0000051

2005.5 PhilNITS

Fundamental IT Engineer Examination (Morning)

Questions must be answered in accordance with the following:

Question Nos.	Q1—Q80
Question Selection	All questions are compulsory
Examination Time	9:30-12:00 (150 minutes)

Instructions:

1. Use an HB pencil. If you need to change an answer, erase your previous answer completely and neatly. Wipe away any eraser debris.
2. Mark your examinee information and test answers in accordance with the instructions below. Your test will not be graded if you do not mark properly. Do not mark or write on the answer sheet outside of the prescribed places.

(1) **Examinee Number**

Write your examinee number in the space provided, and mark the appropriate space below each digit.

(2) **Date of Birth**

Write your date of birth (in numbers) exactly as it is printed on your examination admission card, and mark the appropriate space below each digit.

(3) **Answers**

Select one answer (a through d) for each question.

Mark your answers as shown in the following sample question.

[Sample Question]

In which month is the next Fundamental IT Engineer Examination conducted?

a) September b) October c) November d) December

Since the correct answer is "b)" (October), mark your answer sheet as follows:

[Sample Reply]

No.	a	b	c	d
Q 1	○	●	○	○

Do not open the exam booklet until instructed to do so.
Inquiries about the exam questions will not be answered.

Q1. Symbol strings consisting of 0 and 1 only are defined as follows:
Symbol strings whose length is 1: 0, 1
Symbol strings whose length is 2: 00, 01, 10, 11
Symbol strings whose length is 3: 000, 001, 010, 011, 100, 101, 110, 111
Which one of the expressions shown below represents the total number of symbol strings whose lengths are 1 through n?

a) $2 \times (2^n - 1)$ b) 2×2^n c) 2^n d) $2^n - 1$

Q2. In order to multiply a positive integer, expressed in binary, by 32, how many bits should it be shifted to the left? Assume that no overflow will occur.

a) 4 b) 5 c) 6 d) 32

Q3. According to the IEEE754 (1985) standard, a 32-bit floating point number format is expressed as follows:

Sign (1 bit)	Exponent part (8 bits)	Mantissa part (23 bits)

Which of the following hexadecimal values expresses the mask bits used to extract the E(Exponent part)? Here, "mask bits" refers to a bit pattern used to extract required information by performing a AND operation for each bit.

a) 0FF00000 b) 7F800000 c) FF00000 d) FF800000

Q4. From the answer groups below, select the correct answers to insert in the blank [ ] in the above text.
[ ] times more bit patterns can be expressed in 32 bits, as opposed to 24 bits.

a) 8 b) 16 c) 128 d) 256

Q5. Which of the following is decimal numbers can be expressed without error as a binary floating-point number?

a) 0.2 b) 0.3 c) 0.4 d) 0.5

Q6. From the logical expressions shown below, select the one that is equal to $X \cdot \overline{Y} + \overline{X} \cdot Y$. "$\cdot$" is AND, "$+$" is OR, and $\overline{X}$ is the negation of X.

a) $(X+Y) \cdot (\overline{X}+Y)$
b) $(X+Y) \cdot (X+\overline{Y})$
c) $(X+Y) \cdot (\overline{X}+\overline{Y})$
d) $(X+\overline{Y}) \cdot (\overline{X}+Y)$

Q7. The following is the algorithm that, when a bit string is given, the rightmost 1 is left as it is and all other digits are changed to 0's. For example, when 00101000 is given, this algorithm turns this bit string to 00001000. In executing this algorithm, what must be executed in Step 3 shown below?

Step 1: A given bit string "A" is considered to be a binary number, and 1 is subtracted from "A" and the result of this subtraction is assigned to "B."

Step 2: Exclusive OR (EOR) of "A" and "B" is calculated and the result is assigned to "C."

Step 3: [ ]

a) Exclusive OR (EOR) of "A" and "C" is calculated.
b) Negative AND (NAND) of "A" and "C" is calculated.
c) AND of "A" and "C" is calculated.
d) OR of "A" and "C" is calculated.

Q8. n data items, in ascending order, are stored in an array. What is the approximate number of comparison required to reach a given value by means of a binary search method?

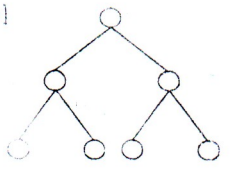
a) $\log_2 n$
b) $(\log_2 n + 1) / 2$
c) n
d) n^2

Q9. When a recursive procedure is executed, which one of the data structures shown below is the most suitable for storing necessary data?

a) Tree
b) Queue
c) Graph
d) Stack

Q10. There is a complete binary tree that has all the leaves. Which one of the relational expressions holds for the complete binary tree? The n is the number of nodes and k ($k \geq 1$) is the number of hierarchical levels from the root to the leaves. The number (k) of hierarchical levels of the example is 3.

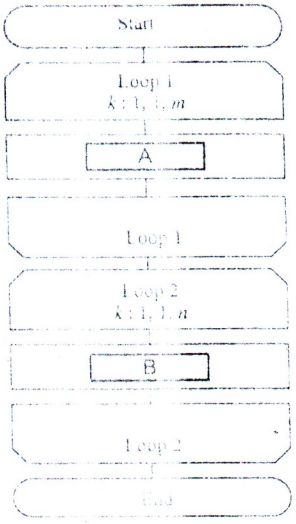
[Example]



$k = 3$

a) $n = k(k-1)+1$
b) $n = k(k-2)+3$
c) $n = 2^k - 1$
d) $n = 2^k + 1$

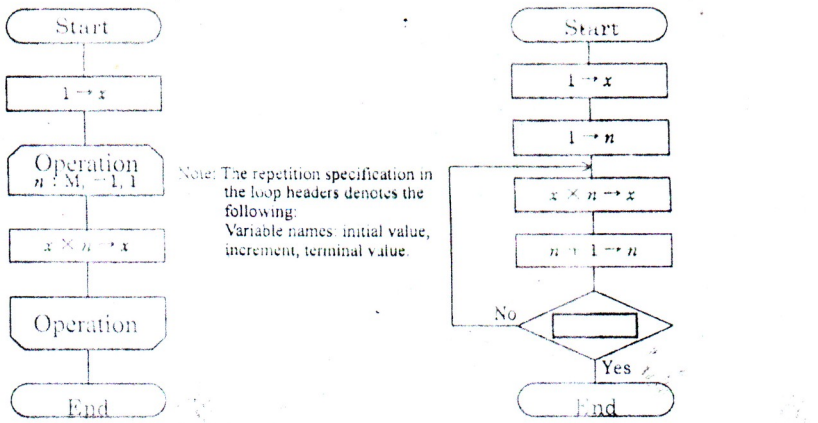
Q11. Arrays X and Y store character strings of lengths m and n. The figure below is a flow chart expressing an algorithm in which a character string, obtained by concatenating the character string of length n after the character string of length m, is stored in array Z. Which processes are the correct ones to insert into [A] and [B] in the figure? In this example, it is assumed that a single character is stored in a single array element.



Note: The repetition specification in the loop headers denotes the following:
Variable names: initial value, increment, terminal value.

	A	B
a)	$X(k) \rightarrow Z(k)$	$Y(k) \rightarrow Z(m+k)$
b)	$X(k) \rightarrow Z(k)$	$Y(k) \rightarrow Z(n+k)$
c)	$Y(k) \rightarrow Z(k)$	$X(k) \rightarrow Z(m+k)$
d)	$Y(k) \rightarrow Z(k)$	$X(k) \rightarrow Z(n+k)$

Q12. What condition needs to be inserted in the box below so that the same value x can be obtained when each of the algorithms described in the two flowcharts below are performed on a positive integer M?



a) $n > M$ b) $n > M + 1$ c) $n > M - 1$ d) $n < M$

Q13. What can be deducted from the decision table below showing pass/fail criteria for a test? The test here consists of three subjects – Human resources management, Accounting, and English, each with 100 points as the maximum score.

years of work experience >= 5	Y	Y	Y	N
Total score in 3 subjects >= 260	Y	Y	N	-
Score in English >= 90	Y	N	-	-
Pass	X	-	-	-
Tentative pass	-	X	-	-
Fail	-	-	X	X

a) Persons who have scored 90 or more points in English are considered to have passed or tentatively passed.

b) Persons who have scored less than 90 points in English are considered to have failed.

c) Persons with work experience of 5 or more years are considered to have passed or tentatively passed.

d) Persons who have scored less than 60 points in Accounting are considered to have failed.