# FUKIEN SECONDARY SCHOOL S5 First Term Examination (2020-2021) Information and Communication Technology (1 hour 30 minutes)

 Date: 11<sup>th</sup> January 2021
 Name:\_\_\_\_\_

 Time: 10:30a.m. - 12:00nn
 Class: \_\_\_\_\_No.: \_\_\_\_\_

#### **INSTRUCTIONS**

- 1. Write your name, class and class number on both the MC answer sheet and this Question-Answer Book.
- 2. Answer all questions. You are advised to use an HB pencil to mark all the MC answers on the MC answer sheet. Write your answers in the spaces provided in this Question-Answer Book.
- 3. Hand in the MC answer sheet and this Question-Answer Book at the end of the test.
- 4. The total mark of this paper is 100.
- 5. Candidates are allowed to use a calculator which has been pad-printed with the 'H.K.E.A.A. APPROVED' or 'H.K.E.A. APPROVED' label.

#### Section A – Multiple Choice Questions (40 marks)

1. Which of the following pseudocodes produce the same result?

(1) IF P < 3 AND Q > 25 THEN R ← R + 1
(2) IF Q > 25 THEN IF P < 3 THEN R ← R + 1
(3) IF P < 3 THEN IF Q > 25 THEN R ← R + 1
A. (1) and (2) only
B. (1) and (3) only

- C. (2) and (3) only
- D. (1), (2) and (3)
- 2. What is the output of the following algorithm?

```
S ← 0
For J from 1 to 5
Output J
S ← S + J
Output S
A. 12345
B. 1234515
C. 5432115
```

D. 5432121

3. What kind of iteration is used in the following segment of a flowchart?



- A. Multi-way selection
- B. For loop
- C. Pre-test loop
- D. Post-test loop
- 4. The following pseudocode represents part of an algorithm.

IF (AGE > 6) AND (AGE < 12) THEN OUTPUT AGE

Which of the following sets of test data is the most appropriate?

```
A. 3 6 10 12 40
B. 4 5 6 8 11
C. 6 8 9 10 12
D. 7 9 11 12 13
```

5. An array DAT stores English names as shown below.

Amy	Bob	Carol	Dave
DAT[1]	DAT [2]	DAT[3]	DAT [4]

After executing the following algorithm, which element in DAT stores 'Carol'?

 $P \leftarrow 4$ While P > 2DAT[P]  $\leftarrow$  DAT[P-1]  $P \leftarrow P - 1$ A. DAT[1]

- **B.** DAT[2]
- C. DAT[3]
- D. DAT[4]

#### 6. Consider the algorithm below.

```
A \leftarrow 1
While A < 10
A \leftarrow A + A
Output A
```

Which of the following values is/are included in the output?

- (1) 6
- (2) 8
- (3) 16
- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only
- 7. The sales department of an insurance company wants to improve service to its clients. It asks the IT project manager to establish some web pages for the clients. What should the IT project manager do first?
  - A. Define the scope of the service
  - B. Evaluate the IT equipment needed
  - C. Estimate the project completion date
  - D. Set up a project team and recruit programmers

8. Part of a flowchart is shown below. The algorithm requests the user to repeatedly enter a number until a positive number is entered.



What should be filled in the decision box?

- A.
   X > 0 

   B.
    $X \ge 0$  

   C.
   X < 0 

   D.
    $X \le 0$
- 9. What is the output of the following algorithm?

```
X 🗲 5
   Y ← 9
   If (X+Y < 15) or (X-Y < X+y)
            ү ← ү-х
      then
             х ← ⊻-х
      else
   Output X, Y
A. 4
      4
B. 4
      9
C. 5
      4
D. 5
      9
```

10. What is the output of the following algorithm?

```
S ← 5
C ← 0
While S ≤ 10
C ← C + 1
S ← S + C
Output C
A. 11
B. 5
C. 4
D. 3
```

11. Which of the following is a valid variable name in C programming language?

- A. My Age
- $B.\quad {\tt My-Age}$
- $C. \quad \texttt{My}\_\texttt{Age}$
- D. My\*Age
- 12. Which conversion specifier should be used to display an integer?
  - A. d
  - B. s
  - C. f
  - D. c

13. Among the following data types, which one can be used to store a real number?

- A. int
- B. float
- C. char
- D. string

14. What is the output if the following statements are executed?

```
int x;
x = 10;
printf("%d\n", --x);
printf("%d\n", x--);
A. 10
9
B. 10
8
C. 9
8
D. 9
9
```

15. What is the smallest and largest possible output when the following statement is executed?

	printf("%d\n", rand	() % 7 + 2);
	Smallest possible output	Largest possible output
A.	0	8
B.	1	9
C.	2	8
D.	2	9

- 16. A condition whether a person is a Hong Kong citizen has to be checked and his Hong Kong identity card number will be displayed if the condition is met. Otherwise, nothing has to be shown. Which of the following is the best and simplest construct to evaluate the condition?
  - A. if
  - B. if-else
  - C. nested if
  - D. switch case

#### 17. What is the output when the following program is executed?

```
#include <stdio.h>
   void main() {
       int mark = 4;
       switch(mark) {
          case 10:
          case 9:
                    printf("Distinction\n");
                    break;
          case 8:
                    printf("Credit\n");
          case 7:
                    break;
          case 6:
          case 5:
                    printf("Passed\n");
                    break;
          default: printf("Failed\n");
       }
   }
A. Distinction
B. Credit
C. Passed
D. Failed
```

```
18. How many passes will be carried out when the following loop is executed?
for (counter = 10; counter <= 20; counter += 3)
printf("%d\n", counter);
```

- A. 3
- B. 4
- C. 5
- D. 6

#### 19. What are the outputs when the following program is executed?

```
#include <stdio.h>
   void change value(int a, int *b) {
       a = a / 2;
      *b = *b * 2;
   }
   void main() {
      int x, y;
      x = 100;
      y = 200;
       change value(x, &y);
      printf("%d %d\n", x, y);
   }
A. 50 400
B. 50 200
C. 100 200
D. 100 400
```

#### 20. Consider the following C program.

```
void main() {
    int x[] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
    int y, z;
    z = 0
    for (y = 0; y <= 9; y++)
        z += x[y];
}</pre>
```

What is the function of the variable z?

- A. Accumulator
- B. Counter
- C. Flag
- D. Sentinel value

### Section B – Structured Questions (60 marks)

1. An email server can identify spam mail by matching strings in a data file. The array ST stores the strings in the data file, as shown below:

```
ST[1] ← "CONGRATULATIONS"
ST[2] ← "LOTTERY"
.....
ST[1000] ← "WINNER"
.....
```

The following two algorithms, ALG1 and ALG2, check whether the string stored in the variable check\_ST is included in the data file. They produce the same result. N is a variable for storing the total number of strings in the data file.

ALG1	ALG2
Input check_ST	Input check_ST
Found 🗲 -1	FOUND 🗲 -1
For I from 1 to N	I 🗲 -1
If check_ST = ST[I] then	While $(I \le N)$ and $(FOUND = -1)$
FOUND 🗲 I	If check_ST = ST[I] then
	FOUND 🗲 I
	I 🗲 I + 1

- (a) (i) Suppose that the string in check\_ST is "LOTTERY". After executing the algorithms, what is the value of FOUND?
  - (ii) Give **two** test values of check\_ST to verify the algorithms and describe your answer briefly.
  - (iii) In the case of (a)(i), will ALG1 or ALG2 be more efficient? Explain briefly.

(iv) What is the benefit of using an array to store the strings?

(6 marks)

2. Ms Wong develops a vending machine which has an embedded computer. She writes a program to control the sales of 30 kinds of products in the vending machine.



- (a) (i) Other than the operating system, what will the secondary storage in the embedded computer store?
  - (ii) The operating system is not installed in the ROM of the embedded computer. Why?
  - (iii) The vending machine only allows customers to use the Octopus stored value card to buy the products. What is the advantage and disadvantage of this setting?

Advantage: \_\_\_\_\_

Disadvantage:

(4 marks)

Ms Wong uses an array with 30 elements, P[1], P[2], ..., P[30], to store the numbers of the 30 kinds of products remained in the vending machine. She uses the following algorithm ALG1 to check whether all the products in the machine are sold out or not.

```
ALG1

N \leftarrow 0

For I from 1 to 30

N \leftarrow N + P[I]

If N = 0 then

FLAG \leftarrow FALSE

else

FLAG \leftarrow TRUE
```

- (b) (i) If the values of P[1] and P[2] are 0 and 1 respectively, what is the final value of FLAG?
  - (ii) What does the final value of N mean?
  - (iii) Ms Wong chooses Boolean as the data type of FLAG. What is the major benefit of her choice?

(4 marks)

(c) (i) According to the values of I and FLAG, complete the following truth table.

I	FLAG	(I <= 30) AND (NOT FLAG)
1	FALSE	TRUE
15	TRUE	
30	FALSE	
31	TRUE	

(ii) The following algorithm ALG2 performs the same task as ALG1.

```
<u>ALG2</u>

FLAG \leftarrow FALSE

I \leftarrow 1

While (I <= 30) AND (NOT FLAG) do

IF P[I] > 0 THEN

FLAG \leftarrow TRUE

I \leftarrow I + 1
```

Which algorithm, ALG1 or ALG2, should Ms Wong use? Explain briefly.

(4 marks)
A department store gives its members a bonus card. In a month, a member, Mary,
has 10 transactions with the bonus card and the amounts are stored in $T[1]$ ,

T[2],...,T[10].

3.

(a) Complete the following algorithm, ALG1, to calculate the total amount, TOTAL, that Mary has spent.

ALG1	
TOTAL $\leftarrow$	
I 🗲 1	
While I	10 do
total $\leftarrow$ [	
I 🗲 I + 1	

(3 marks)

The department store has a sales promotion. Every month, members do not have to pay the transaction with the lowest amount among the first 10 transactions in which the bonus card was used.

(b) (i) Complete the following algorithm, ALG2, to find the transaction with the lowest amount for Mary.

```
ALG2

M \leftarrow 1

J \leftarrow 1

While J \leq 10 do

If T[M]

M \leftarrow J

J \leftarrow J + 1
```

(ii) Could the second line of ALG2 be changed to 'J ← 2'? Explain briefly.

(2 marks)

(c) In this sales promotion, ALG3 is used to calculate the actual payment, PAYMENT, for Mary. ALG3 includes ALG1 and ALG2. Complete ALG3.

#### ALG3

Execute		 	 
Execute		 	 
PAYMENT	←		

(3 marks)

- (d) The department store has another sales promotion. The 20 members with the highest total spending each month can enjoy 20% off all year round. A computer application system is used to find these 20 members.
  - Should the system be a single-user system or a multi-user system? Explain briefly.

(ii) Should the system be a batch processing system or a real-time system? Explain briefly.

(4 marks)

4. The following statements in a C program (uses the math.h header file) are executed one by one, what are the outputs?

Statements	Output
printf("%d\n", 17 / 3);	
printf("%d\n", 17 % 3);	
printf("%.2f\n", 3 * pow(-2, 5));	
printf("%f\n", sqrt(3 * 3 + 4 * 4));	

(4 marks)

### 5. Refer to the following program.

Line no.	Statement
10	<pre>int main() {</pre>
20	float balance;
30	float deposit;
40	float interest;
50	float withdrawal;
60	balance = 5678;
70	deposit = 322;
80	<pre>balance += deposit;</pre>
90	<pre>interest = balance * 0.05;</pre>
100	<pre>balance = balance + interest;</pre>
110	withdrawal = 500;
120	<pre>balance -= withdrawal;</pre>
130	return 0;
140	}

Fill in the value of each variable to 2 decimal places after each statement is executed. Leave blank for uninitialized variables.

Line no.	balance	deposit	interest	withdrawal
60				
70				
80				
90				
100				
110				
120				

(7 marks)

# 6. Consider the following C program.

Line no.	Statement
1	<pre>int main() {</pre>
2	<pre>int numegg, dozen, remain;</pre>
3	<pre>printf("Enter number of eggs: ");</pre>
4	<pre>scanf("%d", &amp;numegg);</pre>
5	dozen = numegg / 12;
6	remain = numegg % 12;
7	<pre>printf("%d\n", dozen);</pre>
8	<pre>printf("%d\n", remain);</pre>
9	return 0;
10	}
(a) What are	e the functions of the statements in lines 3 and 4?
	(2 marks)
(b) What are	e the functions of the statements in lines 5 and 6?
	(2 marks)
(c) If a user statemer	enters 42 for the number of eggs, what are the outputs of the ats in lines 7 and 8?

(2 marks)

(d) Modify the statements in lines 7 and 8 so that the displays are more meaningful, e.g. showing the message "No. of dozens = ".

(2 marks)

(e) Suggest an alternative statement for line 6 to perform the same function without using %.

(1 mark)

- (f) If the variables dozen and remain are declared as float type and the statements in lines 5 and 6 are replaced by "dozen = (float) numegg / 12;" and the alternative statement in (e) respectively.
  - (i) What is the value of dozen if a user enters 42 for the number of eggs?
  - (ii) What is the problem if the above changes are made?

(3 marks)

7. The following program is executed to evaluate the H.C.F. of two integers 78 and 462.

```
#include <stdio.h>
#include <stdlib.h>
void main() {
    int x, y;
    x = 78;
    y = 462;
    do {
        if (x > y)
            x = x % y;
        else
            y = y % x;
    } while (x != 0 && y != 0);
    printf("HCF = %d\n", abs(x - y));
```

}

(a) Fill in the values of the variables x and y after each pass of the loop.

pass	Х	У
1		
2		
3		

(6 marks)

(b) What is the final output? (Given: The function abs returns a positive value of its argument, e.g. abs(-5) returns 5; abs(5) returns 5.)

(1 mark)

**END OF PAPER**