



# ZHONGHUA SECONDARY SCHOOL

## PRELIMINARY EXAMINATION 2018

### SECONDARY 4 EXPRESS

Candidate's Name

Class

Register Number

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## COMPUTING

Paper 1

**7155/01**

13 September 2018

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:

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|  |
|--|

Setter: Mr. Calvin Heng

Vetter: Mr. Low Kee Ley

1 Define the term 'computer'.

[3]

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It is said that the modern smartphone is a computer. From your definition above, describe two areas where the smartphone meets the requirements of the definition. [2]

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2 Number Systems. **All workings must be shown clearly.**

- (a) Convert the Hexadecimal number 4D to Denary: [2]

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- (b) Convert the Binary number 101011110101 to Hexadecimal: [2]

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- (c) Convert the Denary number 844 to Hexadecimal: [2]

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- (d) Convert the Binary number 1010111111001000 to Denary: [2]

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3 Data Protection.

- (a) Study the following exhibit. Is this a case of data loss or data corruption? Explain your answer briefly. [2]

| \$#!% | 9!%%@ | &%!#+- | !!**#@ \$ |
|-------|-------|--------|-----------|
| 1011  | 1.65  | 65     | 176.96    |
| 1012  | 1.52  | 54     | 124.76    |
| 1013  | 1.68  | 62     | 174.99    |

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- (b) Describe one way to prevent Data Loss. [1]

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- 4 Complete the following table by writing in the type of Malicious Software next to its description.

|     | <u>Type of Malicious Software</u> | <u>Description</u>                                                                                                                                                          |     |
|-----|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| (a) | <input type="text"/>              | A hidden program that secretly collects personal information about its users and transmits this information to attackers without the users' knowledge.                      | [1] |
| (b) | <input type="text"/>              | A computer program that runs automatically and attempts to spread by sending copies of itself to other computers, without the need to attach itself to an existing program. | [1] |
| (c) | <input type="text"/>              | A computer program that pretends to be a harmless file or useful application, but when activated, does harmful things like grant unauthorised access to the computer.       | [1] |

- 5 For the following scenarios, state whether the person described is guilty of copyright infringement, plagiarism, or both by putting a tick ( ✓ ) in the box.

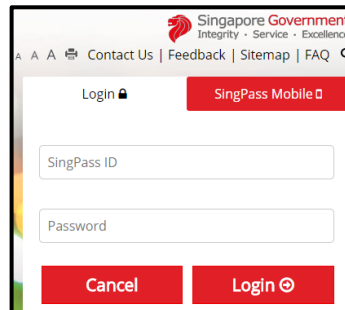
|     | <b>Scenario</b>                                                                                                          | <b>Copyright Infringement</b> | <b>Plagiarism</b>        |     |
|-----|--------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------|-----|
| (a) | Jason takes his friend's python program and submits it for a contest as his own program without his friend's permission. | <input type="checkbox"/>      | <input type="checkbox"/> | [4] |
| (b) | Jason installs a crack on a software application so that he can use it for free.                                         | <input type="checkbox"/>      | <input type="checkbox"/> |     |
| (c) | Jason found a programming solution on a public domain website and submits it as his own work for an assignment.          | <input type="checkbox"/>      | <input type="checkbox"/> |     |

- 6 Study the problem statement below and answer the questions:

Problem Statement

Your 70-year-old grandma is trying to access her Central Provident Fund information on the [www.cpf.gov.sg](http://www.cpf.gov.sg) website.

As she knows you are a student of Computing, she requests for your help in logging in. You are presented with the following screen:

The screenshot shows the SingPass login interface. At the top, there's a header with the Singapore Government logo and navigation links like 'Contact Us', 'Feedback', 'Sitemap', and 'FAQ'. Below the header, there's a 'Login' section with a 'SingPass Mobile' button. The main area contains two input fields: 'SingPass ID' and 'Password'. At the bottom, there are two red buttons: 'Cancel' and 'Login'.

- (a) What are the inputs for this screen? [3]

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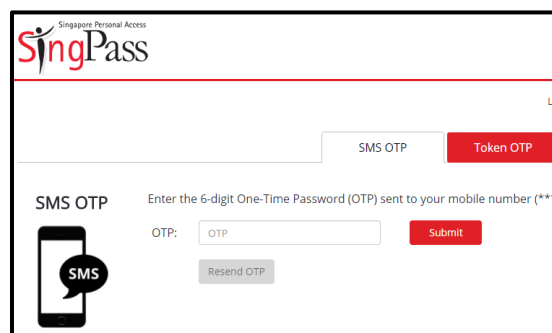
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- In order to improve security, websites use two-factor authentication. What is two-factor authentication? [2]

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The next screen shows two-factor authentication in action.

The screenshot shows the SingPass two-factor authentication screen. It features the SingPass logo at the top. Below the logo, there are two tabs: 'SMS OTP' (selected) and 'Token OTP'. The 'SMS OTP' section contains a text input field for the 'OTP' and a 'Submit' button. There is also a 'Resend OTP' button. A small icon of a mobile phone with an 'SMS' bubble is shown on the left. The background is white with a red header bar.

- (c) Describe how the process works here, using her mobile phone. [1]

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7 Study the following program code:

```

import math

#Function returns True if input integer is even, False otherwise
def is_even(q):
    return q % 2 == 0

#Function returns the sum of the squares of two integers
def sum_of_squares(x, y):
    return x * x + y * y

#Function returns the area of a circle with radius r
def area_of_circle(r):
    return math.pi * r * r

#Main body of Program
#Find area of circle from r = 0 to r = 100
for i in range(101):
    print("Area of Circle ", i, " is ", area_of_circle(i))

#Find sum of squares from 100,100 to 1,1 for even numbered j
j = 100
k = 100
while j > 0:
    if is_even(j):
        print("Sum of squares of ", j, " and ", k, " is ", sum_of_squares(j, k))
        j -= 1
        k -= 1

```

Annotate the program with the following Labels:

- |     | <u>LABEL</u> | <u>STATEMENT</u>                                         |     |
|-----|--------------|----------------------------------------------------------|-----|
| (a) | A            | Sub-Goal Labelling {Has been done for you as an example} |     |
| (b) | B            | Iteration over Condition Statement                       | [1] |
| (c) | C            | Iteration over Sequence Statement                        | [1] |
| (d) | D            | Selection Statement                                      | [1] |

8 Study the following program carefully:

| Line | Program Code                     |
|------|----------------------------------|
| ---- | -----                            |
| 001  | def dectobin(n):                 |
| 002  | binary = 0                       |
| 003  | while str(n):                    |
| 004  | if n // 2 == 0:                  |
| 005  | binary += '0'                    |
| 006  | else:                            |
| 007  | binary += '1'                    |
| 008  | n = n // 2                       |
| 009  | return ''.join(reversed(result)) |

The programmer tests this program by issuing the following commands:

`print(dectobin(2))`, with expected result as: '10'

`Print(dectobin(10))`, with expected result as: '1010'

Unfortunately, errors of various kinds start to appear. Please help to debug the program.

There are four errors in this program. Locate the errors (*state the line number*) and state the correction in the program:

- (a) Error 1: [2]

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Correction:

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- (b) Error 2: [2]

---

Correction:

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- (c) Error 3: [2]

---

Correction:

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- (d) Error 4: [2]

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Correction:

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- 9 Study the program (func\_s) below. Use the Trace Table for the inputs of:

a\_list = [5, 4, 3, 2]

(values of *i* and *j* have been placed for you)

```
def func_s(a_list): # a_list is a list of integers
    for i in range(len(a_list)):
        for j in range(len(a_list)-1):
            if a_list[j] > a_list[j+1]:
                a_list[j], a_list[j+1] = a_list[j+1], a_list[j]
            print(a_list)
    return a_list
```

- (a) Complete the Trace Table here:

[4]

|    | <i>i</i> | <i>j</i> | <b>a_list</b> |  |  |  |
|----|----------|----------|---------------|--|--|--|
| 01 | 0        | 0        |               |  |  |  |
| 02 |          | 1        |               |  |  |  |
| 03 |          | 2        |               |  |  |  |
| 04 | 1        | 0        |               |  |  |  |
| 05 |          | 1        |               |  |  |  |
| 06 |          | 2        |               |  |  |  |
| 07 | 2        | 0        |               |  |  |  |
| 08 |          | 1        |               |  |  |  |
| 09 |          | 2        |               |  |  |  |
| 10 | 3        | 0        |               |  |  |  |
| 11 |          | 1        |               |  |  |  |
| 12 |          | 2        |               |  |  |  |

- (b) What does this program do?

[1]

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- (c) Make a suggestion to improve the efficiency of this program.

[1]

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- 10 Data validation is an important function for many software applications. You have been tasked to write a specification for performing data validation on the Email field. Please focus your answer on the Format Check. Here is a typical example of an Email ID:

***firstname.lastname@service.domain\_name***

Discuss four aspects of your format check in your specification.

(a) \_\_\_\_\_ [1]

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(b) \_\_\_\_\_ [1]

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---

(c) \_\_\_\_\_ [1]

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(d) \_\_\_\_\_ [1]

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11 Programming Languages can be categorized as Compiled Languages or Interpreted Languages. For example, C is a compiled language and Python is an interpreted language.

(a) State Two advantages of an interpreted Programming Language. [2]

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(b) State Two disadvantages of an Interpreted Programming Language. [2]

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12 Client-Server Network Technology.

(i) Write down three advantages of using a Client-Server Network

(a) \_\_\_\_\_ [1]

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(b) \_\_\_\_\_ [1]

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(c) \_\_\_\_\_ [1]

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(ii) Write down one disadvantage of using a Client-Server Network.

(d) \_\_\_\_\_ [1]

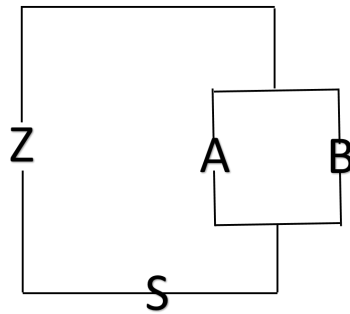
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13 Study the following electrical circuit diagram.

A & B represent switches

Z represents a light bulb

S represents a power source



(a) Using only the **NAND** gate, draw the **Logic Circuit Diagram** for this circuit. (Label your diagram!) [6]

(b) Write out the Truth Table for this electrical circuit diagram. [3]

(c) Write down the Boolean Statement for this device. [3]

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#### 14 Computer Networking

- (a) Give two reasons why wireless networks are preferred over wired networks at educational facilities. [2]

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- (b) Explain the terms 'modulation' and 'demodulation' as applied in the world of computer networking. [2]

Modulation: \_\_\_\_\_

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Demodulation: \_\_\_\_\_

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- (c) A topology describes the physical layout of a network. Understanding the topology is essential to designing a network. Connect the topology term with the statement. [3]

Topology Term

BUS



Statement



Each computer is connected to two other computers. All the data is passed around in the same direction. If a failure occurs in the cable or if a computer breaks down, the entire network will fail to function.

RING



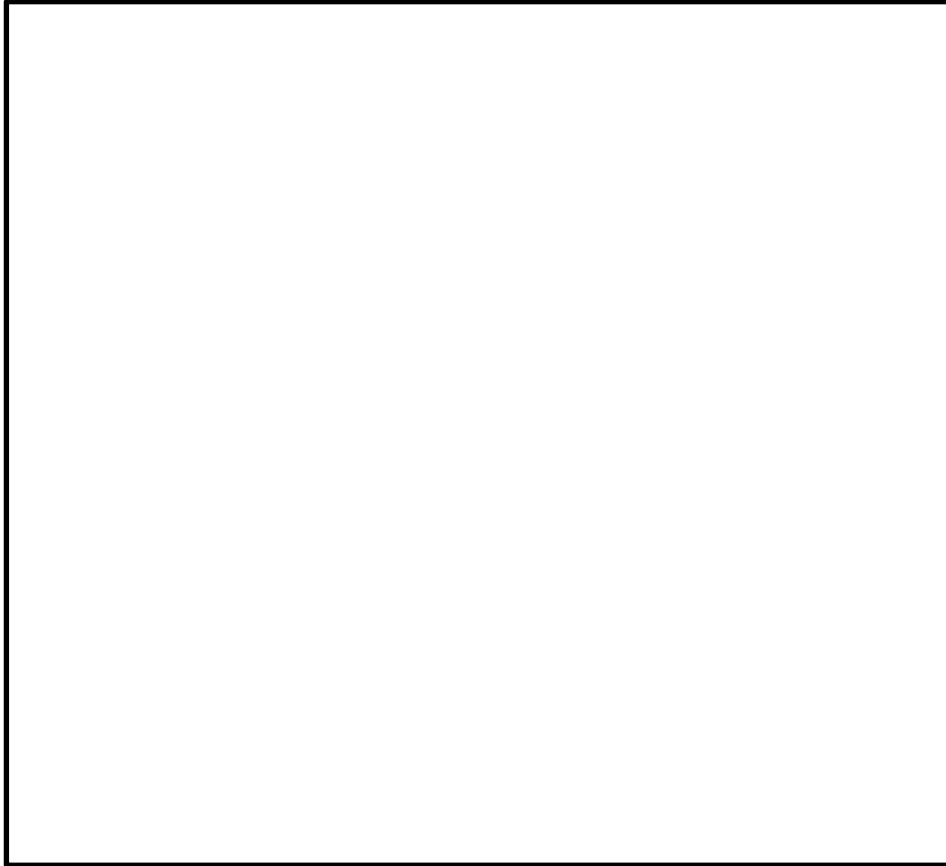
Network device such as a hub or switch is at the centre of the network with connections to all the other computers. The computers will send data to the central device and the device forwards the data to the intended destination.

STAR



A common cable or backbone connects all the devices. It also allows the devices to communicate with the server, with each other and with devices such as a shared printer.

- (d) Alex wants to wirelessly connect up to five devices, which includes two tablets, two laptops and one wireless printer, in his home. There will be a Wireless Router for connecting all the devices and a Modem to offer Internet connectivity. Draw a simple diagram of Alex's home network. (Make sure you LABEL your diagram) [3]



***End of Paper***