FUKIEN SECONDARY SCHOOL S5 First Term Uniform Test (2020-2021) Information and Communication Technology (1 hour)

 Date: 22nd October 2020
 Name:_____

 Time: 10:30a.m. - 11:30a.m.
 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. What are the boundary cases for testing in the following segment of algorithm?

Input A
If A > 5
Then B ← 10
Else B ← 20
Output A, B
(1) 5
(2) 6
(3) 10
(4) 20
A. (1) and (2) only
B. (3) and (4) only
C. (2), (3) and (4) only
D. (1), (2), (3) and (4)

2. age is an integer variable and IsStudent is a Boolean variable. Which of the following Boolean expressions produce the same result?

(1)(age < 25) AND (IsStudent = TRUE)
(2)NOT ((age >= 25) OR (IsStudent = FALSE))
(3)(age > 25) OR (IsStudent = TRUE)

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

```
LENGTH \leftarrow 6
HEIGHT \leftarrow 5
AREA \leftarrow LENGTH * HEIGHT
LENGTH \leftarrow 4
HEIGHT \leftarrow 3
Output AREA
```

- A. 12
- B. 20
- C. 24
- D. 30
- 4. N is an array and N[1], N[2], N[3] and N[4] store 1, 3, 5 and 7 respectively. What is the output of the following algorithm?

5. Study the following algorithm:

```
A \leftarrow 1

B \leftarrow 1

Repeat

Output B

C \leftarrow A + B

A \leftarrow B

B \leftarrow C

Until (B > 10)
```

How many times will 'Output B' be executed?

A. 4
B. 5
C. 6
D. 7

6. Y is an array. What is the output of the following algorithm?

D. 19

7. Study the following algorithm:



How many "A" will be displayed?

- A. 0
- B. 2
- C. 4
- D. 5

8. The following algorithm is used to find the value of $(1^2 + 2^2 + 3^2 + ... + N^2)$.

INPUT N s ← 0 WHILE [$S \leftarrow S + N \times N$ N ← N - 1 OUTPUT S

What should be in the box?

A. N > 0
B. N > 1
C. N < 0
D. N < 1

9. Study the following algorithm:

INPUT n IF n < -6 THEN Y \leftarrow y + 2 ELSE IF n > 9 THEN y \leftarrow y - 2 ELSE y \leftarrow y × 2

Which of the following sets of input data is most suitable for testing the algorithm?

- A. -6, 0, 9
- B. -2, 0, 1, 2
- C. -20, -6, 0, 9, 15
- D. -20, -10, 0, 1, 10, 20
- 10. Study the following segment of a flowchart:



Suppose that the initial values of X and Y are 14 and 4 respectively. What is the output?

- A. 0
- **B**. 1
- C. 2
- D. 3

11. Suppose that X = 1, Y = 2 and Z = 3. Which of the following Boolean expressions is 'true'?

A. ((X = 1) AND (Y > -2)) AND (Z > 3)B. ((X = 1) AND (Y > -2)) OR (Z > 3)C. ((X = 1) OR (Y > -2)) AND (Z > 3)D. (X = 1) AND ((Y > -2)) AND (Z > 3))

- 12. What are the characteristics of using modularity for designing computer solutions?
 - (1) Usually modularity is used to solve simple problems.
 - (2) Modules may be reusable.
 - (3) The development cost is higher.
 - (4) Modules can be independently developed.
 - A. (1) and (3) only
 - B. (1) and (4) only
 - C. (2) and (3) only
 - D. (2) and (4) only
- 13. What are the good ergonomic practices in software design?
 - (1) Fixed font size
 - (2) Appropriate system messages to users
 - (3) Consistent user interface
 - A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

14. The following segment of a flowchart is used to represent a task in a cinema ticket booking system. What is the task?



- A. Print a ticket
- B. Calculate a ticket price
- C. Display a 'welcome' message
- D. Validate the number of tickets entered
- 15. The problem-solving procedures for developing a computer system are listed below. What is the correct order of the procedures?
 - (1) Test the system
 - (2) Define the problem
 - (3) Design the algorithm
 - (4) Write the program codes
 - A. $(2) \rightarrow (4) \rightarrow (3) \rightarrow (1)$
 - B. $(2) \rightarrow (3) \rightarrow (4) \rightarrow (1)$
 - C. $(3) \rightarrow (2) \rightarrow (4) \rightarrow (1)$
 - D. $(1) \rightarrow (4) \rightarrow (2) \rightarrow (3)$
- 16. What is the output of the following algorithm?

```
K ← 0
For N from 1 to 3
    K ← K + N × N
Output K
3
9
```

B. 9

A.

- C. 14
- D. 30

17. Study the following statement:

If NOT (X > 30 OR (Y AND Z))
Then output `***'

For which of the following combinations of the values X, Y and Z will '***'be displayed?

	Х	Y	Z
A.	20	TRUE	TRUE
B.	30	FALSE	FALSE
C.	40	FALSE	FALSE
D.	50	FALSE	TRUE

18. A is an array with A[1], A[2], ..., A[N] storing N non-zero values. What is the purpose of the following algorithm?

Input P $K \leftarrow P$ While K <= N-1 do $A[K] \leftarrow A[K+1]$ $K \leftarrow K+1$ N \leftarrow N-1

- A. Remove the P-th value in A
- B. Increase the value of P by 1
- C. Swap the values of A[K] and A[K+1] for $K \le N-1$
- D. Calculate the sum of the values in A
- 19. NUM is an integer array. What is the output of the following algorithm?

```
K ← 0
While K <= 100 do
NUM[K] ← K × K
K ← K+1
Output (NUM[3] + NUM[4])
A. 7
B. 25
C. 49
D. 100</pre>
```

Input	Process	Output
N1 N2 N3	AVE = $(N1 + N2 + N3) / 3$ Start Input N1, N2, N3 AVE = $(N1+N2+N3)/3$ Output AVE End	AVE

20. Study the problem shown in the Input-Process-Output (IPO) cycle below.

Which of the following statements is **not** correct?

- A. The IPO cycle illustrates the data type and data structure.
- B. The problem shown is to find the average of three numbers.
- C. The IPO cycle illustrates a solution to the problem.
- D. The control structure of the flowchart shown in the 'Process' is a sequence.

Section B – Structured Questions (60 marks)

1. Peter designs a program using an algorithm with an array A, as shown below:

 $N \leftarrow 6$ For I from 1 to N do $A[I] \leftarrow 1 - A[I]$

(a) (i) Suppose that the initial content of A is:

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	1	1	0	0

What is the content of A after executing the algorithm?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(4 marks)

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
1	0	1	0	1	0

(ii) Suppose that the content of A after executing the algorithm is:

What is the initial content of A?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(2 marks)

Peter modifies the algorithm below:

$$N \leftarrow 6$$

$$K \leftarrow 2$$
For I from 1 to N do
If K = 1 then
$$A[I] \leftarrow 1 - A[I]$$
If A[I] = 1 then
$$K \leftarrow 1$$

(b) (i) Suppose that the initial content of A is:

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	1	1	0	0

(1) What is the content of A after executing the algorithm once?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(4 marks)

(2) What is the content of A after executing the algorithm once again?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(2 marks)

(ii) Suppose that the content of A after executing the algorithm is:

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
1	0	1	0	1	0

What is the initial content of A?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	1	0			

(4 marks)

(iii) Write down the initial content of A such that the content remains unchanged after executing the algorithm.

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	0			

(2 marks)

- (c) Peter will execute the program millions of times with $N \ge 64$ on his desktop computer and wants to improve the performance of the program execution significantly.
 - (i) Increasing the size of RAM does not help. Why?

(ii) Suggest a hardware component that should be upgraded.

(1 mark)

2. Mary designs an algorithm of a number guessing game as follows:

```
N ← 100
ANSWER ← a random integer between 1 and N inclusive
do
    Input an integer into GUESS
    If (GUESS < 1) or (GUESS > N) then
        output "Out of range!"
    else if (GUESS <> ANSWER) then
        output "Try again!"
until (GUESS = ANSWER)
output "You win!"
```

(a) Suppose the value of ANSWER is 19. Suggest an input value to test the algorithm for each output.

Input	Output
	Out of range!
	Try again!
	You win!

(6 marks)

- (b) Mary plans to make two modifications to the algorithm:
 - If GUESS is smaller than ANSWER, display "Too small!" and 1. if GUESS is larger than ANSWER, display "Too large!";
 - Allow users to guess at most 5 times. 2.
 - Complete the algorithm below showing the modifications. (i)

Line number Content

1	к 🗲 О
2	N 🗲 100
3	ANSWER \leftarrow a random integer between 1 and N
	inclusive
4	Do
5	Input an integer into GUESS
6	If (GUESS < 1) or (GUESS > N) then
7	output "Out of range!"
8	else if () then
9	output "Too small!"
10	else if () then
11	output "Too large!"
12	к 🗲
13	until (GUESS=ANSWER) or ()
14	If (GUESS=ANSWER) then
15	output "You win!"
	(8 marks)
Line 14 'if (GUESS=ANSWER) then' is omitted, the output of	

(ii) If the algorithm may be wrong. Why?

(2 marks)

- 3. A railway company develops a computer system that installs kiosks with touch screen display panels at stations.
 - (a) The kiosks should display the following train information on the display panels and help passengers look for the arrival times and platform numbers of trains
 - Train numbers, such as 3338 and 0910
 - Destinations, such as Shenzhen and Tianjin
 - Arrival time, such as 14:30 and 08:00
 - Platform numbers, such as 3 and 12

Design an interactive layout for the kiosks with annotations.

- (b) The data in the kiosks are stored in Electrically Erasable Programmable Read Only Memory (EEPROM), which is a form of flash memory.
 - (i) Give one difference between flash memory and RAM.
 - (ii) Give one difference between flash memory and ROM.

(4 marks)

On a certain route, there are 10 stations, A to J. The estimated travel time (hours) between any two adjacent stations is shown below. For example, the estimated travel time from station A to station B is 2 hours.



(c) What is the estimated travel time from station D to station G?

(2 marks)

In the computer system, the array W with W[1], W[2], ..., W[9] is used to store the 9 estimated travel times respectively. That is W[1]=2, W[2]=5, and so on.

(d) Complete the following algorithm to generate the estimated travel times from station A to station J.



(8 marks)

(e) What is the major advantage of using the variables X and Y instead of constant values in the loop?

(4 marks)

END OF PAPER