April, 2007

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 a 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?
   Answer group

   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. Which of the following is the correct decimal fraction equal to hexadecimal fraction 0.248?

a) $\frac{31}{32}$ b) $\frac{31}{125}$ c) $\frac{31}{512}$ d) $\frac{73}{512}$

Q2. Which of the following is the correct value of the quadruple of hexadecimal fraction 0.FEDC?

a) 1.FDB8 b) 2.FB78 c) 3.FB70 d) F.EDC0

Q3. In a floating-point number format, which of the following is the correct operation for adjusting the radix point and the exponent so that the most significant digit of the mantissa can be a non-zero value? Here, an absolute value is used for the mantissa.

a) Carry b) Normalize c) Round down d) Round up

Q4. The decimal value "-72" is stored in an 8-bit register using 2's complement. If the data in the register is logically shifted two bits to the right, which of the following is the correct result that is represented in decimal?

a) -19 b) -18 c) 45 d) 46

Q5. By definition of the IEEE754 standard, 32-bit floating point numbers are represented as follows:

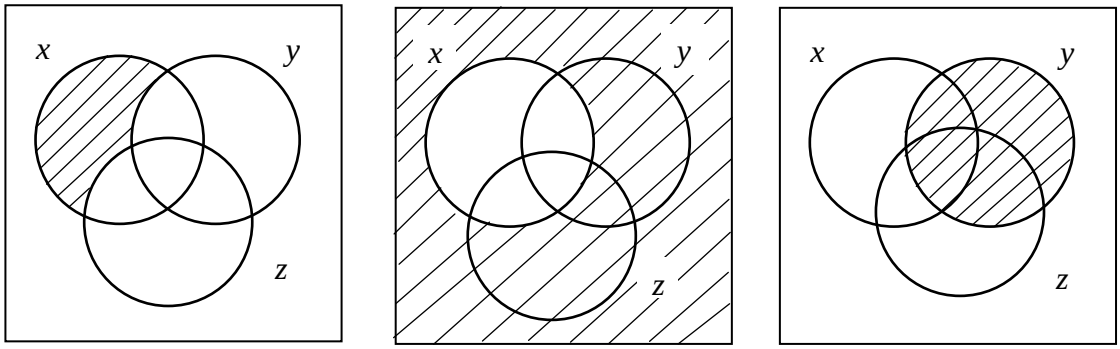
S (1 bit)	E (8 bits)	M (23 bits)

S: Sign bit
E: Exponent
M: Mantissa

Which of the following is the correct "mask bits" in hexadecimal to be used for extracting only the exponent part of the above format? Here, "mask bits" means a bit pattern which is logically ANDed with the 32-bit floating point value.

a) 107FFFFF b) 7F800000 c) FF100000 d) FF800000

Q6. In the Venn Diagrams labeled 1 to 3, which of the following is the result of Boolean "OR" operations for all three to be combined? Here, "$\bullet$" is used for "logical AND," "+" for "logical OR," and "$\overline{A}$" for the "logical NOT" of *A*. Each set corresponding to *x*, *y*, or *z* is depicted by a circle



1 2 3

a) $x \bullet y \bullet \overline{z} + \overline{x} + \overline{y}$ b) $x \bullet \overline{y} \bullet \overline{z} + x + y$

c) $x \bullet \overline{y} \bullet \overline{z} + \overline{x} + y$ d) $x \bullet \overline{y} \bullet \overline{z} + x + \overline{y}$

Q7. When you flip a coin four times, what is the probability that it will come up heads exactly twice?

a) 0.2 b) 0.375 c) 0.5 d) 0.625

Q8. There are two important operations on a stack: PUSH and POP. PUSH adds the new data to the top of the stack leaving previous data below, and POP removes and returns the current top data of the stack. When the operations shown below are sequentially executed, which of the following is the correct combination of the values *x* and *y*?
Here, the size of the stack is big enough to hold the entire data. "PUSH(*a*)" inserts the data *a* into the stack, and "POP(*b*)" removes the data *b* from the stack.

[Operations]
PUSH (5);
PUSH (3);
PUSH (6);
PUSH (1);
x = POP ( );
PUSH (7);
y = POP ( );

	x	*y*
a)	1	6
b)	1	7
c)	5	3
d)	5	7

Q9. Reverse Polish Notation (RPN) is used to represent arithmetic expressions without using brackets to define priorities for evaluation of operators. For example, `3×(a+b)` becomes `3ab+×` in RPN. Which of the following is the best data structure that should be used for implementation of RPN in a computer?

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

Q10. Which of the following is an appropriate description concerning the list and/or array structures?

a) The list structure allows any data to be inserted or deleted simply by modifying pointers. But, after the data was deleted, the cells that contained the data remain as garbage in memory.
b) The list structure is similar to the array structure in that all data elements of the same type are sequentially lined up. In the list structure, the logical arrangement is the same as the physical arrangement.
c) The number of operations is fixed in inserting or deleting an element in an array; it does not depend on the position of the element in the array.
d) Using a subscript for each element in an array, quick access to any element can be achieved. The array structure allows any data to be inserted or deleted simply by modifying pointers.

Q11. The table below shows a state transition table that checks the input character string. This check starts from the initial state *A*, and it fails if the state changes to *E* during the input of the character string. Which of the character strings in the answer group fails this check? Here, the symbol Δ in the answer group represents a space.

		Input character				
		Space	Numeric	Sign	Radix point	Other
Current state	*A*	*A*	*B*	*C*	*D*	*E*
	B	*A*	*B*	*E*	*D*	*E*
	C	*E*	*B*	*E*	*D*	*E*
	D	*A*	*E*	*E*	*E*	*E*

a) +0010 b) -1 c) 12.2 d) 9.Δ

Q12. There are two jugs; one is a 4-liter (4L) jug and the other is a 3-liter (3L) jug. Which of the following is the correct sequence to obtain exactly 2 liters of water in the 4L jug under the conditions shown below? Here, (x, y) indicates that the 4L jug contains x liters of water and the 3L jug has y liters of water.

[Conditions]

You can use only the 3L and 4L jugs.
You are allowed to fill up or empty either jug.
You are allowed to pour water from one jug to the other.
The jugs have no scale marks.
There is an ample supply of water.

a) $(0,0) \rightarrow (0,3) \rightarrow (3,0) \rightarrow (0,3) \rightarrow (4,2) \rightarrow (0,2) \rightarrow (2,0)$
b) $(0,0) \rightarrow (0,3) \rightarrow (3,0) \rightarrow (3,3) \rightarrow (4,2) \rightarrow (0,2) \rightarrow (2,0)$
c) $(0,0) \rightarrow (0,3) \rightarrow (3,3) \rightarrow (3,0) \rightarrow (4,2) \rightarrow (0,2) \rightarrow (2,0)$
d) $(0,0) \rightarrow (3,0) \rightarrow (0,3) \rightarrow (3,3) \rightarrow (0,2) \rightarrow (4,2) \rightarrow (2,0)$

Q13. Which of the following is the correct result produced by executing the program shown below? Here, the parameter "x" is called by value, and the parameter "y" is called by reference.

```
Main Program
a = 2;
b = 3;
sub(b, a);
```

```
Subprogram sub(x, y)
x = x + y;
y = x + y;
return;
```

a) $a = 2, b = 3$
b) $a = 2, b = 5$
c) $a = 7, b = 3$
d) $a = 7, b = 5$

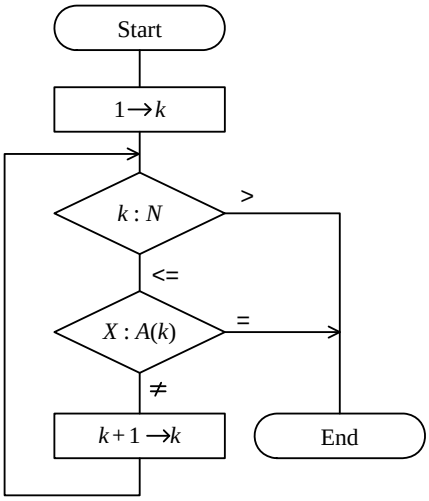
Q14. The "prime number division remainder" method is a well-known hashing algorithm. In this method, a key value is divided by a number *N*, and the remainder which is also called a hash value is used directly as an index into the hash table. *N* is the largest prime number less than or equal to the size of the available addressable spaces. When the 20 addressable spaces are available, which of the following is the correct hash value calculated from the key value 136? Here, a prime number is one that cannot be divided evenly by any other number except one (1). 2, 3, 5, 7, 11, and 13 are the first few prime numbers.

a) 0 b) 1 c) 3 d) 16

Q15. In a certain computer, a bubble sort of an array of 200 data elements takes the same time as a quick sort of the array. In case of an array of 40,000 data elements, how many times faster is a quick sort than a bubble sort? Here, a bubble sort and a quick sort take time proportional to n^2 and $n \times \log_2 n$ respectively, and "n" is the number of data elements.

a) 10 b) 50 c) 100 d) 200

Q16. Integers are stored in the 1st to *N*-th elements of an array *A* (*N* >1). The flowchart below shows the process to check which element of the array contains the same value as *X*. Which of the following correctly describes the execution result of this process?

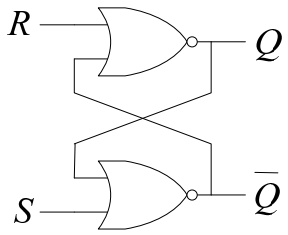


a) If the same value as *X* exists in two places of the array, the 1st and *N*-th elements, *k* is set to 1.
b) If the same value as *X* exists in two places of the array, the 1st and *N*-th elements, *k* is set to *N*.
c) If the same value as *X* is not in the array, *k* is set to 1.
d) If the same value as *X* is not in the array, *k* is set to *N*.

Q17. Which of the following is a re-writable, erasable memory, using electrical signals, which is widely used for various devices such as digital cameras and digital music players and can maintain the data even after the power is turned off?

a) DRAM
b) Flash memory
c) Mask ROM
d) SRAM

Q18. The figure shows an RS flip-flop using two NOR gates. Which of the following is the correct truth table for the flip-flop? Here, "unchanged" shown in the table means the outputs maintain a previous state, and "unstable" means the outputs are in an unstable state.



a)

Inputs		Outputs	
S	R	Q	$\overline{Q}$
0	0	unchanged	
0	1	0	1
1	0	1	0
1	1	unstable	

b)

Inputs		Outputs	
S	R	Q	$\overline{Q}$
0	0	unchanged	
0	1	1	0
1	0	0	1
1	1	unstable	

c)

Inputs		Outputs	
S	R	Q	$\overline{Q}$
0	0	unstable	
0	1	0	1
1	0	1	0
1	1	unchanged	

d)

Inputs		Outputs	
S	R	Q	$\overline{Q}$
0	0	unstable	
0	1	1	0
1	0	0	1
1	1	unchanged	

Q19. Which of the following is the correct combination of various addressing modes? Here, X_1 is an address which is stored in a program counter. X_2 is an address part of an instruction which is addressed by X_1. X_3 is an address in which an operand needed to execute an instruction is stored. X_4 is a value in an index register. (X_2) means the contents of location X_2.

Addressing mode	Direct	Indirect	PC (Program Counter)-relative	Indexed
a)	$X_3 = X_2$	$X_3 = X_2+X_4$	$X_3 = (X_2)$	$X_3 = X_1+X_2$
b)	$X_3 = X_2$	$X_3 = (X_2)$	$X_3 = X_1+X_2$	$X_3 = X_2+X_4$
c)	$X_3 = X_2$	$X_3 = (X_2)$	$X_3 = X_2+X_4$	$X_3 = X_1+X_2$
d)	$X_3 = (X_2)$	$X_3 = X_2$	$X_3 = X_1+X_2$	$X_3 = X_2+X_4$

Q20. A computer is designed to enable pipeline control so that each instruction can be completed in five cycles. How many cycles are needed to execute 20 instructions? Here, all instructions can be executed without being stopped halfway.

a) 20 b) 21 c) 24 d) 25

Q21. Which of the following is an appropriate statement in regard to interrupts?

a) Applications must constantly detect the occurrence of interrupts.
b) A priority is individually assigned to the cause of an interrupt in preparation for the occurrence of multiple interrupts.
c) The operation completion notice from an I/O device is classified as an internal interrupt.
d) When the CPU accepts an interrupt, it stops the program currently being executed and stores the information needed to restart the program in the designated area of the hard disk.

Q22. Which of the following is an appropriate description concerning cache memory?

a) Cache memory is used to compensate the difference in capacity between real storage and virtual storage.
b) If a cache miss occurs in access to main memory, an interrupt occurs and data is transferred from main memory to cache memory by the program.
c) In one method, when executing a write instruction, data is written to both cache memory and main memory. In the other method, data is written only to a block in cache, and the modified block is written back into main memory only when it is replaced.
d) The need for cache memory is diminishing these days because of the significant improvement in access speeds of semiconductor memory.

Q23. There are two systems A and B whose access times of cache and main memory are shown in the table. When a certain program runs on these systems, the cache hit ratio and the effective access time are the same on both systems. What is the cache hit ratio in this case?

Unit: nsec.

	System A	System B
Cache memory	15	10
Main memory	50	70

a) 0.2 b) 0.3 c) 0.5 d) 0.8

Q24. Which of the following is an appropriate description of memory interleaving?

a) Compensating the difference between the access time of main memory and that of hard disk.
b) Dividing main memory into several banks and speeding up access to sequential addresses in memory.
c) Updating cache and main memory simultaneously.
d) Writing data not needed in cache to main memory when fetching new data to cache memory.

Q25. There is a hard disk drive with specifications shown below. When a record of 15 Kbytes is processed, which of the following is the average access time in milliseconds? Here, the record is stored in one track.

[Specifications]

Capacity:	25 Kbytes/track
Rotation speed:	2,400 revolutions/minute
Average seek time:	10 milliseconds

a) 22.5 b) 37.5 c) 40.0 d) 50.0

Q26. The sequence of virtual page numbers shown below is encountered in the course of execution of programs on a computer with virtual memory.

[Sequence of virtual page numbers]

3 4 2 6 4 7 1 3 2 6 3 5 1 2 3

In the computer, the LRU page replacement policy is adopted. Main memory has a capacity of 5 pages for programs, and each page is initially empty. What is the page hit ratio (percentage of times that the referenced page is found in main memory) rounded to the nearest integer value?

a) 20 b) 33 c) 50 d) 67

Q27. What is an advantage of DVD-RAM in comparison with DVD-RW and DVD+RW?

a) Higher access speed
b) Higher capacity
c) More durable rewritable disc
d) Support of dual-layer DVD format

Q28. Which of the following is the appropriate combination of 4 color inks or toners for a full-color printer?

a) Aqua, Orange, Brown, and Black
b) Cyan, Magenta, Yellow, and Black
c) Red, Green, Blue, and Black
d) Red, Green, Blue, and Gray

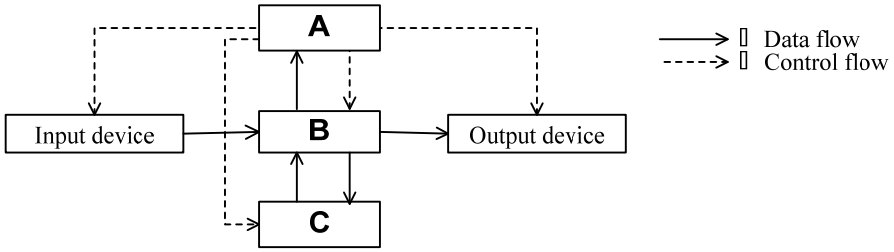
Q29. Which of the following is the most appropriate index indicating the performance of a laser printer?

a) Number of dots per inch (2.54 cm) and number of pages that can be printed per minute
b) Number of horizontal dots and number of vertical dots used to print a character and number of characters that can be printed per second
c) Spacing of printed lines and number of lines that can be printed per second
d) Types of characters printed and number of characters that can be printed per second

Q30. Computer font is an element in the user interface. Which of the following is the most appropriate explanation concerning the font?

a) A set of characters to be displayed on a computer
b) A set of glyphs and associated information such as code points
c) A set of letters used by a computer as an interface to users
d) A visual representation of generic elements generated from a script

Q31. The figure shows the basic configuration of a computer. Which of the following is the correct combination of A, B, and C to be inserted in the figure?



	A	B	C
a)	ALU	Memory	Control unit
b)	Control unit	ALU	Memory
c)	Control unit	Memory	ALU
d)	Memory	Control unit	ALU

Q32. Which of the following is an input device classified as a pointing device and can be used for graphical input in a CAD system?

a) Image scanner b) OCR c) OMR d) Tablet

Q33. Which of the following is a display, with low-voltage operation and low-power consumption, which does not need backlighting because it emits light when voltage is applied?

a) CRT b) OLED c) PDP d) TFT LCD

Q34. Which of the following is an appropriate description concerning the role of a shell in an OS?

a) It allows mouse operations, instead of keyboard operations, such as selecting commands from menus and selecting items on setup screens in an application.
b) It holds reference information for frequently used files and directories so that users can use these items even if they do not know the actual paths.
c) It interprets the commands entered by the user and instructs the OS to execute the corresponding functions.
d) It performs efficient security management and mutual exclusion (exclusive control) when multiple users simultaneously access common resources.

Q35. Which of the following terms refers to the function that adjusts all address dependent locations within a program to correspond to the load position when the program is loaded into main memory prior to its execution?

a) Optimization b) Recompilation c) Reloading d) Relocation

Q36. The table shows the priorities of five tasks A to E. When each task is independently executed, the processing sequences and times associated with CPU and I/O devices are also shown in the table. Which of the tasks B to E should be combined together with task A assigned a "high" priority so that there may be no idle time of CPU from starting of execution of the combined tasks to ending of both tasks? Here, I/O operations never conflict with each other, and any overhead involved in the OS can be ignored. The number in parentheses denotes each processing time.

	Task	Priority	Processing sequence and time (in milliseconds) during independent execution
	A	High	CPU (3) → I/O (3) → CPU (3) → I/O (3) → CPU (2)
a)	B	Low	CPU (2) → I/O (5) → CPU (2) → I/O (2) → CPU (3)
b)	C	Low	CPU (3) → I/O (2) → CPU (2) → I/O (3) → CPU (2)
c)	D	Low	CPU (3) → I/O (2) → CPU (3) → I/O (1) → CPU (4)
d)	E	Low	CPU (3) → I/O (4) → CPU (2) → I/O (5) → CPU (2)

Q37. In a search system, when search was first performed under condition A, there were 5,000 search results. When further narrowed down with condition B, 30% of these search results remained. If search first performed under condition B produces 10,000 search results, what percentage will remain when these are further narrowed down with condition A?

a) 15 b) 30 c) 35 d) 60

Q38. Which of the following functions can reduce the network load by placing a frequently-used instruction set on the server in advance, when accessing a database in a client/server system?

a) Group commitment function
b) Multi-thread function of server process
c) Stored procedure function
d) Two-phase commitment function

Q39. Which of the following is a system where one computer is in standby mode when the other computer is functioning normally?

a) Dual system b) Duplex system
c) Load sharing system d) Multiprocessing system

Q40. There is a CPU whose clock cycle time is 0.01 microsecond. The table below shows a program's instruction mix executed on the CPU. What is the approximate MIPS value for the processor?

Type of instruction	Number of clock cycles required for instruction execution	Frequency of occurrence
Data transfer instructions	5	70%
Calculation instructions	10	15%
Decision instructions	5	10%
Jump instruction	1	5%
Total		100%

a) 4.76 b) 10.30 c) 18.02 d) 20.70

Q41. Which of the following is an appropriate statement with regard to system performance evaluation, when selecting a new computer system?

a) Evaluation can be performed in an environment close to actual use by creating a relatively simple and easy-to-understand program for test purposes, repeatedly running this program as necessary, and measuring the performance.
b) Evaluation can be performed with high accuracy by using a test program that is relatively unaffected by differences in memory capacity and I/O device configuration.
c) Performance should be measured in as simple environment as possible. The data required for evaluation can be obtained by running many programs with multiplicity 1.
d) The data required for evaluation can be acquired by running programs which are frequently used or time critical.

Q42. A company uses 1,000 PCs. The mean failure in 20 days is to be restricted to 2 PCs. How many hours of MTBF are at least required for these PCs? Here, the mean usage time of the PCs is assumed to be 8 hours per day.

a) 8,000 b) 20,000 c) 80,000 d) 160,000

Q43. Which of the following statements concerning programming languages appropriately describes Java?

a) It enables the creation of applets and other programs that run in web browsers. The applets can be run on any environment where virtual machines are implemented.
b) It incorporates object-oriented concepts of class and inheritance into C and has upper compatibility with C.
c) It is a markup language used on the Web and describes the document structure using tags. It enables the creation of hypertext that links text, movies, etc.
d) It is an interpreter-type, object-oriented language developed in the 1970's and includes editor, debugger, and other integrated development environment as well as OS functions.

Q44. There are two methods to execute byte-code programs written in Java. In the first method, an interpreter is used to execute byte-code. In the second method, native code generated by a compiler is executed. In the second method, how many lines of byte-code are at least required, in order to achieve shorter processing time (including compiling time) than the first method, under the conditions below?

[Conditions]

(1) The execution time is proportional to the number of lines in the program.
(2) If a program consisting of 100 lines of byte-code is executed using an interpreter, it takes 0.2 seconds. If the same program is executed after compiling, it takes 0.003 seconds.
(3) It takes 0.1 seconds to compile 100 lines.
(4) In case of the method using a compiler, an overhead of 0.15 seconds is always required for file input/output, compiler startup, and so on, regardless of the number of lines in the program.
(5) Other miscellaneous time such as time for downloading the program file may be ignored.

a) 50 b) 75 c) 125 d) 155

Q45. Which of the following is an appropriate description concerning a tracer that is used as a debugging tool?

a) It outputs history information such as execution sequences and execution results of program instructions.
b) It outputs the contents of a specified memory each time a specific instruction in a program is executed.
c) It outputs the contents of magnetic tape files and hard disk files.
d) It outputs the contents of the relevant memory when an error occurs during the execution of a program.

Q46. Which of the following is an appropriate description in regard to a waterfall model?

a) System development proceeds in the order of process flow, so going back upstream results in a significant loss of efficiency.
b) Systems are developed in a short time by involving users, performing development in small groups and utilizing development tools.
c) The design and implementation of an application is performed for a unit of component, and then this process is repeated successively for every component.
d) Working prototypes are created to verify and evaluate requirements specifications at an early stage.

Q47. Which of the following is an appropriate description concerning object-oriented design?

a) A class always has at least one instance.
b) A class can inherit attributes and methods from its base class.
c) An object is a template for a class.
d) Encapsulation refers to the creation of a library of classes.

Q48. Which of the following is a UML diagram that can be used to describe interactions among a number of objects in terms of an exchange of messages?

a) Activity diagram
b) Class diagram
c) Sequence diagram
d) Use case diagram

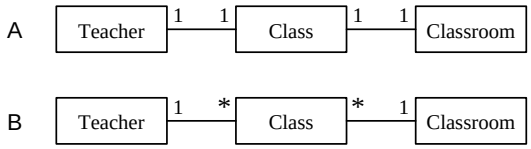
Q49. A systems design is represented using several diagrams. When a system analyst wants to confirm the design information such as the relationships among functions and the interface among modules in a hierarchical manner, which of the following is the most appropriate diagram that should be inspected by the analyst?

a) Data flow diagram
b) Entity-relationship diagram
c) State transition diagram
d) Structured chart

Q50. In the module design of software, which of the following is the appropriate technique for improving reliability and maintainability?

a) Module cohesion is increased, and module coupling is strengthened.
b) Module cohesion is increased, and module coupling is weakened.
c) Module cohesion is reduced, and module coupling is strengthened.
d) Module cohesion is reduced, and module coupling is weakened.

Q51. The entity-relationship diagrams A and B shows the relationships between three entities in a school: teacher, class, and classroom. Which of the following is an appropriate interpretation concerning the diagrams? Here, "$\frac{1 \quad 1}{}$" shows a one-to-one relationship while "$\frac{1 \quad *}{}$" shows a one-to-many relationship.



a) In A, a teacher is responsible for one class only. In B, a teacher may be responsible for one or more classes.
b) In A, one class is always assigned to the same classroom. In B, one class may be assigned to one or more classrooms.
c) In A, one class is always supervised by one teacher. In B, one class may be supervised by one or more teachers.
d) In A, when a teacher or a classroom is decided, a single class will be decided. In B, if a teacher and a classroom are decided, a single class will be decided.

Q52. Which of the following is an appropriate statement in regard to a module unit test?

a) Generally, test cases are created and executed by dedicated testing staff, not programmers who have done the coding.
b) The module design documents have already been verified. If a problem is found in the test results, an error exists in the test case or the module.
c) The module interface falls outside the scope of the unit test because the module interface cannot be tested using a single module.
d) Verification should be performed, in principle, using test cases which cover all the logic paths at least once while reviewing the module design documents.

Q53. Which of the following is an appropriate statement in regard to program testing?

a) In the program testing, it is necessary to check not only whether the program works as intended but also whether there are any unintended operations.
b) The black box method is used for the test of internal structure, and the white box method is used for the test of external specifications.
c) The number of errors remaining in a program is unrelated to the number of errors already found.
d) The objective of program testing is to verify its completeness, and the test should be planned under the assumption that all errors can be detected.

Q54. Which of the following software test methods is performed to verify whether changes made for software maintenance are not affecting other portions of the software?

a) Integration test
b) Operation test
c) Regression test
d) System test

Q55. A check digit for a 4-digit number $X_1X_2X_3X_4$ can be calculated as follows:

$$\mathrm{mod}((X_1\times 4+X_2\times 3+X_3\times 2+X_4\times 1), 10)$$

When the check digit for the 4-digit number "$7X_242$" is equal to 6, which of the following is the correct number to be put in X_2? Here, mod (a,b) returns the remainder after "*a*" is divided by "*b*."

a) 5 b) 6 c) 7 d) 8

Q56. An implementation plan for a system development project was drawn up, and the critical path was determined. Which of the following tasks can be identified by the critical path?

a) Tasks directly connected with the delay of the entire project
b) Tasks entailing the highest cost
c) Tasks in which the greatest care should be exercised in terms of system quality
d) Tasks where the execution sequence can be changed

Q57. From multiple types of slips, data in items specified for each type is inputted. Which of the following is the appropriate initial process to be executed in the program to confirm that all the required data is inputted?

a) A comparison is made between the number of items specified for each slip type and the number of items inputted.
b) Inputted data is checked against master files to confirm that the contents of inputted items are correct.
c) It is confirmed that the contents of inputted items are in agreement with the data formats specified for the slip type.
d) The slip type code is used to inspect the data formats of inputted items.

Q58. When the system development division and the operations division are separately organized, which of the following is an appropriate method for ensuring that the transition from development to operation proceeds smoothly and efficiently?

a) After completion of the operation test, the development division explains the system specifications and operation methods to the operations division.
b) In order to improve the efficiency of the operation test, the operation test should be performed only by the operations division without the participation or assistance of the development division.
c) The development division conducts the operation test, prepares the operation manual, and then hands over the system to the operations division.
d) The operations division participates actively in system development to provide assistance from the viewpoint of operability.

Q59. Which of the following is an appropriate statement in regard to operation of a distributed system?

a) A dedicated administrator is assigned in the same manner as in a centralized system to manage common resources such as databases.
b) An administrator is not assigned at each site; instead, the users involved in operation are thoroughly educated, and operation is left to the users.
c) The extent of user responsibilities is made clear, and each user is able to manage the network configuration.
d) The information resources are distributed, so a malicious network intrusion is not likely to happen, and the workload of security management is relatively low.

Q60. In the OSI 7-layer model, which of the following layers converts data from the upper layer into many tiny pieces called segments for transmission across the network?

a) Data Link Layer
b) Network Layer
c) Physical Layer
d) Transport Layer

Q61. Which of the following is the appropriate protocol that can deliver data from sender to receiver, correctly and in order?

a) IP
b) RARP
c) SNMP
d) TCP

Q62. Which of the following protocols is used in a TCP/IP network to provide a virtual terminal function that enables remote login to a host for remote operation?

a) FTP
b) HTTP
c) SMTP
d) TELNET

Q63. When constructing a network with a TCP/IP environment, IP address management becomes cumbersome and complicated as the number of clients becomes larger. Which of the following protocols is able to increase the efficiency of IP address management by assigning IP addresses dynamically according to requests from clients?

a) DHCP b) HTTP c) LDAP d) SNMP

Q64. Which of the following is an appropriate statement in regard to the transmission operation of nodes connected to a LAN in the CSMA/CD method?

a) Each node checks whether the carrier is busy and can transmit only if the carrier is not busy. When collision is detected, transmission is tried again after a random time has elapsed.
b) Each node is assigned a logical ranking, the transmission privilege is passed on down the nodes in order of this ranking, and only the node that has received this privilege can transmit.
c) Only the node that has been assigned a time slot can transmit.
d) The nodes are connected in a ring, a special frame for controlling transmission privileges is circulated, and only the node that has received this frame can transmit.

Q65. A message consists of 200 characters. If we can transmit 200 messages on average before a 1-bit error occurs, what is the bit error rate of the transmission line? Here, 1 character equals to 2 bytes while 1 byte equals to 8 bits.

a) 1/640000 b) 1/320000 c) 1/80000 d) 1/64000

Q66. Which of the following appropriately describes a schema in a relational database management system?

a) It is a set of data definitions such as the data properties, format, relationship with other data, etc.
b) It is not an actual table but a virtual table from the perspective of the user.
c) It is the general term for database operations such as data insertion, updating, deletion, search, etc.
d) It is the general term for various conditions and constraints that are used to maintain the database in absolutely perfect condition.

Q67. Which of the following appropriately describes a domain (defined area), a term used for relational databases?

a) It is a relationship derived by applying the relational operations to the basic relationship.
b) It is a set of values that attributes can hold.
c) It is a specification for copying the real world to a database.
d) It is the general term for data insertion, updating, deletion, and search in a database.

Q68. Which of the following operations extracts specific columns from tables in a relational database?

a) Join b) Projection c) Selection d) Union

Q69. When a transaction fails, which of the following should be performed in order to abort it and to rebuild the previous state of the database?

a) Archive b) Checkpoint dump
c) Commit d) Rollback

Q70. There is an OS that can set access privileges to read, update, and create subordinate files in a directory. These three types of access privileges can be set to “enabled” or “disabled” using 1 bit. If these three bits are set by an octal (base-8) number expressed by numerals 0 to 7, which of the following is an appropriate description, taking into account the trial results below?

[Trial results]

(1) When 0 was set, all accesses were disabled.
(2) When 3 was set, read and update were enabled, but create was disabled.
(3) When 7 was set, all accesses were enabled.

a) When 2 is set, read and create are enabled.
b) When 4 is set, only create is enabled.
c) When 5 is set, only update is enabled.
d) When 6 is set, read and update are enabled.

Q71. Which of the following is an appropriate description of the virus pattern file that is used in virus protection measures for computers?

a) It is a file included in virus protection software and is used to repair files that have been infected by viruses.
b) It is a file that records the program code of known viruses and is used to re-enact viruses to monitor their activities.
c) It is a file that records the signature code of known viruses and is used to detect viruses by the virus protection software.
d) It is a restoration file and is used when a data file is damaged by a virus.

Q72. Against what kind of attacks does SSL (Secure Socket Layer) protect users on the Internet?

a) Bruce force attack
b) DoS (Denial of Service) attack
c) IP Spoofing
d) Tapping and exploitation of data

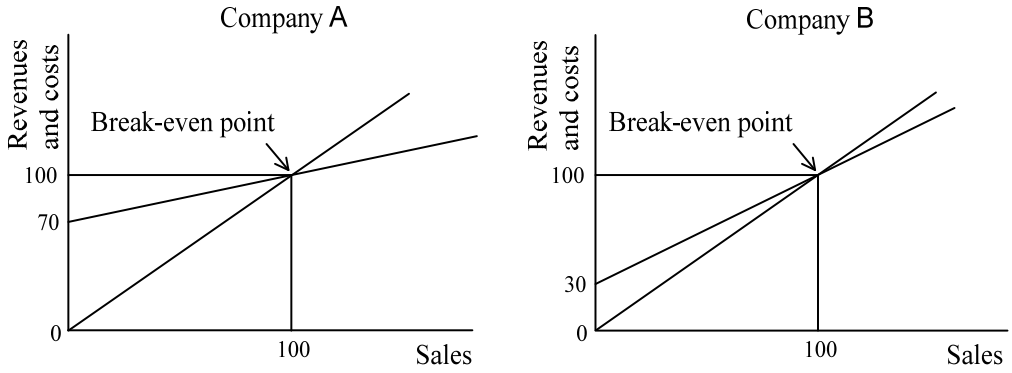
Q73. Which of the following is an appropriate statement regarding elements of information security defined in ISO/IEC 17799:2005?

a) Availability is ensuring that information is accessible only to those authorized to have access.
b) Confidentiality is ensuring that authorized users have access to information and associated assets when required.
c) Information security is characterized as the preservation of confidentiality and integrity of information assets, but not its availability.
d) Integrity is safe-guarding the accuracy and completeness of information and processing methods.

Q74. Which of the following is an appropriate description concerning CRM (Customer Relationship Management)?

a) It is a management technique that vastly improves efficiency throughout the entire supply chain by exchanging all information such as production, inventory, purchasing, sales, and distribution in real time.
b) It is a method for wholesalers and manufacturers to expand their transactions by supporting the business activities of retailers with the aim of increasing retailers' sales and profits.
c) It is a technique for effectively and comprehensively planning and managing business resources throughout an entire company to raise management efficiency.
d) It is an approach for increasing customer satisfaction and ultimately revenues by sharing information and raising the service levels, not only in the sales division but in all customer related channels within a company.

Q75. The figures show the break-even point for two companies A and B. Which of the following is an appropriate statement with regard to the profit/loss analysis of Companies A and B?



a) Both companies have the same break-even point, so their profits and loss are also the same.

b) Both companies have the same break-even point, so when both companies are producing the same profit, their sales are also the same.

c) Company A has low variable costs per unit of product, so when sales exceed the break-even point, Company A's profits are larger than Company B.

d) When sales figures increase for both Company A and Company B, Company B has lower fixed costs, so its profits are larger than Company A.

Q76. Which of the following is an appropriate statement concerning a radar chart?

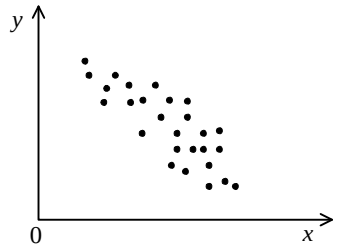
a) A bar graph and a line graph are combined together to graphically show the ratio of the cumulative total of each item to that of all items, thereby indicating important management items.

b) Relations between many causes and a specific effect are systematically represented in a fishbone-like form, thereby clarifying what kinds of causes are associated with a single effect.

c) The degree of attainment of the benchmarking goal is plotted on the radial axis which corresponds to each item. All such plotted points are connected by a line, thereby making a comparison of overall balance.

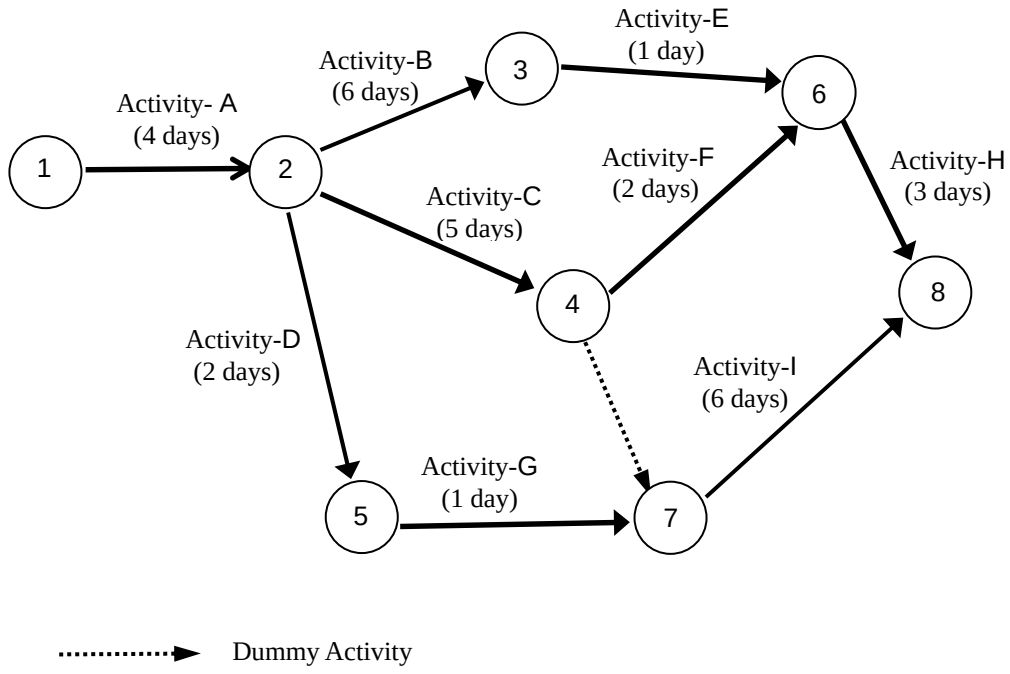
d) The schedule and actual achievement record during the execution period are shown, for each job, in a bar graph.

Q77. The figure below shows plots of the relationship between values of a certain factor *x*, in the product manufacturing process, and values of quality characteristics *y*. Which of the following is an appropriate description concerning this figure?



a) The coefficient of correlation between *x* and *y* is negative.
b) The coefficient of correlation between *x* and *y* is positive.
c) The regression equation for estimating *y* from *x* is the same as that for estimating *x* from *y*.
d) To estimate *y* from *x*, it is necessary to calculate second order regression coefficients.

Q78. In order to shorten the cumulative duration of activities on the critical path by one day, which of the following is the appropriate action to be taken?



a) To shorten the activities B and F by one day respectively
b) To shorten the activity B by one day
c) To shorten the activity H by one day
d) To shorten the activity I by one day

Q79. Three products A, B, and C are produced from raw materials at plant X. The production time per unit volume of each product, the required quantity of raw materials, and the profit amounts are shown in the table below. The maximum production hours per month at this plant total 240 hours, and the amount of raw materials that can be fed for production is 150 kg per month.

Under these conditions, management would like to know how many of A, B, and C should be manufactured so as to yield maximum profits. Which of the following is an appropriate method for solving this problem?

Product	A	B	C
Production time (hours)	2	3	1
Quantity of raw materials required (kg)	2	1	2
Profit (US$)	80	50	50

a) Fixed order quantity system
b) Least squares method
c) Linear programming method
d) Moving average method

Q80. There are various types of e-commerce, depending on the transaction: B2B, B2C, C2C, m-commerce, etc. Which of the following refers to the activities associated with the selling and buying of goods and services via the Internet such as an online auction website and an online flea market?

a) B2B (Business to Business)
b) B2C (Business to Consumer)
c) C2C (Consumer to Consumer)
d) m-commerce (Mobile Commerce)