April, 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]

   In which month is the spring Fundamental IT Engineer Examination conducted?
   Answer group

   a) March b) April c) May d) June

   Since the correct answer is "b)" (April), 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 equal to the hexadecimal fraction 2A.4C?

a) $2^{5}+2^{3}+2^{1}+2^{-2}+2^{-5}+2^{-6}$
b) $2^{5}+2^{3}+2^{1}+2^{-1}+2^{-4}+2^{-5}$
c) $2^{6}+2^{4}+2^{2}+2^{-2}+2^{-5}+2^{-6}$
d) $2^{6}+2^{4}+2^{2}+2^{-1}+2^{-4}+2^{-5}$

Q2. In what radix does the following equation hold?

$131 - 45 = 53$

a) 6 b) 7 c) 8 d) 9

Q3. In fixed-point representation that expresses negative numbers by two's complement, which range of integers can be expressed with *n* bits? Here, the position of the binary point is to the right of the least significant bit.

a) -2^{n} through 2^{n-1}
b) $-2^{n-1}-1$ through 2^{n-1}
c) -2^{n-1} through 2^{n-1} - 1
d) -2^{n-1} through 2^{n-1}

Q4. In a certain program, in order to stay in a loop, variable *X* must be in the range from 1 through 10 (*X* >= 1 AND *X* <= 10). In this program, which of the following is the condition of exiting the loop? Here, "AND" and "OR" are the logical product and logical sum operations respectively. In addition, comparison operators <, <=, >, and >= are less than, less than or equal to, greater than, and greater than or equal to, respectively.

a) *X* < 1 AND *X* > 10
b) *X* >= 1 OR *X* <= 10
c) *X* <= 1 OR *X* >= 10
d) *X* < 1 OR *X* > 10

Q5. When the results of the logical operation "*x* # *y*" are shown in the table below, which of the following expressions is equivalent to the operation "*x* # *y*"? Here, "AND" is used for the logical product, "OR" is for the logical sum, and "NOT" is for the logical negation.

x	*y*	*x* # *y*
True	True	False
True	False	False
False	True	False
False	False	True

a) *x* AND (NOT *y*)
b) *x* OR (NOT *y*)
c) (NOT *x*) AND (NOT *y*)
d) (NOT *x*) OR (NOT *y*)

Q6. Which of the following numbers is a valid ISBN? Here, ISBN means the International Standard Book Number which is used to identify books, publishers, and bookstores. It consists of exactly 10 digits, and the rightmost digit is used for a check digit. The check digit is validated by using modulo 11 as follows:

- Multiply each digit from the first (leftmost) to the ninth by a weight from 10 to 2 respectively; the first digit is multiplied by 10, the second by 9, and so on.
- Calculate the sum of each product, and then add the check digit.
- Divide the resulting value by 11.
- If the resulting remainder is zero (0), the check digit is valid. Otherwise, it is invalid.

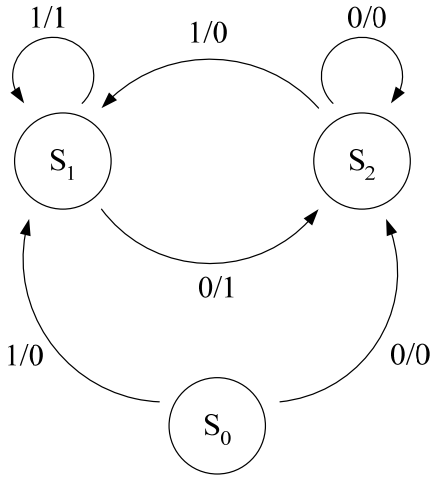
For example, in case of ISBN 0003194876, the check digit is validated as follows:

First 9 digits:	0	0	0	3	1	9	4	8	7	
Weight from 10 to 2:	10	9	8	7	6	5	4	3	2	
Each product and sum:	0	0	0	21	6	45	16	24	14	= 126
Add check digit:	6									
Total:	132									

The remainder of the division of 132 by 11 is 0, so this ISBN is valid.

a) 0071361283
b) 0071361284
c) 0071361285
d) 0071361286

Q7. The state diagram shown below is a simple Mealy machine. Which of the following transitions is NOT possible in the diagram? Here, S_0, S_1, and S_2 are states. Each edge is labeled with "*j* / *k*" where *j* is the input and *k* is the output.



a) $S_0 \rightarrow S_1 \rightarrow S_2 \rightarrow S_1 \rightarrow S_1 \rightarrow S_2$
b) $S_0 \rightarrow S_1 \rightarrow S_2 \rightarrow S_1 \rightarrow S_2 \rightarrow S_0$
c) $S_0 \rightarrow S_2 \rightarrow S_1 \rightarrow S_2 \rightarrow S_1 \rightarrow S_2$
d) $S_0 \rightarrow S_2 \rightarrow S_2 \rightarrow S_1 \rightarrow S_2 \rightarrow S_2$

Q8. The formula shown below is represented in postfix (or reverse Polish) notation. Which of following is the resulting value of this formula?

5 1 − 3 ∗ 3 1 − 2 ∗ /

a) 1 b) 3 c) 5 d) 7

Q9. There are five different sizes of white balls and five different sizes of green balls. When these ten balls are laid out in a line so that adjacent balls can have different colors, how many arrangements of the balls can be made?

a) 7,200 b) 14,400 c) 28,800 d) 57,600

Q10. A coin is tossed three times. What is the probability that it lands on heads exactly one time?

a) 0.125 b) 0.25 c) 0.333 d) 0.375

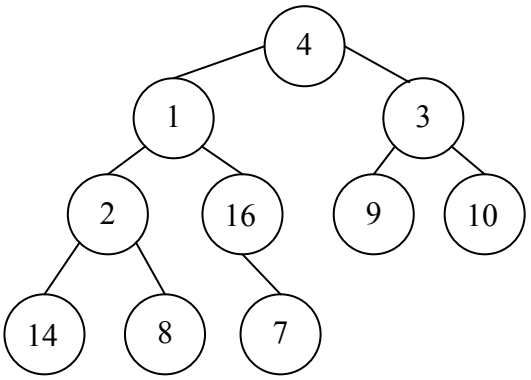
Q11. In a certain computer system, a simple hash function called the division method is used for page-based address translation. By using this method, a pair of new logical page number "101000" and its corresponding physical page number "0010" is stored into the page table shown below. Which of the following indexes is used to place them in the table? Here, the given logical page number is divided by 7, and its remainder is used as the index of the page table. If the slot specified by the index value is already taken, the table is searched forward from that slot to find the next empty slot.

Page table

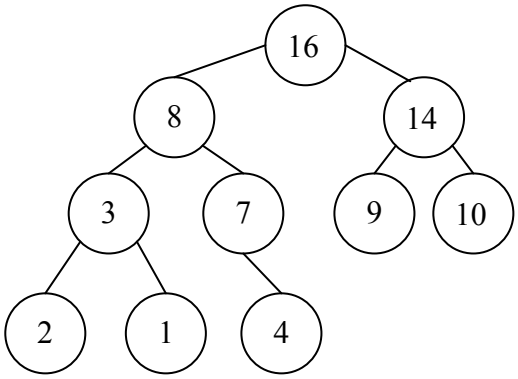
Index	Logical page number	Physical page number
000	Empty	Empty
001	001111	1110
010	Empty	Empty
011	000011	0001
100	001011	0011
101	000101	1010
110	Empty	Empty
111	Empty	Empty

a) 000 b) 010 c) 110 d) 111

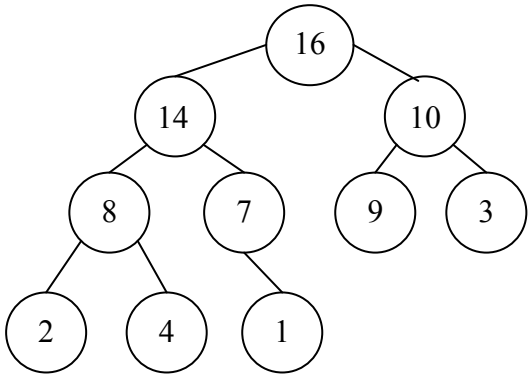
Q12. In the binary tree shown below, which of the following trees is created after conversion into a (max) heap?



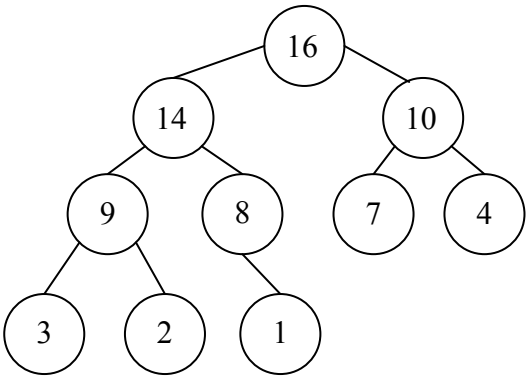
a)



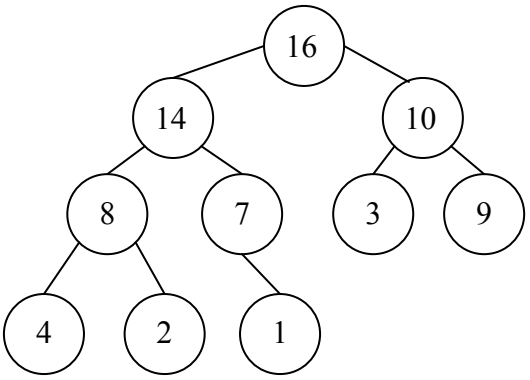
b)



c)



d)



Q13. A singly linked list is implemented using two arrays VALUE and LINK, in which `LINK(I)` points to the successor of `VALUE(I)`. When a new element that does not exist initially in the list is assigned to `VALUE(J)`, the program fragment shown below is executed. Which of the following appropriately describes the function of this program?

```
LINK(J) <- LINK(I);
LINK(I) <- J;
```

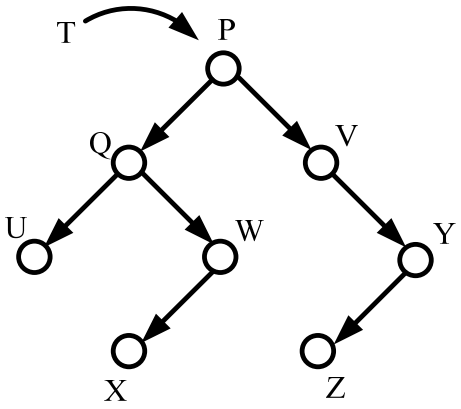
a) `VALUE(I)` is replaced by `VALUE(J)` in the list.
b) `VALUE(J)` is inserted after `VALUE(I)` in the list.
c) `VALUE(J)` is inserted before `VALUE(I)` in the list.
d) `VALUE(J)` is replaced by `VALUE(I)` in the list.

Q14. When a list of 7 elements shown below is rearranged in ascending order, which of the following sorting algorithms is completed with the minimum number of element exchanges?

3	5	12	9	10	7	15

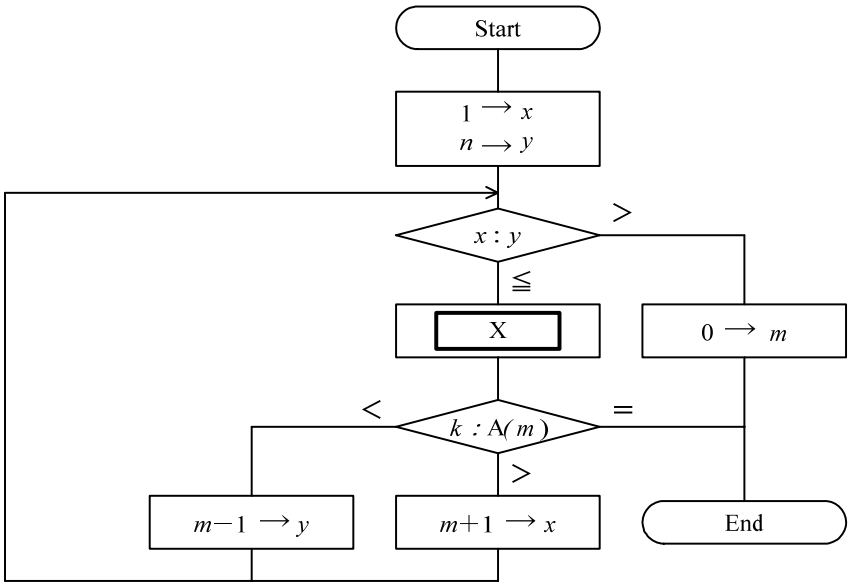
a) Bubble sort
b) Insertion sort
c) Merge sort
d) Shell sort

Q15. Which of the following represents the sequence of nodes visited in a post-order traversal of the binary tree T shown below?



a) U Q X W P V Z Y
b) U X W Q Z Y V P
c) U X Z Q W Y V P
d) X Z U W Y Q V P

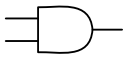
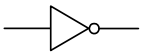
Q16. The flowchart below shows a binary search algorithm to find the index m of the array element A(m), such that the equation "A(m) = k" holds, from the array elements A(1), A(2), …, A(n) already sorted in ascending order. In case of "m = 0" at the end, there is no element such that the equation "A(m) = k" holds. Which of the following is inserted in the process box [X] in the flowchart? Here, the slash (/) indicates division that truncates all digits after the decimal point.

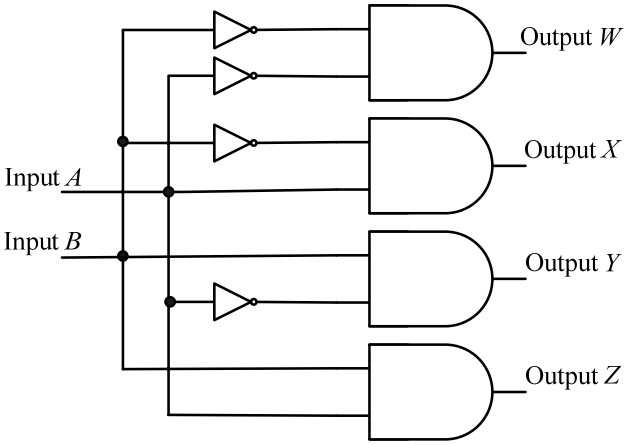


a) $(x + y) \rightarrow m$
b) $(x + y) / 2 \rightarrow m$
c) $(x - y) / 2 \rightarrow m$
d) $(y - x) / 2 \rightarrow m$

Q17. How many memory cells (or latches for holding 1 bit each) are implemented in SRAM with 24 address lines and 16 data lines?

a) 2^{16}
b) 2^{24}
c) 24 x 16
d) 2^{24} x 16

Q18. When two input signals *A* and *B* are given in the logic circuit shown below, which of the following tables describes the correct combination of output signals *W*, *X*, *Y,* and *Z*? Here,  is used for an AND gate, and  for a NOT gate.



a)

Input		Output			
A	*B*	*W*	*X*	*Y*	*Z*
0	0	1	0	0	0
0	1	0	0	0	1
1	0	0	0	1	0
1	1	0	1	0	0

b)

Input		Output			
A	*B*	*W*	*X*	*Y*	*Z*
0	0	1	0	0	0
0	1	0	0	1	0
1	0	0	1	0	0
1	1	0	0	0	1

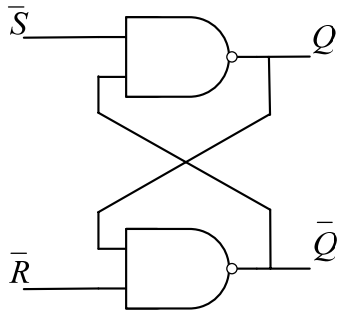
c)

Input		Output			
A	*B*	*W*	*X*	*Y*	*Z*
0	0	0	0	0	1
0	1	0	0	1	0
1	0	1	0	0	0
1	1	0	1	0	0

d)

Input		Output			
A	*B*	*W*	*X*	*Y*	*Z*
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0

Q19. The figure shows an RS flip-flop using two NAND 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)

Input		Output	
$\overline{S}$	$\overline{R}$	Q	$\overline{Q}$
0	0	unchanged	
0	1	0	1
1	0	1	0
1	1	unstable	

b)

Input		Output	
$\overline{S}$	$\overline{R}$	Q	$\overline{Q}$
0	0	unchanged	
0	1	1	0
1	0	0	1
1	1	unstable	

c)

Input		Output	
$\overline{S}$	$\overline{R}$	Q	$\overline{Q}$
0	0	unstable	
0	1	0	1
1	0	1	0
1	1	unchanged	

d)

Input		Output	
$\overline{S}$	$\overline{R}$	Q	$\overline{Q}$
0	0	unstable	
0	1	1	0
1	0	0	1
1	1	unchanged	

Q20. Which of the following interrupts can signal to OS that a program might have gone into an infinite loop?

a) Machine check interrupt
b) Program Interrupt
c) Supervisor call interrupt
d) Timer Interrupt

Q21. Which of the following appropriately explains the pipeline processing method of processors?

a) Method whereby each of the multiple processors executes different instructions with its own data while communicating with each other
b) Method whereby each of the multiple processors executes the same single instruction with its own data in a parallel way while synchronizing with the other processors
c) Method whereby one processor reduces its execution time of a single instruction as much as possible
d) Method whereby one processor simultaneously executes multiple instructions with slight delays in time

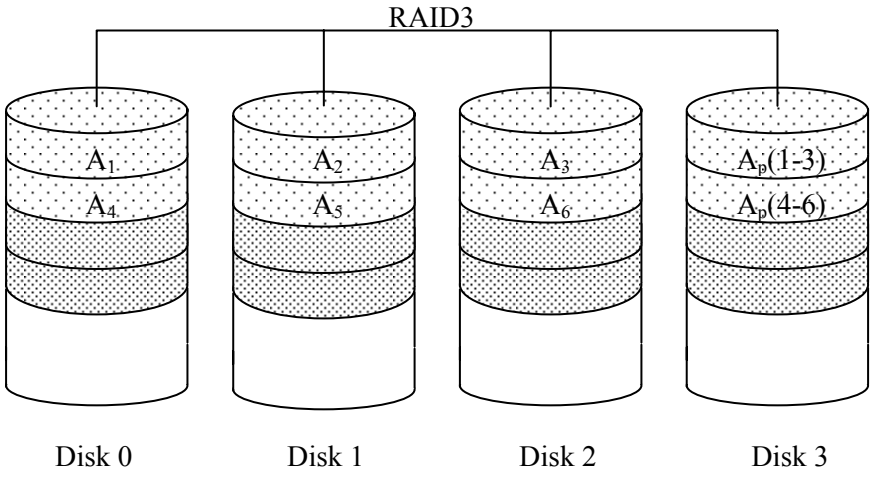
Q22. Which of the following appropriately describes cache memory?

a) An interrupt occurs if a cache miss is detected when the main memory is accessed, and the program transfers data from the main memory to the cache memory.
b) The cache memory is used to make up the difference of capacity between the real memory and the virtual memory.
c) The demand for cache memory is decreasing due to the rapid increase in the access speed of semiconductor memory.
d) Two methods exist: one is to rewrite both the cache and main memory when a write instruction is executed; the other is to rewrite only the cache memory while the main memory is not rewritten until the data is removed from the cache memory.

Q23. In the RAID3 system shown below, three disks (Disks 0 through 2) for byte-striped data and one dedicated parity disk (Disk 3) are used as one volume. Parity byte Ap is generated by calculating the exclusive OR (XOR) of three bytes in Disks 0 through 2. For example, Ap (1-3) is calculated as follows:

$$Ap(1\text{-}3) = A_1 \text{ XOR } A_2 \text{ XOR } A_3$$

In the case of drive failure, data recovery can be accomplished by using the information recorded on the remaining three error-free drives. Which of the following operations should be executed for this data recovery?



a) AND
b) OR
c) XNOR (Exclusive NOR)
d) XOR (Exclusive OR)

Q24. A system manages files by allocating file storage on a block-by-block basis, where each block consists of eight 500-byte sectors. How many sectors in total are required to store two files: one with 2,000 bytes and the other with 9,000 bytes? Here, sectors for management information such as directories can be ignored.

a) 22
b) 26
c) 28
d) 32

Q25. Which of the following is an appropriate description concerning the characteristics of USB?

a) It has three data transfer modes: high-speed mode for external hard disks, full-speed mode for printers and scanners, and low-speed mode for keyboards and mice.
b) It is a high-speed interface suitable for data transfer that requires real-time processing, such as transfer of audio and visual data; it is also called FireWire.
c) It is a parallel interface for connecting a small computer such as a PC to a peripheral device such as a hard disk or a laser printer.
d) It is a serial interface that was originally the standard used for modem connections but is now used to connect PCs to peripheral devices as well.

Q26. A computer consists of units that execute five functions: input, storage, processing, control, and output. From which unit is an instruction fetched and by which unit is the instruction decoded?

	Fetch	Decode
a	Control	Processing
b	Input	Processing
c	Processing	Control
d	Storage	Control

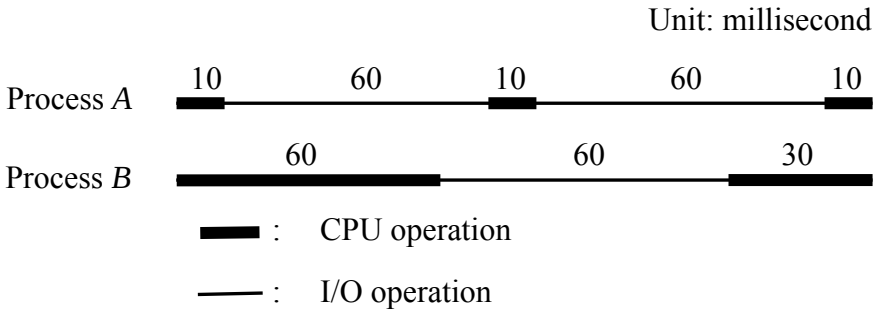
Q27. In a multiprogramming environment, there is a need to limit access to shared resources; that is, the current process has exclusive use of the assigned resources for some period of time. Which of the following appropriately describes the function to successfully implement this type of exclusive control?

a) A dispatcher is used to determine which resource should be allocated to which process and to restrict access to a specific resource.
b) A semaphore variable is used to indicate the status of common resource.
c) An interrupt is generated to signal to all processes that the use of a specific resource is restricted for some period of time.
d) Spooling is used to enable exclusive control of a process by means of a queue.

Q28. In virtual memory systems, serious degradation of system performance may occur due to a large number of page faults. Which of the following terms most appropriately describes this situation?

a) Caching b) Paging c) Swapping d) Thrashing

Q29. Two processes *A* and *B* with the same priority are executed in a round-robin method with a time slice of 30 milliseconds on a single CPU, but they use respectively different I/O devices. When they are executed as a standalone process, their processing times and sequences are shown in the figure below. How long (in milliseconds) does it take to complete both processes? Here, the two processes are alternately executed; that is, the first is *A*, the second *B*, and then *A* again. The multi-processing overhead of OS can be ignored, and both CPU and I/O operations can be executed concurrently.



a) 150 b) 160 c) 170 d) 180

Q30. The FIFO method is used as the page-replacing algorithm in virtual memory. There are 3 page frames available for a program in main memory, and the page numbers referred to by a program are 4 → 3 → 2 →1 → 3 → 5 → 2 in this order. How many times does page-in occur during execution of the program? Here, nothing is loaded into main memory in the initial state.

a) 2 b) 3 c) 5 d) 6

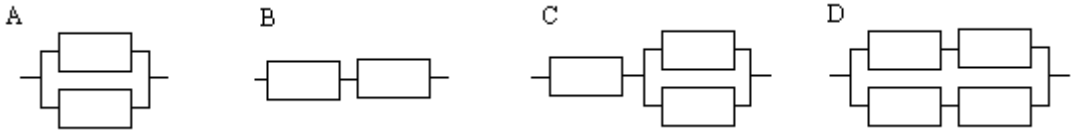
Q31. Which of the following is an appropriate description concerning throughput?

a) Spooling in which the output to the printer is temporarily stored on a hard disk drive is helpful for increasing the throughput.
b) Throughput is an index of the CPU performance, and it is not affected by input/output speed, overhead time, and so on.
c) Throughput is not affected even if an operator intervention between jobs causes idle time in the system.
d) While multiple programming contributes to reduction in turn-around time, it does not help increase the throughput.

Q32. Last year, a company providing web application services needed an Internet line to service clients' demand at that time. However, in order to increase availability, the company actually made use of two Internet lines from different vendors. This year, the demand is doubled and both lines are fully busy, so the company will install one more Internet line. Each of the Internet lines has availability of 80%. What percentage of availability will be cut down after the installation?

a) 0.8 b) 4.8 c) 7.8 d) 12.8

Q33. Which of the following is the system configuration with the highest availability? Here, each unit shown by a box has the same availability (less than 1), and multiple units connected in parallel are considered operating if at least one unit is operating.



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

Q34. Which of the following is an appropriate language that can be used to develop applications running mainly on Web browsers?

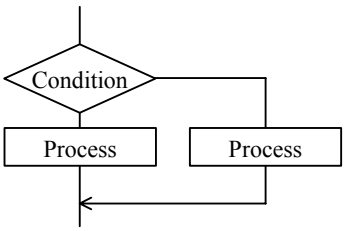
a) Java Applet
b) JavaBeans
c) JavaScript
d) Java Servlet

Q35. Which of the following appropriately describes a typical feature of ADSL?

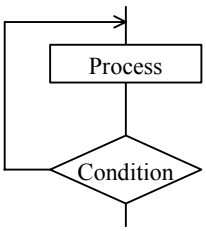
a) By separating the frequency bands used by analog telephones and data communications, it allows both of these connections to be used simultaneously.
b) Compared to single use of a PC, the use of a splitter reduces the communication speed when both analog telephone and the PC are used at the same time.
c) It achieves high-speed communication by using a bundle of multiple channels of 64Kbps.
d) The communication speed varies between upstream (from the user to the telephone company) and downstream; it is suitable for communication applications where the amount of upstream data is large.

Q36. Which of the following flowcharts illustrates a "while repetition structure" in the control structure of programs?

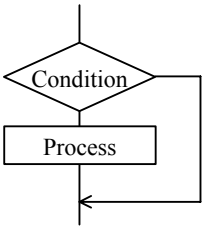
a)



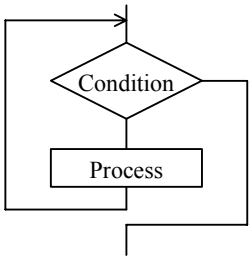
b)



c)



d)

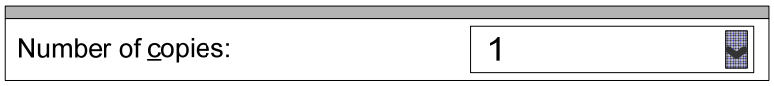


Q37. Which of the following is an appropriate description concerning the spiral model?

a) A prototype is created for each phase of the waterfall model and the specifications are checked, in order to eliminate the difficulty of checking the specifications required by documents.
b) System development proceeds in the order of process flow, so going back upstream results in a significant loss of efficiency.
c) Systems are developed in a short time by involving users, performing development in small groups and utilizing development tools.
d) The design and implementation of an application is performed for a unit of component, and then this process is repeated successively for every component.

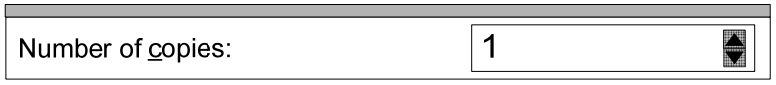
Q38. In the GUI design of visual panels, how to input the data of "Number of copies" is under review. If there are both keyboard and mouse available as input devices, which of the following options is the best choice that can be acceptable to a wide range of users? Here, the value of "Number of copies" can range from 1 up to the maximum number of copies.

a) [Drop-down list]

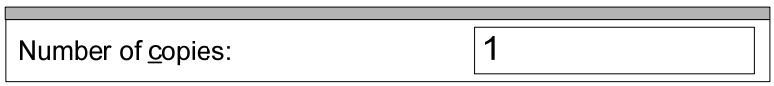


b) [Radio button]

c) [Spin box]



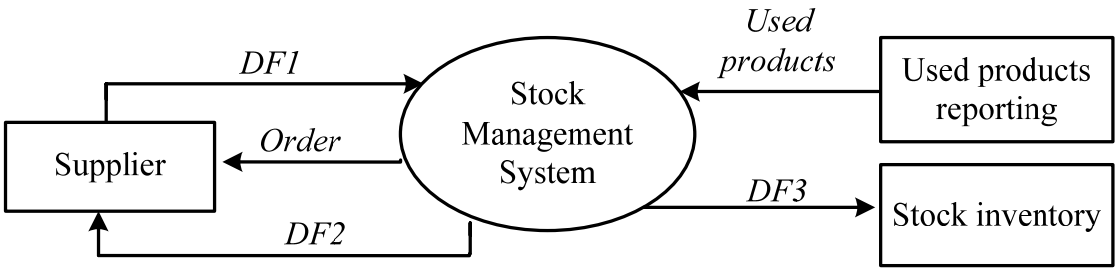
d) [Text input field]



Q39. Which of the following characteristics can be found in well-designed modules with a high degree of independence?

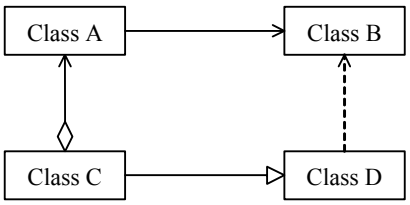
a) High coupling and high cohesion
b) High coupling and low cohesion
c) Low coupling and high cohesion
d) Low coupling and low cohesion

Q40. In the context diagram illustrated below, which of the following combinations appropriately describes data flows *DF1*, *DF2*, and *DF3*?



	DF1	*DF2*	*DF3*
a	Delivery invoice	In-stock inventory	Payment bill
b	Delivery invoice	Payment bill	In-stock inventory
c	In-stock inventory	Payment bill	Delivery invoice
d	Payment bill	Delivery invoice	In-stock inventory

Q41. Which classes are in the relationship of aggregation in the UML class diagram shown below?



a) Class A and Class B
b) Class A and Class C
c) Class B and Class D
d) Class C and Class D

Q42. In object orientation, the term “open (white box) reuse” refers to the reusing of base-class data and functions by creating subclasses for the base class. Which of the following is the appropriate description concerning the reuse technology in object orientation of this method?

a) Changes in the base class do not affect the subclasses.
b) Only differences between the data and functions defined by the base class and those of subclasses can be stated in subclasses, so development is highly efficient.
c) Since the data defined in the base class is protected, programs with a high degree of safety can be developed.
d) The base class can be used to develop multiple applications, but its subclasses cannot be re-used.

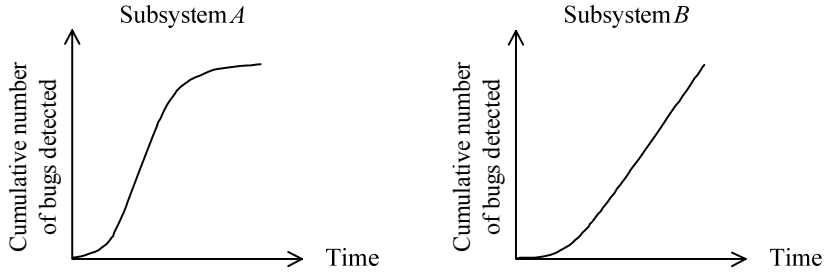
Q43. Which of the following is the method in which the designer and a group of involved personnel review the design documents at the completion of each design for the purpose of early detection of design errors?

a) Desktop debugging
b) Parallel simulation
c) Top-down testing
d) Walk-through

Q44. A certain system is being developed separately as Subsystems *A* and *B*. Each subsystem test has just been completed. The test data up to this point is shown in the table below. Here, the number of standard test items for this system is 10 items/Ksteps.

Subsystem name	Development size	Number of test items	Number of unresolved bugs
A	30 Ksteps	300	0
B	20 Ksteps	200	0

The following graphs show the numbers of bugs detected so far.



When Subsystems *A* and *B* have the same level of difficulty, which of the following appropriately evaluates the current status?

a) About the same number of bugs has been detected in both of the subsystems, so both can be considered practically identical in quality.
b) In both subsystems, the number of unresolved bugs is 0, so both can be considered fully tested.
c) Neither of the subsystems has stable quality, so both can be considered to be tested additionally.
d) The number of bugs detected by the test is reaching the saturation level in Subsystem *A* compared to Subsystem *B*, so Subsystem *A* can be considered superior in quality.

Q45. Which of the following appropriately explains a tracer as one of the dynamic debugging tools?

a) At an abnormal end of the program, it outputs the contents of the memory and registers.
b) Every time it executes code for debugging, which is embedded in the program, it outputs the contents of the memory and registers.
c) It creates a pseudo-environment necessary for the execution of the program.
d) It outputs the contents of the memory and registers in order to monitor the results of the program execution in chronological order.

Q46. There are seven activities, *a* through *g* shown in the table below. At least how many days does it take to complete these seven activities? Here, 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. The optimistic time estimate is *x* in days, the most likely or normal time estimate is *y*, and the pessimistic time estimate is *z*. The expected time T_e is computed using the formula $(x + 4y + z)/6$.

Unit: day

Activity	Preceding activity	Optimistic *x*	Normal *y*	Pessimistic *z*	T_e $(x + 4y + z) / 6$
a	--	2	4	6	4.00
b	--	3	5	9	5.33
c	*a*	4	5	7	5.17
d	*a*	4	6	10	6.33
e	*b, c*	4	5	7	5.17
f	*d*	3	4	8	4.50
g	*e*	3	5	8	5.17

a) 15.67 b) 19.51 c) 19.69 d) 20.00

Q47. Full backup and differential backup are two methods of backing up a database. Which of the following appropriately describes the differential backup method?

a) It requires a longer backup time than full backup.
b) Only the differential data must be restored at error recovery time, so the recovery time is shorter than that of the full backup method.
c) This method cannot be used in alternation with full backup.
d) To recover a database, the full backup data is restored and then the differential backup data is added.

Q48. Which of the following most appropriately describes the handling of control information in system operation management?

a) The system should be managed by a single manager. Control information should be disclosed to the general user after its security level and other factors are considered.
b) The system should be managed by a small group of managers. The management account should be exclusive to the group and should be shared. Control information should be disclosed to the general user after its security level and other factors are considered.
c) The system should be managed by a small group of managers. The management account should be exclusive to the group and should be shared. Control information should be disclosed to the general user so that each user can check the information.
d) The system should be managed by a small group of managers. Each manager should be given an exclusive and separate account. Control information should be disclosed to the general user after its security level and other factors are considered.

Q49. Which of the following is an appropriate description concerning countermeasures to online system failures?

a) Backup files for journal files and master files should be stored at the same location as the original files so that they can be used quickly for system recovery.
b) If a transaction could not be completed properly, roll-forward should be performed to return to the state immediately before the transaction began.
c) Most up-to-date data immediately before the system failure occurred should be recovered using the master file as well as the transaction files prepared on a regular basis to update the master file.
d) The master file should be backed up not only at the completion of online service but at times corresponding to the characteristics of the system.

Q50. Which of the following can make MTBF longer in system maintenance?

a) To disperse a single-location maintenance center to various locations
b) To do preventive maintenance
c) To do provisional maintenance where a failure has occurred
d) To do remote maintenance

Q51. When a network device is connected to the LAN with the network address of 201.12.1.64 and the subnet mask of 255.255.255.192, which of the following IP addresses should NOT be assigned to the device on the network?

a) 201.12.1.65
b) 201.12.1.96
c) 201.12.1.126
d) 201.12.1.127

Q52. Which of the following is the appropriate protocol that is widely used with TCP/IP networks to collect and manage information from network devices such as servers, routers, switches, and hubs?

a) HTTP
b) HTTPS
c) SMTP
d) SNMP

Q53. Which of the following is the appropriate protocol that is used to send e-mail messages from one server to another over the Internet?

a) FTP b) HTTP c) POP3 d) SMTP

Q54. Which of the following operations is performed on the packet header while the data packet moves from the lower to upper layers according to the OSI basic reference model?

a) Header addition
b) Header deletion
c) Header modification
d) Header rearrangement

Q55. Which of the following occurs when computer *A* broadcasts an ARP request to find the MAC address of computer *B* on the same network?

a) All computers in network receive the request from *A*, and all of them reply to *A* with the MAC address of *B*.
b) All computers in network receive the request from *A*, and only *B* replies to *A* with its MAC address.
c) DNS server replies to *A* with the MAC address of *B*.
d) The nearest router that receives the request from *A* replies to *A* with the MAC address of B or forwards the request to another router.

Q56. Which of the following is the general-purpose markup language that allows its users to define their own tags and to facilitate the sharing of data across different information systems, particularly via the Internet?

a) HTML b) SGML c) UML d) XML

Q57. Which of the following is the key technology that enables to connect a computer using a private IP address to the Internet?

a) BOOTP b) DHCP c) NAT d) RARP

Q58. Which of the following provides the function of mapping between domain names and IP addresses in a TCP/IP network?

a) DHCP b) DNS c) SNMP d) Proxy

Q59. Which of the following is an appropriate purpose of installing a firewall in a computer network?

a) To authenticate internal users
b) To block and permit data traffic
c) To protect a computer from computer viruses
d) To verify company policies

Q60. Which of the following is described graphically using an E-R diagram?

a) Data flows between processes
b) Data source and destination
c) Entities and relationships between entities
d) Hierarchical data structure

Q61. You are building a new database for a company with 10 departments. Each department contains multiple employees. In addition, each employee might work for several departments. How should you logically model the relationship between the department entity and the employee entity?

a) Create a mandatory one-to-many relationship between department and employee.
b) Create a new entry, create a one-to-many relationship from the employee to the new entry, and create a one-to-many relationship from the department entry to the new entry.
c) Create a new entry, create a one-to-many relationship from the new entry to the employee entry, and then create a one-to-many relationship from the entry to the department entry.
d) Create an optional one-to-many relationship between department and employee.

Q62. Which of the following is an appropriate explanation concerning functions of keywords in SQL?

a) "HAVING" specifies a search condition for an aggregate or a group.
b) "INDEX" is a special way to join two or more tables.
c) "LIKE" is used along with JOIN clause.
d) "VALUES" is used to sort the data in ascending or descending order.

Q63. User *A* issues the command as follows:

```
UPDATE cust_orders
SET id = 200
WHERE id = 1
```

Then user *B* issues this command as follows:

```
UPDATE cust_orders
SET id = 300
WHERE id = 1
```

User *B* informs you that his/her UPDATE statement seems to be hung. Which of the following is a possible solution that you can find?

a) Ask user *A* to commit the transaction.
b) Ask user *B* to abort the statement.
c) Ask user *B* to commit the transaction.
d) No action is required.

Q64. There is a table including the data items shown below. Which of the following SQL statements can insert a new row in the "student" table?

Name	Null?	Type
STUD_ID	NOT NULL	NUMBER(3)
NAME	NOT NULL	VARCHAR2(25)
ADDRESS		VARCHAR2(50)
GRADUATION		DATE

a)
```
INSERT INTO student (stud_id, address, graduation)
  VALUES (101, 'Dave', '100 Happy Lane', '2001-06-14');
```

b)
```
INSERT INTO student (stud_id, address, name, graduation)
  VALUES (101, '100 Happy Lane', 'Dave', '2001-06-14');
```

c)
```
INSERT INTO student
  VALUES (101, '100 Happy Lane', '2001-06-14', 'Dave');
```

d)
```
INSERT INTO student
  VALUES (101, 'Dave', '100 Happy Lane', '2001-06-14');
```

Q65. There is a student score table shown below with basic and advanced subject codes which begin with letters A and B respectively. Which of the following SQL statements can be used to retrieve students, from the score table, whose basic score is 70 or more and examination date is 2007-05-04?

score_ table

student_number	subject_code	score	examination_date
1221	A01	70	2007-05-03
1201	A01	60	2007-05-03
1231	A02	90	2007-05-03
1201	B01	85	2007-05-04
1231	B01	80	2007-05-04
1231	B02	75	2007-05-03
1221	B02	60	2007-05-04

a)
```
SELECT * FROM score_table
  WHERE score >=70 AND examination_date = '2007-05-04'
```

b)
```
SELECT student_number FROM score_table
  WHERE score >=70 AND examination_date = '2007-05-04'
```

c)
```
SELECT student_number FROM score_table
  WHERE score >=70 AND examination_date = '2007-05-04' AND
  subject_code LIKE 'B%'
```

d)
```
SELECT * FROM score_table
  WHERE score >=70 AND examination_date = '2007-05-04' AND
  subject_code LIKE 'B_ _'
```

Q66. In database recovery management, which of the following appropriately explains incremental logging with deferred update?

a) Both the old and new values of the updated item are stored in the log.
b) Neither the old nor new value is stored in the log.
c) The new value of the updated item is stored in the log.
d) The old value of the updated item is stored in the log.

Q67. A store intends to use public key cryptography so that it may receive orders from customers through a network without exposing the contents of the orders to third parties. Which of the following is the appropriate combination of keys used by both the store and customer?

	Store	Customer
a	Private key	Private key
b	Private key	Public key
c	Public key	Private key
d	Public key	Public key

Q68. What is the purpose of attaching a digital signature to software disclosed on the Internet?

a) To guarantee that the software contents have not been tampered with
b) To limit the use of the software to certain specified users
c) To make it clear that the copyright of the software belongs to the person whose signature appears there
d) To notify that the software's author is the person in charge of maintenance

Q69. Which of the following can be realized by using the packet filtering function of a firewall?

a) To allow only the packets with specific TCP port numbers to pass from the Internet through to the internal network
b) To change a packet with a dynamically assigned TCP port number to a TCP port number that is fixed at the receiving side and allow it to pass through to the internal network
c) To check for tampering in the header and/or data of a packet received on the Internet and remove the packet if tampering has been found
d) To repair a packet received on the Internet if it has been tampered with, or to record the packet in a log and prevent the packet from passing through to the internal network if the tampering cannot be repaired

Q70. Which of the following is the salami technique used in computer crime?

a) Illegally intercepting audio and/or data being transmitted or received on a network
b) Secretly gaining access to a part of the line to steal someone's password and/or ID and to steal data
c) Secretly searching for information left inside or around a computer after a program is executed, for the purpose of obtaining necessary information
d) Stealing from multiple assets little by little, to a degree that the illegal action does not come to the surface and become noticeable

Q71. Which of the following is a method of phishing?

a) A virus-infected computer is controlled from the outside via a network such as the Internet.
b) Personal information such as the IP address and Web browsing history of computer users is secretly collected and sent to the outside.
c) Someone sends e-mails to entice the recipients and to have them access fake Web sites that appear to be sites of actually existing companies etc. and steals personal information.
d) When there is a part that directly displays what has been entered on a Web page, a malicious script is embedded within the page, causing damage to the user and the server.

Q72. Which of the following is a characteristic of the QR code?

a) Characters except in binary form can be expressed by the code.
b) It can contain up to 128 alphanumeric characters or up to 64 double-byte characters.
c) It is a programming language and is executable on the cell phone.
d) Using three symbols for detection, the code makes it possible to recognize the rotation angle and the direction of reading.

Q73. A data warehouse was set up, but it is hardly used. The result of a hearing suggests that the users' skill level is lower than expected. Which of the following is an appropriate measure for improvement to promote usage?

a) To add more information that is believed to be requested by users
b) To prepare, as standards, templates according to data extraction and analysis patterns
c) To provide the data more close to real time, and improve the data precision
d) To send a notice to promote usage through management

Q74. Which of the following appropriately describes financial statements?

a) Balance sheet is the statement of the book value of the company's financial condition. It contains two parts, the assets and liabilities. The two sides must be balanced.
b) Cash flow statement presents the incoming and outgoing money at a period in time. It is used to determine the long-term viability of the company and its capacity to pay dividends to its investors.
c) Profit and loss statement is also known as the income statement. This presents how revenues are converted to net income by reporting both revenues and expenses of the company for a given period of time.
d) Statement of retained earnings reports the owner's equity. It requires information from the balance sheet and provides information for the income statement.

Q75. Which of the following is the appropriate statement according to the Pareto analysis (also known as the 80-20 rule)?

a) This is the idea that 20% of tasks can be completed in 80% of the disposable time. The remaining 80% of tasks will take up 20% of the time.
b) This is the idea that 50% of tasks can be completed in 80% of the disposable time. The remaining 50% of tasks will take up 20% of the time.
c) This is the idea that 80% of tasks can be completed in 20% of the disposable time. The remaining 20% of tasks will take up 80% of the time.
d) This is the idea that 80% of tasks can be completed in 50% of the disposable time. The remaining 20% of tasks will take up 50% of the time.

Q76. The seven traditional, fundamental quality control tools consist of Check sheet, Pareto chart, Stratification, Scatter Diagram, Histogram, and Control Chart. What is the last (or 7th) one?

a) Affinity diagram
b) Cause and effect diagram
c) Relation diagram
d) Tree diagram

Q77. The activities *A* to *E* shown below are planned in a system development project. What is the highest possible weekly cost (in dollars) of this project?

Activity	Description	Time (weeks)	Cost ($/week)	Preceding activity
A	Setting up	3	1,100	
B	Data collection	4	600	
C	Analysis	6	900	*A, B*
D	Design	7	850	*B*
E	Documentation	2	500	*C*

a) 1,100 b) 1,700 c) 1,750 d) 1,950

Q78. A server runs a regional web application. It services the requests coming in from all regional offices. Each request is completed in 80 milliseconds on average. A total of 10 requests per second arrive at the server on average. If the M/M/1 queuing model can be applied, how many requests are waiting for the service on average?

a) 3.20 b) 4.00 c) 4.66 d) 5.00

Q79. The sales volume of the next month is predicted by the data in the past. The sales volume is changed greatly from month to month, but the annual fluctuation pattern is almost the same every year. Which of the following is the most appropriate formula that can be used for calculating the sales volume of the next month? Here, P_{t+1} is the sales volume predicted for the next month, S_t is the sales volume of the current month t, and the data is retained for three years.

a) $P_{t+1} = (S_t + S_{t-1} + S_{t-2}) / 3$
b) $P_{t+1} = S_t \times S_t / S_{t-1}$
c) $P_{t+1} = (S_t + S_{t-12} + S_{t-24}) / 3$
d) $P_{t+1} = (S_{t-11} + S_{t-23} + S_{t-35}) / 3$

Q80. There are goods whose unit purchase prices are gradually rising. There was an inventory of these goods at the end of the last accounting period, and the goods were carried into and out of the warehouse several times during the current period. Which of the following valuation methods produces the lowest valuation of the inventory at the end of the current period?

a) Average cost method
b) First-in first-out method
c) Last-in first-out method
d) Moving average method