October 2008

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 your answers in accordance with the instructions below. Your answer 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]
   Q1. In which month is the autumn 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 Answer]

Q1	Ⓐ	●	Ⓒ	Ⓓ

Q1. Which of the following decimal fractions becomes a finite fraction when converted to an octal number?

a) 0.3   b) 0.4   c) 0.5   d) 0.8

Q2. A register stores a numerical value representing a binary number.   After a positive integer x is entered in the register, the following operation is performed: "shift the register value two bits to the left and add x."   How many times as large as x is the new value of the register?   Here, the shift does not cause an overflow.

a) 3   b) 4   c) 5   d) 6

Q3. Which of the following is the appropriate way to check whether or not an 8-bit unsigned binary number x is a multiple of 16?

a) The bit-by-bit logical product between x and the binary number 00001111 is 0.
b) The bit-by-bit logical product between x and the binary number 11110000 is 0.
c) The bit-by-bit logical sum between x and the binary number 00001111 is 0.
d) The bit-by-bit logical sum between x and the binary number 11110000 is 0.

Q4. In the single precision of "IEEE Standard for Binary Floating-Point Arithmetic" (IEEE 754), the value "V" is represented as follows:

S: Sign (1 bit)	E: Exponent (8 bits)	F: Fraction (23 bits)

If $0 < E < 255$ then $V = (-1)^S \times 2^{(E-127)} \times (1.F)$
where "1.F" is intended to represent the binary number created by prefixing F with an implicit leading 1 and a binary point.

When the hexadecimal value C1E00000 is represented in IEEE 754, what is the correct value converted to decimal?

a) -59 b) -44 c) -28 d) 26

1

Q5. There are a total of N values observed. The sum S $(S>0)$ of these values is obtained, and then the average value is calculated. Which of the following is the correct expression when the average value is rounded off to the nearest integer value? Here, "/" indicates division, and $[X]$ is the maximum integer equal to X or less.

a) $[(S+0.5)/N]$

b) $[(S-1)/N]+1$

c) $[S/N+0.5]$

d) $[S/N]+1$

Q6. A k-string is a character string with a length of k characters. An m-substring is an ordered sequence with a length of m characters, which consists of consecutive elements of the original k-string. An n-subsequence is also an ordered sequence with a length of n characters, which consists of elements of the original k-string, but it does not need to be consecutive. How many m-substrings and n-subsequences are respectively included in the k-string?

	Total number of m-substrings	Total number of n-subsequences
a)	$k-m+1$	$\dfrac{k!}{n!(k-n)!}$
b)	$k-m$	$\dfrac{k!}{n!(k-n)!}$
c)	$k-m+1$	$\dfrac{k!}{(k-n)!}$
d)	$k-m$	$\dfrac{k!}{(k-n)!}$

Q7. There are 3 white balls and 3 red balls in a box. What is the probability that the two balls taken out at random from the box are one white ball and one red ball?

a) 1/5   b) 1/3   c) 1/2   d) 3/5

Q8. There are *n* locks and *n* keys; the keys are mixed and need to specify which key belongs to which lock. Which of the following is the maximum number of trials to find the correct key for each lock? Here, one key can open only one lock.

a) n^2 b) $(n-1)!$ c) $n!$ d) $(n^2-n)/2$

Q9. Which of the following is equivalent to the logical expression shown below? Here, "•" is used for the logical product, and "+" is for the logical sum.

$$((X + Y) \bullet (X + Z)) + ((X \bullet Y) + (X \bullet Z))$$

a) $(X + (Y \bullet Z)) + (X \bullet (Y + Z))$
b) $(X + (Y \bullet Z)) \bullet (X \bullet (Y + Z))$
c) $(X \bullet (Y \bullet Z)) + (X \bullet (Y + Z))$
d) $((X + Y) \bullet Z) + (X \bullet (Y + Z))$

Q10. Which of the following Boolean expressions is equivalent to the sentence below?

"The output *z* is true if at least two of the three inputs x_1, x_2, and x_3 are true."

Here, "$\bar{x}_n$" is used for the logical negation of x_n, "+" for the logical sum, "•" for the logical product, and "$\oplus$" for the exclusive disjunction (or exclusive OR).

a) $z = \bar{x}_1 \cdot x_2 \cdot x_3 + x_1 \cdot \bar{x}_2 \cdot x_3 + x_1 \cdot x_2 \cdot \bar{x}_3$
b) $z = (\bar{x}_1 + x_2 + x_3) \cdot (x_1 + \bar{x}_2 + x_3) \cdot (x_1 + x_2 + \bar{x}_3)$
c) $z = (x_1 \oplus x_2) \cdot (x_2 \oplus x_3) \cdot (x_1 \oplus x_3)$
d) $z = x_1 \cdot x_2 + x_2 \cdot x_3 + x_1 \cdot x_3$

Q11. There are three stacks *A*, *B*, and *C* where stack *A* contains the values 1, 2, and 3; 3 is on the top of the stack, and stacks *B* and *C* are empty. The stack command format is as follows:

<stack command> (<stack name>, <temporary variable>)

What is the resulting content of stack *A* after executing the stack operations shown below? Each rightmost element in the option list represents the value on the top of the stack.

Pop (*A*, *x*) → Push (*B*, *x*) → Pop (*A*, *x*), → Push (*C*, *x*) → Pop (*A*, *x*) → Push (*C*, *x*)
→ Pop (*B*, *x*) → Push (*A*, *x*) → Pop (*C*, *x*) → Push (*B*, *x*) → Pop (*C*, *x*) → Push (*A*, *x*)
→ Pop (*B*, *x*) → Push (*A*, *x*)

a) 1, 2, 3   b) 2, 1, 3   c) 3, 1, 2   d) 3, 2, 1

Q12. In a certain examination, the minimum and maximum scores are 31 and 95 respectively. A one-dimensional array shown below is used to display the distribution of scores for all examinees, and each array element indicates the number of examinees whose scores are in the specified ranges. Which of the following is the most appropriate expression to calculate an array index for each score? Here, any digits after the decimal point of the resulting value are truncated to generate an integer as an index.

Array index	Score range
1	Score < 40
2	40 <= Score < 50
3	50 <= Score < 60
4	60 <= Score < 70
5	70 <= Score < 80
6	80 <= Score < 90
7	90 <= Score < 100

a) (Score/10)−3   b) (Score/30)/10
c) (Score−30)/10+1   d) (Score−40)/10

Q13. A k-ary tree is a tree in which every node has no more than k children.   A binary tree is the special case where $k=2$.   In a k-ary tree with n nodes and height h, which of the following is an upper bound for the number of leaves?

a) h^k b) k^h c) $\log_k n$ d) $n/\log_k h$

Q14. A recursive definition of a factorial function $f(n)$ that calculates "n!" can be represented as follows:

$$
\begin{cases}
f(n) = \boxed{\quad A \quad} & (n > 1) \\
f(n) = \boxed{\quad B \quad} & (n = 0)
\end{cases}
$$

Which of the following combinations should be inserted in the boxes A and B?   Here, "n" is a non-negative integer.
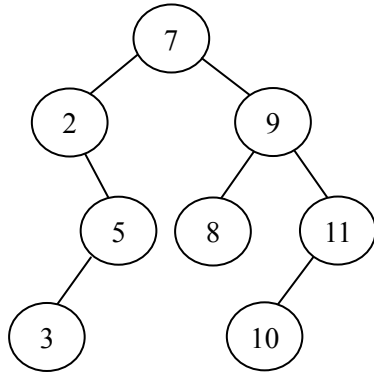
	A	B
a)	$n * f(n-1)$	0
b)	$n * f(n+1)$	0
c)	$n * f(n-1)$	1
d)	$n * f(n+1)$	1

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Q15. A binary search tree is created by inserting the values shown below.
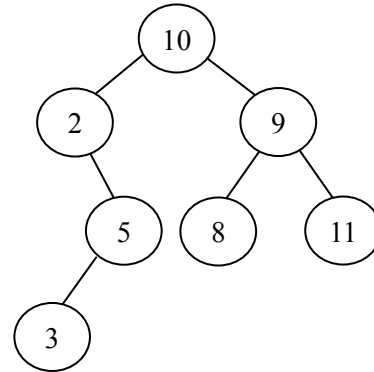
7   9   11   2   8   10   5   3

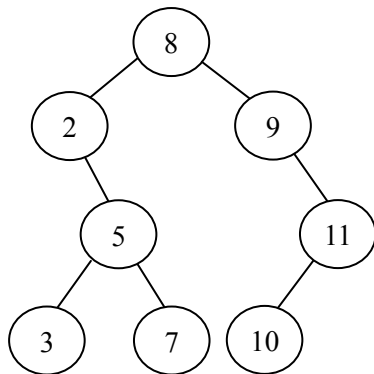After deletion of the root from the newly created tree, what does it look like?

a)

```
        7
      /   \
     2     9
      \   / \
       5 8  11
      /      \
     3       10
```

b)

```
        10
       /  \
      2    9
       \  / \
        5 8 11
       /
      3
```

c)

```
        8
      /   \
     2     9
      \     \
       5     11
      / \   /
     3  7  10
```

d)

```
        8
      /   \
     2     9
      \     \
       5     11
      /      /
     3      10
```
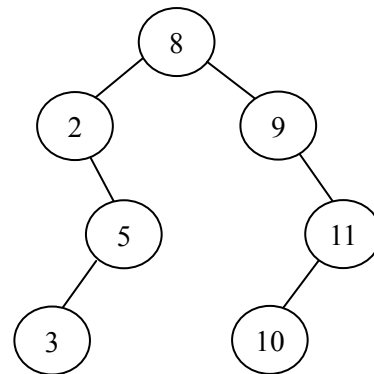
Q16. Which of the following is the sorting algorithm that divides the data elements into two groups, in which all those elements less than a particular element (called a pivot value) and all those elements greater than or equal to it are separately included, and then repeats the same operation until all elements are sorted in ascending or descending order?
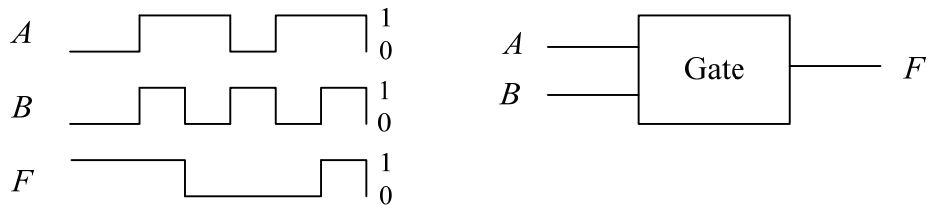
a) Heap sort   b) Insertion sort
c) Merge sort   d) Quick sort

Q17. The figure shown below represents a logic gate and its timing chart. Which of the following is an appropriate logical function of this gate? Here, both A and B are the input signals and F is the output signal.

A ⎍⎍⎍ 1 0

B ⎍⎍⎍ 1 0

F ⎍⎍ 1 0

A ——| Gate |—— F
B ——| |

a) AND
b) Exclusive-NOR
c) Exclusive-OR
d) NOR

Q18. Which of the following is an appropriate description concerning registers in processors?

a) A base register stores the starting address of the computer system.
b) A complement register generates integer complements in order to perform operations in the adder circuit.
c) An accumulator stores a collection of flag bits for a processor.
d) An index register stores the instruction being performed in a processor.

Q19. When a CPU can perform a multiplication in 12 nanoseconds (ns), an addition in 1 ns, and a subtraction in 1.5 ns, which of the following is the minimum CPU time, in nanoseconds, for the calculation of "$a \times a - b \times b$"?

a) 12.5
b) 13.5
c) 14.5
d) 25.5

Q20. Which of the following is the appropriate diagram that explains pipeline control? Here, the meanings of the capital letters in the diagrams are as follows:
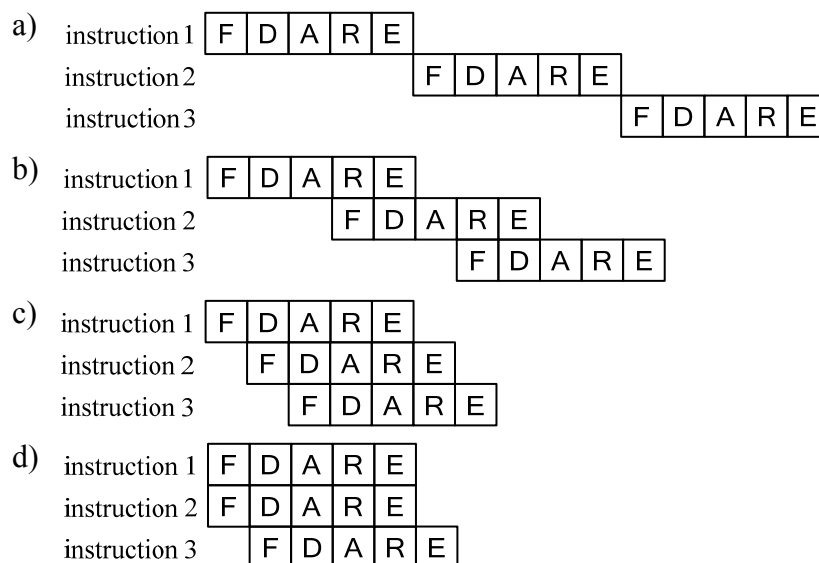
F: Fetching instruction
D: Decoding
A: Address calculation
R: Reading operand
E: Executing

a)
instruction 1	F	D	A	R	E
instruction 2						F	D	A	R	E
instruction 3											F	D	A	R	E

b)
instruction 1	F	D	A	R	E
instruction 2			F	D	A	R	E
instruction 3					F	D	A	R	E

c)
instruction 1	F	D	A	R	E
instruction 2		F	D	A	R	E
instruction 3			F	D	A	R	E

d)
instruction 1	F	D	A	R	E
instruction 2	F	D	A	R	E
instruction 3		F	D	A	R	E

Q21. Which of the following is the appropriate description of CPU clock frequencies for PCs?

a) LAN communication speed changes depending on the clock frequency. The higher the frequency, the faster the communication speed on the LAN gets.

b) The instruction execution timing in a CPU varies depending on the clock frequency. The higher the frequency, the faster the instruction execution speed gets.

c) The interrupt interval of real-time processes changes depending on the clock frequency. The higher the clock frequency, the higher the frequency of interrupt processing gets, increasing the processing speed of real-time processes.

d) The revolution speed of the hard disk varies depending on the clock frequency. The higher the frequency, the faster the revolution speed gets, increasing the transfer speed of the hard disk.

Q22. There is a CPU with an internal clock frequency of 700 MHz.   The number of clock cycles for executing instructions and their appearance rates are shown in the table below.   What is the approximate performance (measured in MIPS) of this CPU?

Type of instructions	Number of clock cycles for executing instructions	Appearance rate (%)
Operation between registers	4	30
Operation between memory and registers	8	60
Unconditional branch	10	10

a) 10   b) 50   c) 70   d) 100

Q23. A processor with a 256-Mbyte address space is using the address "35E3C03" to access a 16-Mbyte memory device. What are the highest and lowest addresses in the memory map of the 16-Mbyte memory device?   Here, the memory addresses are expressed in hexadecimal.

	Highest address	Lowest address
a)	3FFFFFF	0000000
b)	3FFFFFF	3000000
c)	40000000	0000000
d)	FFFFFFF	0000000

Q24. Which of the following is used in ECC memory to detect 2-bit errors and correct 1-bit errors?

a) Checksum   b) Even parity
c) Hamming code   d) Vertical parity

Q25. A system has a main memory access time of 60 nanoseconds (ns) and a cache memory access time of 10 ns.   When the effective access time for accessing the main memory via the cache memory is 15 ns, what is the hit ratio of the cache memory?

a) 0.1   b) 0.17   c) 0.83   d) 0.9

Q26. Which of the following storage devices has the fastest access time?

a) CPU L2 cache memory   b) CPU register
c) Hard disk   d) Main memory

Q27. Which of the following is widely used as a computer port for a modem connection?

a) IEEE 1394 port   b) Parallel port
c) SCSI port   d) Serial port

Q28. A certain computer system runs in a multi-programming environment using a non-preemptive "shortest job first" algorithm.   In this system, four processes *A*, *B*, *C*, and *D* arrive sequentially in the process queue every 1 millisecond.   The table shown below includes estimated execution time for each process; for example, process *A* uses CPU, I/O, and then CPU sequentially for 4, 5, and 5 milliseconds respectively.   When 14 milliseconds elapse after the arrival of the first process *A*, which of the following processes is executed in CPU?   Here, the multi-processing overhead of OS can be ignored, and both CPU and I/O operations can be executed concurrently.

Unit: millisecond

Process Name	Execution time		
	CPU	I/O	CPU
A	4	5	5
B	3	4	6
C	2	3	3
D	4	3	2

a) *A*   b) *B*   c) *C*   d) *D*

Q29. The figure below shows the state transition diagram of a certain process. Which of the following is the appropriate combination of States *A*, *B*, and *C*?
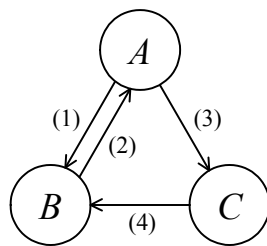
[Factors for State Transitions]
(1) The right to use the CPU is transferred to another process with a higher execution priority.
(2) The right to use the CPU is given.
(3) Waiting for completion of an input/out operation
(4) An input/output operation is completed.

	State *A*	State *B*	State *C*
a)	Ready	Running	Waiting
b)	Ready	Waiting	Running
c)	Running	Ready	Waiting
d)	Running	Waiting	Ready

Q30. Which of the following is the appropriate explanation of spooling?

a) Communication data is sent to a substitute device registered in advance instead of being directly transferred to the communication destination.
b) Input data from the keyboard is temporarily saved in the queue of the main memory.
c) Output data to a low speed device such as a printer is temporarily stored on a high speed hard disk and later sent as output to that target device.
d) The order of execution for jobs requested in the system is determined according to their priorities and characteristics.

Q31. Which of the following is the appropriate set of major functions supported by an OS?

a) Compiler management, I/O management, and network management
b) Data management, job management, and task management
c) Development tool management, job management, and memory management
d) I/O management, multimedia management, and security management

Q32. Which of the following is the appropriate explanation of RPC in a client/server system?

a) It is a method of communication between programs, where parts of the process are assigned to another computer.

b) It is a method of remotely using a hard disk of a computer at another location as a shared resource.

c) It is a method to check whether a user remotely accessing the computer is registered or not.

d) It is a method where a series of procedures for a database is handled together and processed at the server with the arguments provided by the client.

Q33. In order to make a multiplexing system with an availability of at least 0.999 by using devices with an availability of 0.9, how many of these devices need linking together in parallel?

a) 2   b) 3   c) 4   d) 5

Q34. Which of the following helps improve availability?

a) Doubling both MTBF and MTTR

b) Doubling MTBF and reducing MTTR to half

c) Reducing both MTBF and MTTR to half

d) Reducing MTBF to half and doubling MTTR

Q35. Which of the following refers to the concept of fail-safe design?

a) If a failure occurs in a leased line, the system immediately switches to a public line and continues processing even if the processing capacity of the system goes down.

b) If a system failure occurs with a data transfer process in a data collection system, only the data input process is performed, and the data is transferred all at once after recovery of its failure.

c) If something other than a number is entered into a number input field, the system displays a warning message, requesting correct entry.

d) If the system determines that the sensor which detects someone entering the work area has failed, the robot arm is stopped by force.

Q36. Which of the following is the term that refers to collecting a large volume of data through a variety of corporate activities, organizing, integrating, and saving the data for specific purposes, and using it for decision-making support, for example?

a) Data administration
b) Data dictionary
c) Data mapping
d) Data warehouse

Q37. When large-scale websites are built, application servers are often used in addition to Web servers. Which of the following is an appropriate reason for this?

a) System modification or expansion is made easier in comparison with Web servers alone.
b) Web servers alone cannot create content dynamically.
c) Web servers alone cannot execute the business processing.
d) Web servers do not have authentication functions.

Q38. CASE tools can be classified on the basis of the applicable development processes and phases. Which of the following classifications includes support functions for requirements analysis?

a) Downstream
b) Maintenance
c) Testing
d) Upstream

Q39. Which of the following is the method which analyzes the source or object code to retrieve information concerning program specifications and design?

a) Reengineering
b) Refactoring
c) Restructuring
d) Reverse engineering

Q40. Based on the concept of object orientation, which of the following can be commonly regarded as a subclass of the class "automobile"?

a) Engine
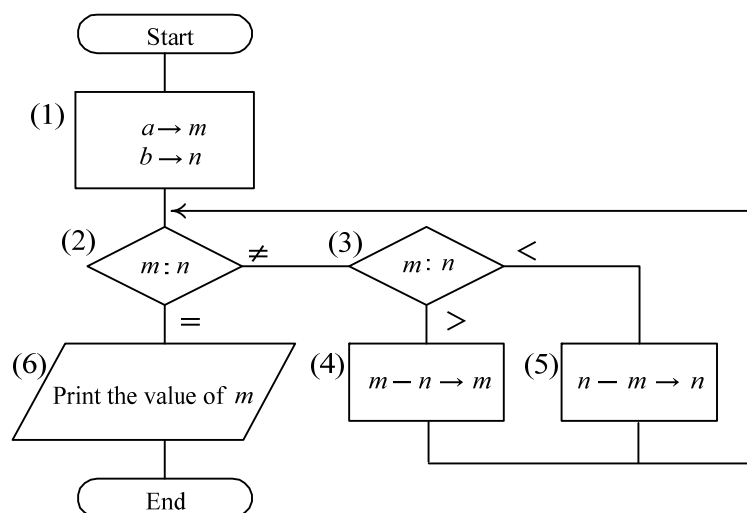b) Serial number
c) Tire
d) Truck

Q41. Which of the following should be done in the internal design phase of software development processes?

a) Designing interfaces between subsystems
b) Designing logical data structure
c) Designing physical data structure
d) Designing screen layouts

Q42. In the flowchart below, which of the following indicates the relationship between the initial values a and b that are given in m and n in the process (1) in order to carry out these processes in the order shown below?

$(1) \rightarrow (2) \rightarrow (3) \rightarrow (5) \rightarrow (2) \rightarrow (3) \rightarrow (4) \rightarrow (2) \rightarrow (6)$

Here, a and b are both positive integers.

Start

(1) $a \rightarrow m$
$b \rightarrow n$

(2) $m : n$ $\neq$ (3) $m : n$ $<$

$=$ $>$

(6) Print the value of m (4) $m - n \rightarrow m$ (5) $n - m \rightarrow n$

End

a) $a = 2b$ b) $2a = b$ c) $2a = 3b$ d) $3a = 2b$

Q43. Which of the following is the appropriate sequence for drawing up a DFD model that is used to develop a new system based on the current system?

1. Current logical model
2. Current physical model
3. New logical model
4. New physical model

a) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
b) $1 \rightarrow 2 \rightarrow 4 \rightarrow 3$
c) $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$
d) $2 \rightarrow 1 \rightarrow 4 \rightarrow 3$

Q44. In DFD illustrated below, DFi is used for data flow i, Pj for process j, Ek for source or destination of data k, and DSl for data storage l.   There are three errors (rule violations) in this DFD.   One is in P2; that is, P2 must have at least one output data flow.   The other two are in data flows.   Which of the following combinations includes two rule violations, one for each data flow?
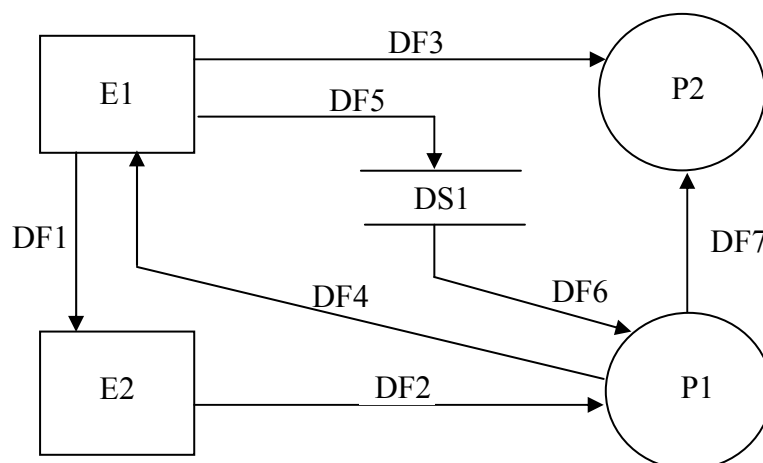
a) DF1 and DF2   b) DF1 and DF5
c) DF2 and DF3   d) DF3 and DF4

Q45. Which of the following is the appropriate characteristic of object-oriented models?

a) A program consists of operational expressions in nested structure, commands expressing functions (operation symbols), and data. "Command execution" corresponds to "calculation (evaluation) of operational expressions or function values."

b) Control of computation is passed from command to command in order. Data is delivered between commands indirectly by referencing memory through the "variables." Definitions of commands and data are separated.

c) Data is hidden from the outside and indirectly handled by procedures called methods. A program is a collection of data and methods.

d) The order of computation is determined by data flow, not by control flow. Commands can be executed when all the input data becomes available.

Q46. Which of the following is the test to verify interfaces both between modules and between subsystems?

a) Integration test   b) Operational test

c) System test   d) Unit test

Q47. A certain program contains the complex decision shown below:

"Condition 1" OR ("Condition 2" AND "Condition 3")

When testing based on decision-condition coverage (branch coverage), which of the following is appropriate for an additional test item?

[Test items completed]

(1) "Condition 1" is true, "Condition 2" is false, and "Condition 3" is false.
(2) "Condition 1" is false, "Condition 2" is true, and "Condition 3" is true.

	Condition 1	Condition 2	Condition 3
a)	false	false	true
b)	true	false	true
c)	true	true	false
d)	true	true	true

Q48. Which of the following is the appropriate interpretation of the testing-process quality control graph shown below and follow-on actions to be taken?
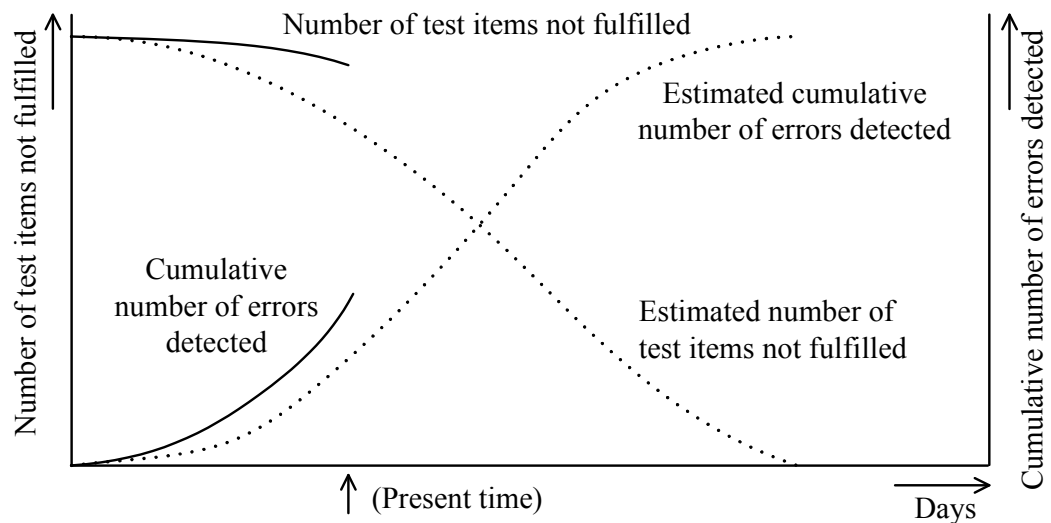
a) Detection of errors is ahead of the pace of fulfilling the test items.   The test is thus efficiently conducted.   At this time there is no concern, but progress management is necessary to cope with errors in order not to leave them unresolved over a protracted period of time.

b) Fulfillment of test items is fast, and detection of errors is also more advanced than expected.   The test is still in the first half, so it is advisable to continue testing and see what happens.

c) Fulfillment of test items is slow, so some measures should be discussed concerning the insufficiency of the testing environment and the lack of development staff members before it is too late.   There is no problem with the quality, as errors are detected more often than expected.

d) The resulting quality is generally rather poor, so it is necessary to take strong measures against places in which errors occur frequently; the quality status of the preceding process should be reviewed and do it over again if necessary.

Q49. How much is the approximate expected value in dollars, for the first-year correction cost of an application program under the following conditions?

[Conditions]
(1) Program size: 2,000 Ksteps
(2) Potential program error rate: 0.04 errors / Ksteps
(3) Annual discovery rate of potential errors: 20 % / year
(4) Classification of errors
    Error with major impact: 20 %
    Error with minor impact: 80 %
(5) Correction cost per error
    Error with major impact: 20,000 dollars
    Error with minor impact: 5,000 dollars
(6) Only errors with major impact are corrected.

a) 64,000   b) 128,000   c) 160,000   d) 640,000

Q50. Which of the following is the most appropriate description concerning a "watch list" of system failures?

a) "Monitoring software" monitors messages displayed on system consoles.
b) All of the items that cannot be monitored by "monitoring software" need to be observed by persons in charge.
c) System operators also monitor processing delays, because such delays can cause system failures.
d) System operators continuously monitor all items which have the possibility of causing failures.

Q51. Which of the following is an appropriate description concerning a characteristic of job scheduling in a computer system?

a) In a system on which interactive processing and batch processing are mixed, it is expected that the response performance of interactive processing is improved by giving a higher priority to interactive processing.

b) In the FCFS (first-come first-served) scheduling, it is possible to guarantee throughput and response time because the CPU is assigned equally among jobs.

c) In the time slice scheduling, where the OS forcibly switches jobs assigned to the CPU, throughput goes down due to frequent timer interrupts.

d) It is expected that overall throughput is improved by giving a higher priority to CPU-bound jobs than to I/O-bound jobs, because the CPU waiting time can be reduced.

Q52. In software maintenance, which of the following tests is performed to ensure that fixes or modifications do not affect other, unchanged parts of the software?

a) Endurance test

b) Exception handling test

c) Performance test

d) Regression test

Q53. An IP address in IPv4 consists of two parts: the network address part and the host address part. Which of the following is the appropriate description concerning the network address and the host address? Here, n is the number of bits in the network address part, and h is the number of bits in the host address part. In addition, the special-purpose and ineffective addresses should not be counted as an effective address.

a) In classes A, B, and C, the maximum number of effective host addresses available to one network is defined as $2^h - 2$.

b) In classes A, B, and C, the maximum number of effective network addresses available is defined as 2^n.

c) In class A, the maximum number of effective host addresses available to one network is defined as $2^h - 2$, but in classes B and C it is defined as 2^h.

d) The maximum number of effective network addresses available is defined as $2^n - 2$, where $n=7$ in class A, $n=14$ in class B, and $n=21$ in class C.

Q54. Which of the following terms can be applicable to an explanation below?

"The sender sends a single datagram; the routers are responsible for making copies and sending them to a group of interested receivers."

a) Anycast   b) Broadcast   c) Multicast   d) Unicast

Q55. Which of the following is a protocol for e-mail on the Internet that supports not only text but other data such as audio and images through message header extension?

a) HTML   b) MHS   c) MIME   d) SMTP

Q56. Which of the following is the appropriate description concerning ATM exchange?

a) It is a general term referring to a private branch exchange used for connection between internal extension telephones located within a limited area such as an office or for connection between subscribers' telephone lines and internal extension telephones.

b) It is a store-and-forward type of exchange device that transfers data by dividing the data into blocked units.   The transfer speed is only up to about several tens of Kbps.

c) It is an exchange device that exchanges data divided up into units called frames. Since it does not re-send data when a transfer error occurs, it can increase the processing speed in the network.

d) It is an exchange device that handles a variety of data in an integrated way by partitioning data into fixed-length blocks called cells and adding a header containing destination information to each cell.

Q57. Which of the following protocols is used for synchronizing the clocks in multiple nodes on the Internet?

a) NNTP   b) NTP   c) SMTP   d) SNMP

Q58. Which of the following is a mechanism that allows a Web server to store its own information about a user on the user's own computer so that the Web server can identify users and possibly prepare customized Web pages for them?

a) Cookie   b) Password   c) SSL   d) URL

Q59. Which of the following is the mechanism for interfacing a Web server with an external program in order to implement an interactive page where an application program on the server executes a request from a client and returns the resulting output to the browser?

a) CGI   b) HTML   c) MIME   d) URL

Q60. Which of the following data models represents data relationships in a tree structure?

a) E-R model   b) Hierarchical model
c) Relational model   d) Network model

Q61. Which of the following is an appropriate explanation of a relational database?

a) A parent record and child records are connected by means of pointers.
b) Data and methods are encapsulated.
c) Data is represented by two-dimensional tables.
d) Tags are used to define data structures and meanings.

Q62. Which of the following is an appropriate explanation of "projection" in relational operations?

a) Only specified attributes are extracted from tables, and a new table is created.
b) The tuples in two tables that meet the relevant conditions are combined, and a new table is created.
c) Tuples that commonly exist in two tables are extracted, and a new table is created.
d) Tuples that meet given conditions are selected from tables, and a new table is created.

Q63. There are two tables "movie" and "movietype" as shown below. Which of the following tables is created as the result of executing the SQL statement specified below?

```
SELECT mName, mTypeCode, mCompany
FROM   movie M, movietype MT
WHERE  M.mTypeID = MT.mTypeID AND MT.mTypeName = 'Action'
```

movie

mID	mName	mTypeID	mDirector	mCompany
M01	Beowulf	01	Robert Zemeckis	Paramount Pictures
M02	Enchanted	02	Kevin Lima	Walt Disney Pictures
M03	This Christmas	03	Preston A. Whitmore II	Sony Pictures
M04	Hitman	01	Xavier Gens	20th Century Fox

movietype

mTypeID	mTypeCode	mTypeName
01	AC	Action
02	AD	Adventure
03	CO	Comedy

a)

mName	mTypeID	mCompany
Beowulf	01	Robert Zemeckis
Hitman	01	Xavier Gens

b)

mName	mTypeCode	mCompany
Beowulf	AC	Paramount Pictures
Hitman	AC	20th Century Fox

c)

mName	mTypeName	mCompany
Beowulf	Action	Paramount Pictures
Hitman	Action	20th Century Fox

d)

mName	mTypeCode	mCompany
Beowulf	AC	Paramount Pictures
Enchanted	AD	Walt Disney Pictures
This Christmas	CO	Sony Pictures
Hitman	AC	20th Century Fox

Q64. Which of the following appropriately describes a group function of SQL?

    a) A group function returns a group of results from one row.

    b) A group function returns a single result row per group for a set of queried rows.

    c) A group function returns multiple result rows per group for a set of queried rows.

    d) A group function returns one result from each row in the table.

Q65. Which of the following appropriately explains the SQL statements shown below?

```
CREATE TABLE STAFF (
  Name       CHAR(256),
  Birthdate  DATE,
  DeptID     NUMBER
)
CREATE TABLE MANAGER UNDER STAFF AS (
  ManagedDept    NUMBER
)
```

    a) "SELECT * FROM STAFF" extracts all records in the table MANAGER.

    b) STAFF is called subtable, and MANAGER is called supertable.

    c) The table MANAGER has only one attribute.

    d) The table STAFF is composed of four attributes.

Q66. Which of the following authentications can be realized with the information exchange between two communication actors X and Y according to the procedure below?

[Procedure]
(1) Y transmits a character string (challenge) including optional information to X.
(2) X generates a new character string (response) from the received character string based on predetermined rules between X and Y, and sends back this character string (response) to Y.
(3) Y confirms that the returned character string (response) is correct.

a) X authenticates Y.
b) X authenticates Y, with the result that Y authenticates X.
c) Y authenticates X.
d) Y authenticates X, with the result that X authenticates Y.

Q67. Which of the following is an advantageous effect of encrypting e-mails?

a) It is possible to prevent denial-of-service attacks against e-mails.
b) It is possible to prevent encryption keys from being lost.
c) It is possible to prevent the contents of e-mails from leaking out.
d) It is possible to protect transmission records on mail servers from being falsified.

Q68. Which of the following is an appropriate action to be taken when a computer virus is found?

a) First, the computer is powered off, because the virus program may be resident in memory.
b) First, the infected computer is disconnected from the relevant network, because other computers may be infected via the network.
c) If a worm that infects a wide area in a short period of time is found while an on-line business system is running, the virus countermeasure is taken without stopping the system.
d) The reproducibility of virus activities is confirmed for the purpose of identifying the virus name by special characteristics activated at the time of infection.

Q69. Which of the following is an appropriate operations management method for user IDs and passwords?

a) A list of user IDs and passwords is prepared for the purpose of expediting troubleshooting, and the administrator in charge keeps the list.

b) For the purpose of preventing passwords from being abused by other people, it is so arranged that users become free to change their passwords at any time.

c) User IDs and passwords that are not currently used are reused for the purpose of simplifying management work.

d) With the aim of improving convenience, user IDs and temporary passwords for newcomers are registered, prior to the arrival of user registration applications, by referring to the advance announcements of personnel changes.

Q70. When LAN analyzers are used for finding out the causes of network failures, which of the following is a point to keep in mind?

a) As a provision against the occurrence of failures, it is necessary to inform all network users of the storage places and directions for use of LAN analyzers.

b) LAN cables must be temporarily disconnected during measurement. Therefore, it is necessary to inform users of the measurement dates in advance.

c) Packets originally intended to be transmitted to their destinations are destroyed during measurement. Therefore, it is necessary to limit the use of computers other than those to be measured.

d) Some analyzers are capable of displaying packets that pass through networks. Therefore, it is necessary to be careful not to use them in different ways such as wiretapping.

Q71. Which of the following is UML standardized by OMG?

a) Description language of an interface for using objects from other programs

b) Manipulation language for relational databases, which defines tables and handles data

c) Mark-up language to describe meanings and structure of a file or data

d) Modeling language used in software development using object orientation

Q72. Which of the following is an appropriate description concerning financial indexes?

a) Capital ratio signifies the ratio of equity capital to fixed assets. The larger the value of this ratio, the greater the financial soundness.

b) Current ratio means the ratio of current assets to current liabilities. The smaller the value of this ratio, the higher the financial stability.

c) Fixed ratio means the ratio of fixed assets to fixed liabilities. The smaller the value of this ratio, the higher the financial stability.

d) Total capital profit ratio denotes the ratio of profits to gross capital. The larger the value of this ratio, the higher the profitability.

Q73. A certain company is producing and selling its product X. The variable cost of the product X is 60% of its selling price, and the fixed cost of the company is $50,000 per month. When the company's target profit for the forthcoming month is $20,000, how much sales volume (in dollars) is required to meet it?

a) 100,000   b) 125,000   c) 150,000   d) 175,000

Q74. A certain manufacturer plans to produce products in the two periods 1 and 2 as shown in the table below. How much is the fixed cost (in dollars) to produce the planned products during a single period? Here, the fixed cost remains unchanged for each period.

Period	Number of products to be produced	Manufacturing cost ($)
1	1,000	5,000
2	1,500	6,000

a) 1,000   b) 2,500   c) 3,000   d) 5,000

Q75. A certain retailer purchases watches from a wholesaler and sells them to customers. As shown in the transaction record table below, the retailer purchased a total of 150 watches and sold 120 watches in January. In addition, the retailer had a stock of 30 watches at the beginning of January. What is the total purchase cost (in dollars) of watches that were sold on an FIFO (First In First Out) basis in January?

[Transaction record]

Date (yyyy-mm-dd)	Transaction	Quantity	Unit cost ($)
2008-01-01	Beginning inventory	30	20
2008-01-10	Purchased	60	21
2008-01-16	Purchased	40	22
2008-01-25	Purchased	50	23
2008-01	Sold	120	

a) 2,500   b) 2,520   c) 2,550   d) 2,670

Q76. Company A and Company B can expect profits as shown in the table below when each of them implements two different strategies. Which of the following is the profit of Company A when both companies carry out the maximin strategy? In each cell of the table, the left value indicates the profit of A, and the right value indicates the profit of B.

		Company B	
		Strategy b1	Strategy b2
Company A	Strategy a1	−15, 15	20, −20
	Strategy a2	5, −5	0, 0

a) −15   b) 0   c) 5   d) 20

Q77. Which is the method of solving a problem of the following type: "How can we distribute a resource subject to constraints that can be expressed by first-degree equations so as to obtain a maximum effect?"

a) Design of experiments   b) Factor analysis
c) Linear programming   d) Regression analysis

Q78. A certain company has installed an online computer for the purpose of improving its inventory control system. When the company anticipates sales of 15,000 units per year, ordering cost of $60 per order, and annual holding cost of $20 per unit, what is the optimal order quantity (in units) per order? Here, the fixed order quantity model can be applied.

a) 300   b) 500   c) 1,500   d) 3,000

Q79. There are seven activities A through G shown in the table below. Activities A and B can be performed concurrently, but the others cannot be done until their preceding activities are completed. For example, C cannot begin until A is completed. Which of the following is the critical path of these activities?

Activity	Preceding activity	Used Time (days)
A	—	4
B	—	5
C	A	5
D	A	6
E	B, C	5
F	D	4
G	E	5

a) $A \rightarrow C \rightarrow E \rightarrow G$
b) $A \rightarrow D \rightarrow F$
c) $B \rightarrow C \rightarrow D \rightarrow F$
d) $B \rightarrow E \rightarrow G$

Q80. Which of the following is the situation that is expected to be improved by the introduction of an MRP (Material Requirements Planning) system?

a) Design changes are so frequent that production efficiency does not improve.

b) Drawing information is managed both by electronic files and on paper, so the history of design changes cannot be correctly understood.

c) Information concerning materials necessary for manufacturing and their required quantities is complex, so errors can occur repeatedly in the estimated quantity of order and thereby bring about problems to production.

d) Many types of products are produced in small quantities, so the introduction cost of manufacturing facilities is increasing.