, in Singapore dollars (SGD), spent on food and beverages.	*Cost_per_pax* : Amount of money, in Singapore dollars (SGD), to be paid by each of the five friends.

The following is a pseudo-code of an algorithm to solve the problem.

INPUT *hours, x*

Cost_per_pax = (25**hours* + (*x* × 1.07 × 1.1)) / 5

OUTPUT *Cost_per_pax*

[Turn over

4(i) State two quantities, with proper units when applicable, that can be generalised for the given problem.

(1) _____

(2) _____ [2]

4(ii) Modify the input-output specification table for your problem by generalising the two stated quantities. Update the output specification based on the modifications.

Input	Output
hours : number of hours spent, rounded up to smallest integer greater or equal to itself. *x*: Amount, in Singapore dollars (SGD), spent on food and beverages.	*Cost_per_pax* :

[3]

4(iii) Rewrite the pseudo-code for the generalised problem.

```
INPUT hours, x, N, F

total = hours * F + (x * 1.10 * 1.07)

OUTPUT total/N
```

[2]

5 In a drawing program, a programmer can use the following commands:

- `step` draws a line of length one unit
- `repeat N` repeats the commands between the following brackets N times
- `left` turns 90° to the left
- `right` turns 90° to the right

Any program will start with the cursor pointing upward.

(i) Dylan wrote the following line of code using the program:

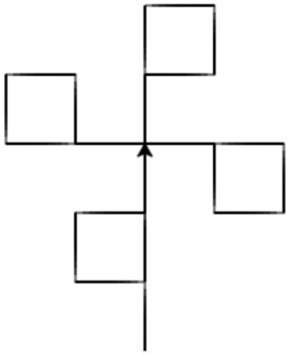
```
step step repeat 4 ( left repeat 4 ( step right ) )
```

Draw the resultant shape, with an arrow indicating where the pointer is and which direction it is facing.

See part (ii) for samples of shape that shows ending position and direction of pointer. [3]

[Turn over

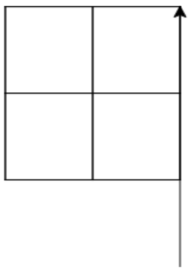
5(ii) Keon wants to write a program to produce the following shape.



The program he writes goes like this:

1	`repeat 3 (step)`
2	`repeat 4 (left step left repeat 4(step left) right step)`

However, the program has a bug. It produces the following shape:



Identify, by underlining below, the command where the first error occurs.

1	`repeat 3 (step)`
2	`repeat 4 (left step left repeat 4(step left) right step)`

Fix the bug by *modifying, removing or adding* just **one** command.
Write the fix in the space below the code. [2]

6 For each part in this question, write the output of the python 3 program.

(i)

```
a = 10
b = 3
def f(b, a):
  a = 2
  b = (a + b) // a
  return b
print(f(a, b))
```

Output: _____ [1]

(ii)

```
T = "Coding is very interesting; Lots of fun!"
A = T[3].upper()
B = T[-13:-10].lower() + T[10:12]
C = " " + T[15:18:2] + T[-1]
print(A+B+C)
```

Output: _____ [3]

(iii)

```
words = ["Code", "Computing", "Future", "Cow", "Thinking"]
count = 0
for word in words:
  v = 0
  for char in word:
    if char in "aeiou":
      v += 1
  if v>2:
    count += 1
print(count)
```

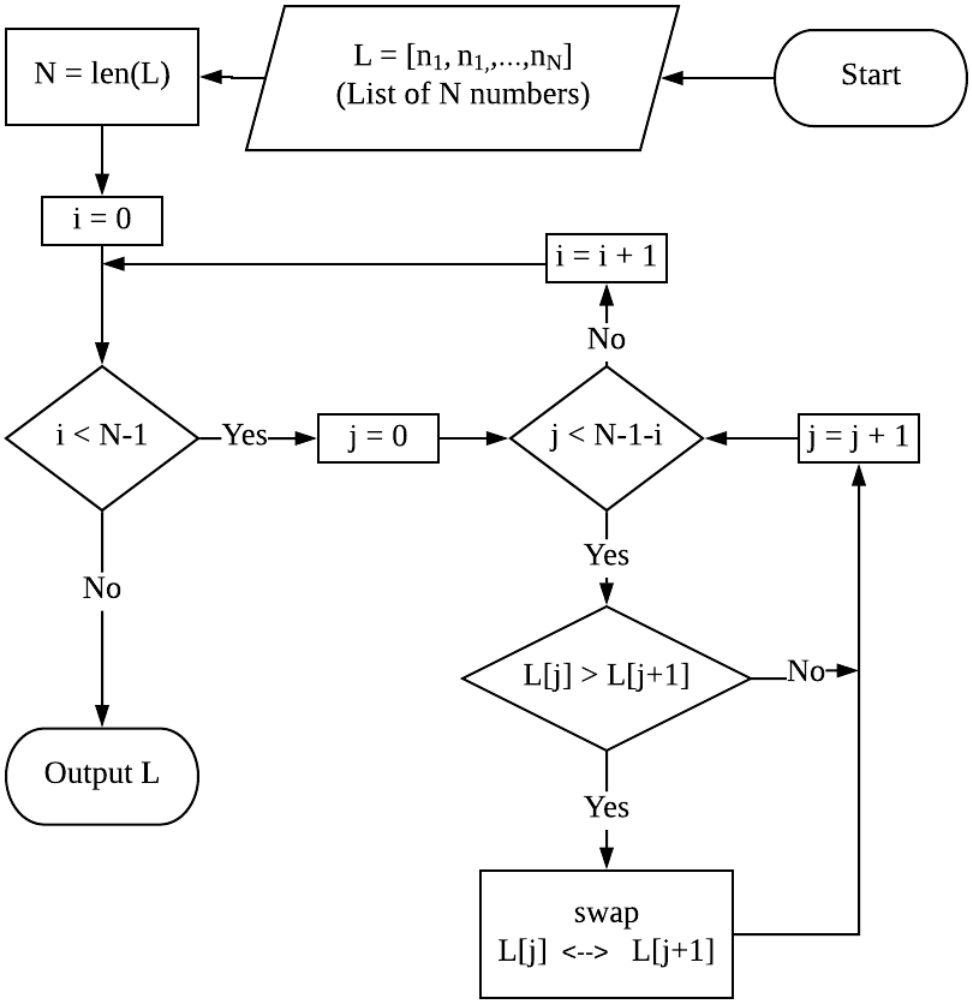
Output: _____ [1]

(iv) Explain what the output for part(iii) represents.

_____

_____ [1]

7 The following flowchart describes what a program does. It accepts a list of N numbers as input.



7. Complete the trace table for the following set of data:

(a) L = [7]

N = _____

L	i	Output
[7]		

[1]

(b) L = [5, 3]

N = _____

L	i	j	Output
[5, 3]			

[2]

[Turn over

(c) L = [7, 1, 5, 3]
N = _____

L	i	j	Output

[3]

(d) Explain what the program illustrated by the given flowchart does.

_____

_____ [1]

8 The following Python 3 program reads 100 positive numbers less than 1000 and prints the highest and lowest numbers.

```
1  highest = 0
2  lowest = 1000
3  for i in range(100):
4    number = input("Enter a number:")
5    if number > highest
6      highest = number
7    if number < lowest:
8      number = lowest
9  print(highest, lowest)
```

There are three errors in the program.
Locate the errors by indicating the line number where each error occurs.
Classify each identified error by circling one of the following three types:

- run-time error,
- syntax error,
- logic error;

and suggest a correction for each error.

Error 1: Line _____

Type: run-time error / syntax error / logic error;

Correction: _____ [2]

Error 2: Line _____

Type: run-time error / syntax error / logic error;

Correction: _____ [2]

Error 3: Line _____

Type: run-time error / syntax error / logic error;

Correction: _____ [2]

[Turn over

9 The program below determines if a given year is a leap year.

```
1  #Input and validate
2  while True:
3    year = input("Enter year in a 4-digit format:")
4    if not year.isnumeric() or len(year)!=4 or len(year)==0:
5      print("Invalid input.")
6    else:
7      year = int(year)
8      if (year<0 or year >9999):
9        print("Invalid input.")
10     else:
11       break
12
13 #Process
14 if year%4!=0 or (year%100==0 and year%400!=0):
15   ans = "Not a leap year"
16 else:
17   ans = "Is a leap year"
18
19 #Output
20 print(ans)
```

The code block from line 2 to line 11 asks for an input and validates the given input. Draw lines to match the validation criterion to the type of validation check.

Code Snippet	Types of Validation Check
`not year.isnumeric()`	Range Check
`len(year)!=4`	Format Check
`len(year)==0`	Presence Check
`if (year<0 or year >9999):`	Length Check

[3]

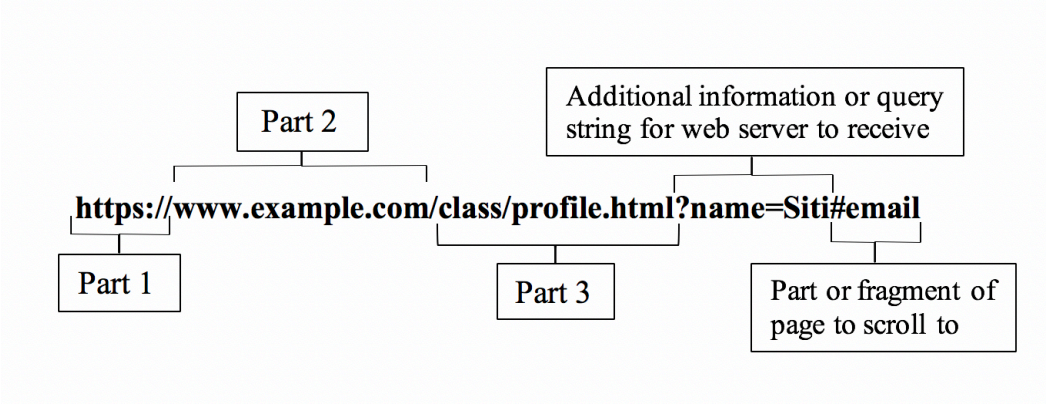
10 All computers are assigned a network address in order for them to communicate or exchange data with other devices over a network.

State two examples of network addresses.

(1) _____ [1]

(2) _____ [1]

11 An example of a Uniform Resource Locator (URL) is given below.
Identify the three parts, as indicated, that make up this URL.



Part 1: _____ [1]

Part 2: _____ [1]

Part 3: _____ [1]

12 More people are purchasing goods online and using the Internet for banking services. This gives rise to an increase in phishing.

(a) Describe what phishing is and give an example of how it works. [2]

_____

_____

_____

(b) Suggest two ways to avoid being phished. [2]

_____

_____

_____

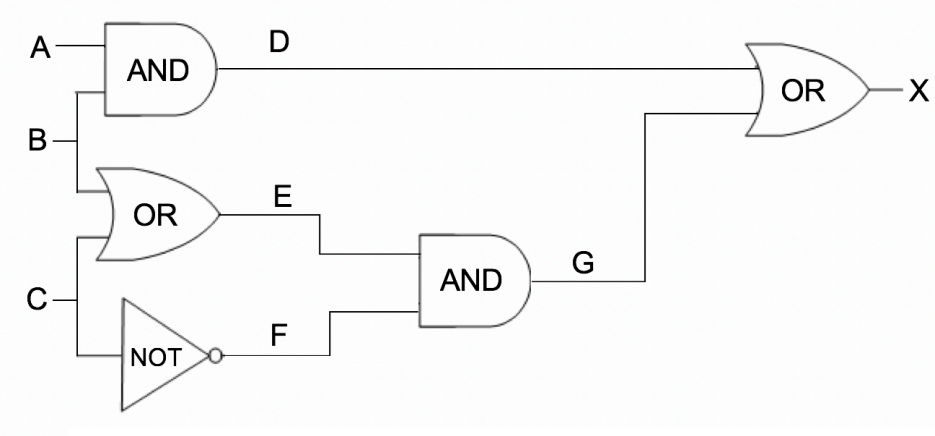
[Turn over

13(a) Identify the logic gate represented by the following truth table.

Inputs		Output
X	**Y**	**Q**
0	0	0
0	1	1
1	0	1
1	1	1

Answer: _____ [1]

13(b) Complete the truth table for the following logic circuit.



A	B	C	D	E	F	G	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					

[3]

13(c) A computer-controlled machine produces treated water fit for human consumption. The machine will receive a STOP signal (i.e. X = 1) depending on certain conditions, shown in the following table.

Input	Binary	Condition
V	1	Volume > 1000 litres
	0	Volume ≤ 1000 litres
T	1	Temperature > 50°C
	0	Temperature ≤ 50°C
S	1	Speed > 15 m/s
	0	Speed ≤ 15 m/s

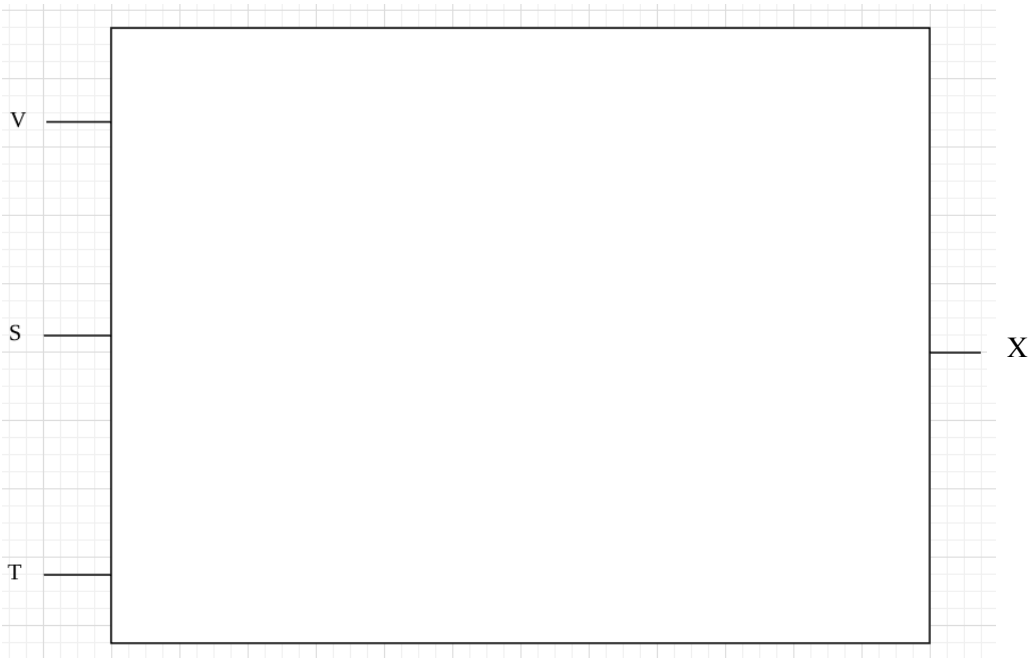
A STOP signal (X = 1) occurs only when

Volume, V > 1000 litres and Speed, S ≤ 15 m/s

OR

Temperature, T ≤ 50° C and Speed, S > 15 m/s

Draw the logic circuit for the system.



[5]

[Turn over

14(a) The diagram below shows a spreadsheet that calculates the real roots of an equation $ax^2 + bx + c = 0$, given the values of a, b and c.

The formula is given to be $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

	A	B
1	a	2
2	b	-4
3	c	-3
4	root 1	2.58
5	root 2	-0.58

(i) State the data type of cell A1:A5.

Answer:_____ [1]

(ii) Suggest a suitable data type, other than "general", for the cell range B1:B5.

Answer:_____ [1]

(iii) Suggest a suitable formula to key in cell B4 to obtain the first root, so that the formula can be copied into B5 and modified only once to find the second root.

Answer:_____ [2]

(b) The Excel formula =FV() calculates the future value of an annuity investment based on constant-amount periodic payments and a constant interest rate.

It has the following syntax: *=FV(rate, nper, pmt, pv)* where:
rate is the interest rate per period,
nper is the number of periods,
pmt is the payment made each period, and
pv is the present value.

The value of the formula "=FV(2%, 24, 100, 3 000)" is evaluated as - $7867.50.
Write a story that describes the scenario depicted by the formula and its value.

_____

_____

_____

_____ [3]

15 (a) Give, with an example, one advantage of the client-server networks as compared to the Peer-to-Peer (P2P) networks.

Advantage:_____

_____

_____

_____

_____

_____

_____ [2]

(b) Give two disadvantages of the client-server networks as compared to the Peer-to-Peer (P2P) networks.

(1) _____

_____

_____ [1]

(2) _____

_____

_____

_____ [1]

[Turn over

16 The use of technology has changed the way workers work and communicate. It has given rise to the use of teleworking and videoconferencing.

Videoconferencing is a way to conduct 'virtual' face-to-face meetings regardless of distance.

(a) Explain what is meant by teleworking.

_____

_____

_____ [1]

(b) Give one reason why Voice over IP (VoIP) is used for teleworking and videoconferencing.

_____

_____

_____ [1]

(c) State an advantage and disadvantage of videoconferencing.

Advantage:_____

_____

_____ [1]

Disadvantage:_____

_____

_____ [1]