

2001 SPRING

Software Design and Development Engineer Examination (Morning)

Questions must be answered in accordance with the following:

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

Instructions:

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

(1) Examinee Number

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

(2) Date of Birth

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

(3) Answers

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

Mark your answers as shown in the following sample Question.

[Sample Question]

In which month is the Spring Software Design and Development Engineer Examination conducted?

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

Since the correct answer is “b” (April), mark your answer sheet as follows:

[Sample Reply]



3. After the test, you may take this question booklet home with you.

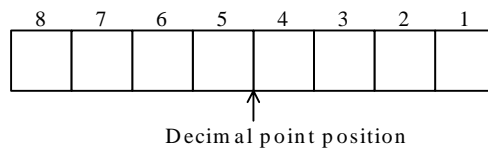
**Do not open the exam booklet until instructed to do so.
Inquiries about the exam questions will not be
answered.**

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Q1. Hospital A has 500 patient rooms, each numbered with a three-digit number beginning at 001. However, the digits 4 and 9 are not used anywhere in any room numbers. What is the room number for the 125th room?

- a) 150 b) 166 c) 175 d) 186

Q2. What is the 8-bit fixed-point binary representation of the decimal number -5.625 ? In this problem, the decimal point position comes between the 4th and 5th bits, and two's complement is used for negative numbers.



- a) 01001100 b) 10100101 c) 10100110 d) 11010011

Q3. The function $\text{Random}(n)$ is a function which returns an integer between 0 and $n-1$ with uniform probability. When the following series of operations is executed for the integer type variables A , B and C , what is the probability that C will be 0?

$A = \text{Random}(10);$
 $B = \text{Random}(10);$
 $C = A - B$

- a) $\frac{1}{100}$ b) $\frac{1}{20}$ c) $\frac{1}{10}$ d) 1

Q4. $X \text{ NAND } Y$ is the negation logical product of X and Y and is defined as $\text{NOT } (X \text{ AND } Y)$. What is the logical formula for $X \text{ OR } Y$ using only NAND?

- a) $((X \text{ NAND } Y) \text{ NAND } X) \text{ NAND } Y$
- b) $(X \text{ NAND } X) \text{ NAND } (Y \text{ NAND } Y)$
- c) $(X \text{ NAND } Y) \text{ NAND } (X \text{ NAND } Y)$
- d) $X \text{ NAND } (Y \text{ NAND } (X \text{ NAND } Y))$

Q5. Which of the following is equivalent to the difference set $S-T$? In this problem, \cup represents "sum," \cap represents "product," and c represents "complement."

- a) $S \cup (S \cap T)$
- b) $S \cup T^c$
- c) $S \cap (S \cup T)$
- d) $S \cap T^c$

Q6. Of the methods used for error control for main memory in a computer, which method can correct 1 bit errors and detect 2 bit errors?

- a) Odd parity method
- b) Longitudinal parity method
- c) Check digit method
- d) Hamming code method

Q7. The following represents part of the syntax in BNF (Backus Normal Form) for a programming language. Which of the possible answers is correct for <parameter specification>?

<parameter specification> ::= <parameter> | (<parameter specification>, <parameter>)
 <parameter> ::= <alphabetic character> | <parameter> <alphabetic character>
 <alphabetic character> ::= a|b|c|...|x|y|z

- a) ((abc, def))
- b) ((abc, def), ghi)
- c) (abc)
- d) (abc, (def))

Q8. When using the postposition notation (reverse Polish notation), the expression $X = (A - B) \times C$ is expressed as $XAB - C \times =$. Which of the possible answers is the correct expression in the postposition notation for the following expression?

$$X = (A + B) \times (C - D \div E)$$

- a) $XAB + CDE \div - \times =$
- b) $XAB + C - DE \div \times =$
- c) $XAB + EDC \div - \times =$
- d) $XBA + CD - E \div \times =$

Q9. Which of the following descriptions of data structures is the proper description of a B tree?

- a) This structure stores records by finding the physical storage address from a record key value according to a specific algorithm.
- b) This structure dynamically re-positions each node in the index in such a way that, considering the key value of this node as middle value, the number of the lower-level records with smaller key values and the number of lower-level records with larger key values are balanced within a given allowance range.
- c) This structure associates and stores records using pointers that logically link records independently from their physical location.
- d) This structure stores records into access units (pages) such as tracks in the ascending order of the key values, and creates an index that contains the largest key value in each page and the address of this page.

Q10. Consider a unidirectional list such as given in the figure below. “Tokyo” is at the top of the list and the value of the associated pointer is the address for the data that follows next. “Milan” is at the end of the list and the value of the associated pointer is 0. Which of the possible answers is the correct procedure for switching “London” and “Paris?”

Pointer to data at top of list	Address	Data	Pointer
120	100	Vienna	160
	120	Tokyo	180
	140	Paris	999
	160	Milan	0
	180	London	100

- a) Set the value of the pointer for Paris to “100,” and set the pointer for Tokyo to “140.”
- b) Set the value of the pointer for Paris to “100,” and set the pointer for London to “140.”
- c) Set the value of the pointer for Paris to “180,” and set the pointer for Tokyo to “140.”
- d) Set the value of the pointer for Paris to “180,” and set the pointer for London to “140.”

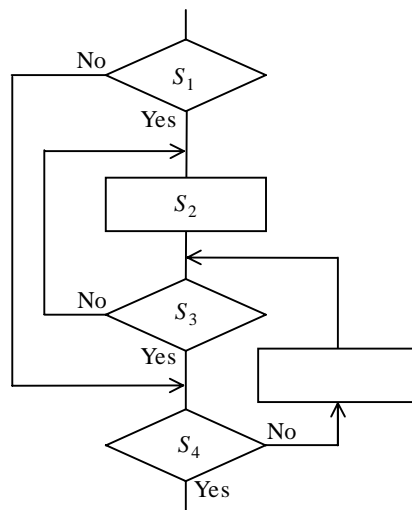
Q11. Which is the proper algorithm to be used for searching for a specific piece of data out of multiple pieces of data which are randomly ordered?

- a) Binary search
- b) Linear search
- c) Hash method
- d) Monte Carlo method

Q12. The function $fact(n)$ returns the n factorial $n!$ for the non-negative integer n . Which is the recursive definition for $fact(n)$?

- a) if $n = 0$ then return 0 else return $n * fact(n - 1)$;
- b) if $n = 0$ then return 0 else return $n * fact(n + 1)$;
- c) if $n = 0$ then return 1 else return $n * fact(n - 1)$;
- d) if $n = 0$ then return 1 else return $n * fact(n + 1)$;

Q13. In the following flowchart, the number of times that steps S_1 , S_2 , S_3 and S_4 are executed before “Yes” results at step S_4 are n_1 , n_2 , n_3 and n_4 , respectively. Which expression represents the relationship between n_4 and n_1 , n_2 and n_3 ?



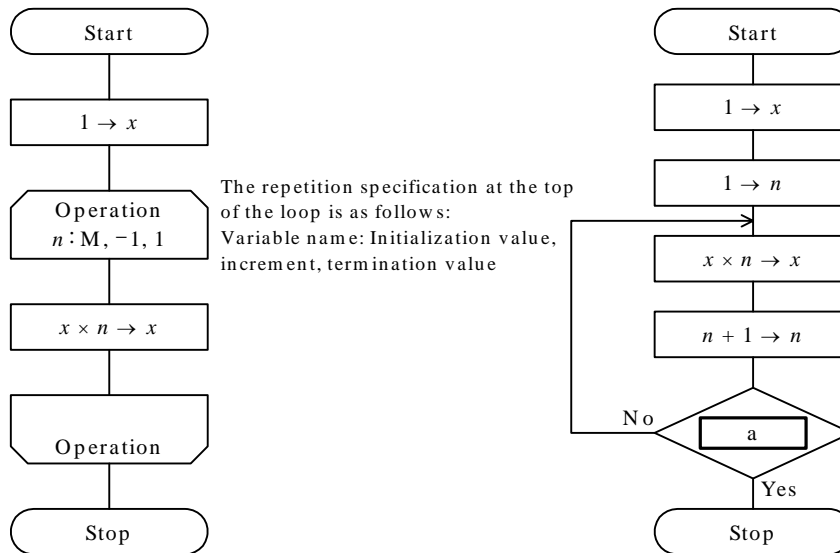
- a) $n_4 = n_1 + n_2 + n_3$
- b) $n_4 = n_1 + n_2 - n_3$
- c) $n_4 = n_1 - n_2 + n_3$
- d) $n_4 = -n_1 + n_2 + n_3$

Q14. A search is made for a character string consisting of multiple alphabetic characters and a “.” used as a delimiter. If an “*” is used to represent any character string of 0 or more characters in length and a “?” is used to represent any single character, then which of the possible answers matches the following expression?

$A?B*A.?AB*$

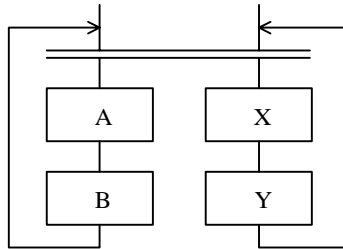
- a) AABA.BABBB
- b) AABBAB.ABAB
- c) ABABA.BABA
- d) ABBBA.BAABB

Q15. When the algorithms given by the following two flowcharts are executed for positive integer M , we want to make the resulting value of x the same in both cases. Which of the following conditions should be placed in box a in order to do this?



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

Q16. When the processing represented by the following flowchart is executed several times, which of the execution sequences can actually occur during the processing? In this problem, the double line represents the synchronization of parallel processing.



- a) $B \rightarrow A \rightarrow B \rightarrow A$
- b) $B \rightarrow X \rightarrow A \rightarrow Y$
- c) $X \rightarrow B \rightarrow A \rightarrow Y$
- d) $Y \rightarrow X \rightarrow B \rightarrow A$

Q17. Which of the following descriptions comparing a CMOS processor to a bipolar processor is correct?

- a) It is capable of faster operations.
- b) It permits a higher level of integration.
- c) It has a higher tolerance to static electricity.
- d) It is more susceptible to noise from the power source.

Q18. As one technique to increase processor speed, which of the methods below aims at reduced CPI (Cycles Per Instruction) by grouping simultaneously executable operations into a single compound instruction at compilation time?

- a) MIMD
- b) RISC
- c) SCSI
- d) VLIW

- Q19.** Which of the following is the appropriate description of CISC features?
- a) They include instruction sets for both fixed point, decimal arithmetic operations, etc.
 - b) Implementation using wired logic is relatively easy because of the simplified instruction set.
 - c) The logic used to decode instructions is simple because the instruction length is fixed.
 - d) The only memory reference instructions available are the load and store instructions.
- Q20.** Which of the following is the appropriate description of the clock frequency of a PC?
- a) The clock frequency of the CPU need not have the same value as the clock frequency of the system bus connected to the main memory.
 - b) The inverse of the clock frequency of the CPU represents the number of instructions which can be executed per second.
 - c) If the clock frequency of the CPU is increased by a factor of 2, 3, 4, etc., the overall system performance is also increased proportionally by a factor of 2, 3, 4, etc.
 - d) If two PCs use CPUs of the same type and of the same clock frequency, one can safely conclude that they have the same performance as executing programs on two PCs.
- Q21.** RAID5 is one of RAID (Redundant Array of Inexpensive Disks) technologies. Which is the appropriate description of RAID5?
- a) It writes data in units of bits onto distributed magnetic disks, and then writes a parity bit onto a single magnetic disk.
 - b) It writes data in units of blocks to distributed magnetic disks, and then writes parity blocks concentratively to a single magnetic disk.
 - c) It writes data in units of blocks to distributed magnetic disks, and then writes a parity block to more than one distributed magnetic disk.
 - d) It refers to mirrored magnetic disks.

Q22. Which of the following is the appropriate description of the features and applications of optical disk drives?

- a) Offering relatively fast access and data transfer, they are used widely on various kinds of equipment from mainframes to PCs in order to implement virtual storage.
- b) Coming in read-only types, write-once types, and erasable types, they are used to save large amounts of data such as image data.
- c) They are used to store data of the order of 1 MB, are notable for their light weight and low prices, and are therefore easily replaceable.
- d) Used from early on for auxiliary storage, they have been used for information interchange and for archiving files. Currently, the main types are cartridge types rather than open-reel types.

Q23. Which of the following is the most appropriate description of I/O processing handled by DMA control?

- a) The CPU directly controls the I/O devices and performs data transfer.
- b) Data is transferred between the I/O devices and main memory without passing through the CPU.
- c) Data is transferred between the I/O devices and main memory using channel connections.
- d) Data transfer is performed by a processor dedicated to I/O control.

Q24. Which of the following thin display devices uses the cells which emit light using discharge electricity such as in a neon tube, and offers high contrast and a wide field of view?

- a) CRT
- b) DSTN liquid crystal display
- c) TFT liquid crystal
- d) Plasma display

Q25. Which of the following descriptions concerning task scheduling by an operating system is correct?

- a) The multiple queuing method first allocates low priority and long CPU times to the task for which allocation is requested, and then increases priority and gradually reduces the CPU time for it.
- b) The first-come first-served (FCFS) method allocates to tasks, CPU time with priorities in the order that the tasks are created. This aims at giving higher priorities to the tasks which started ahead of others and having them finish early.
- c) The shortest expected processing time first (SEPT) method improves the overall efficiency of system processing by increasing priorities of the tasks which have been using little CPU time, and by decreasing priorities of the tasks which have been using much CPU time.
- d) The round robin method allocates CPU time to the tasks in the requested order, and places at the end of the queue the task which has consumed the CPU time allocated to it.

Q26. Which of the following is the most appropriate description of preemption in the case of a real-time operating system?

- a) A task being executed is suspended at a specified interval and another ready task is executed.
- b) When a task being executed terminates or enters wait status, another ready task is executed.
- c) If a task with a higher priority than the one being currently executed becomes ready, the latter is suspended and the higher priority task is executed.
- d) If a high priority task is waiting for a low priority task to be terminated, the priority level of the low priority task is temporarily increased so that it may be executed.

Q27. Which is the correct combination of functions A through C when describing input-output control?

Function	Description
A	Performs I/O device-dependent processing, is provided for each type of the device, and controls one or more devices. If a read or write I/O request occurs, that device is directly operated and managed.
B	A dedicated process handles I/O operations for which speed is not so necessary, such as file output to a printer, or file transfer over the serial line, allowing I/O operations and program execution to be performed in parallel.
C	Performance is improved by increasing the parallel operations for program I/O and processing. To accomplish this, several regions are allocated in main memory to perform I/O, and these memory regions are shared by several programs.

	A	B	C
a)	Spooling	Device driver	Buffer pool
b)	Spooling	Buffer pool	Device driver
c)	Device driver	Spooling	Buffer pool
d)	Device driver	Buffer pool	Spooling

Q28. “Memory leak” is a cause of system failure. Which of the following is the appropriate description of a “memory leak?”

- a) Part of a program residing in memory is paged out arbitrarily.
- b) A process writes its results outside the memory region which is secured for itself, and destroys the regions of other processes.
- c) As many processes repeatedly start and stop, many unused memory regions are created here and there, causing a reduction in the efficiency of memory utilization.
- d) Memory space secured by processes is not released even after it is no longer needed, thus gradually reducing the memory space which can be used by the system.

Q29. Which is the correct combination of functions A through C when describing memory control?

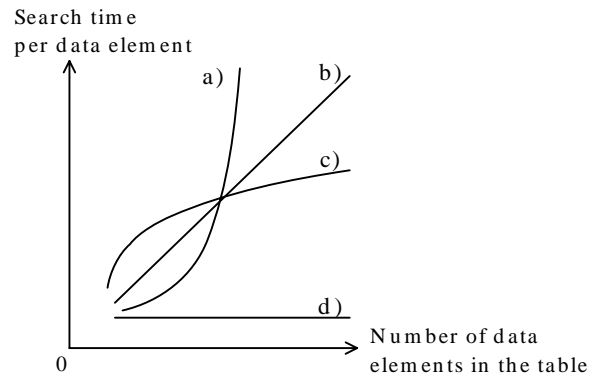
Function	Description
A	A program is split into several pieces, which are stored in auxiliary memory and swapped into and out of main memory as specified by the program.
B	Main memory and programs are divided into units of a fixed length for efficient memory management. This makes it possible to execute a large program when there is only a small amount of main memory.
C	Programs are temporarily suspended, and the contents of main memory in use are saved into auxiliary memory. When the program is restarted, the saved contents are reloaded into main memory and original status is restored.

	A	B	C
a)	Overlay	Paging	Swapping
b)	Swapping	Overlay	Paging
c)	Swapping	Paging	Overlay
d)	Paging	Overlay	Swapping

Q30. Which of the following require separate stack areas in a real-time system?

- a) A given task and another task
- b) A given interrupt process and another interrupt process
- c) An interrupt process and a system call
- d) An interrupt process and a task

- Q31.** In the following graph, which of the curves shows the characteristics of the search time required for a hash table search? For this problem, assume that synonyms do not occur.



- Q32.** Which is the appropriate description of a dual system?
- a) Two systems, both performing the same processing, are installed, and processing accuracy is checked by verifying the results of processing on both systems. If one of the systems fails, processing continues under a degradation mode using only the other system.
 - b) A main system for performing online processing, and a standby system which performs batch processes, etc. while it stands by are installed. If the main system fails, online processing is restarted by switching the system after reloading the online programs into the standby system.
 - c) The online processing programs of the main system are loaded onto the standby system before it begins to stand by. If the main system fails, an immediate switching is made to the standby system and the processing continues.
 - d) A single computer is equipped with each pair of processors, memories, channels, power sources, etc. so that processing can continue even if one device of any pair fails.

Q33. Which of the computer system configurations having a large processing capacity with the use of multiple processors of the same type shares the same main memory?

- a) Overdrive processor
- b) Co-processor
- c) Loosely coupled multi-processor
- d) Tightly coupled multi-processor

Q34. Which of these descriptions of job processing describes real-time processing?

- a) Although a single computer is simultaneously shared by multiple users, processing is made to look as though each user were using his or her own computer.
- b) Processing is performed at the moment data is generated. As constraints on response time are severe, programs are made to reside in main memory so that they can be executed at once.
- c) The processing procedure from entering the data to obtaining the results are predetermined, and the processes are automatically executed according to a set of descriptions to be executed by the computer.
- d) Multiple PCs and printers are connected on a LAN so that data can be shared and exchanged between them, and so that printers can be shared.

Q35. Which of the following descriptions concerning the design of a distributed system is correct?

- a) Since improved processing efficiency is not the goal, the emphasis is placed on improved operability and reliability.
- b) When data distribution is studied, the first steps are to specify where data update processing should be performed and to determine where master data should be located.
- c) In cases a problem occurs if processing is performed in parallel, the processing program in question is located on a client.
- d) The location of processes is automatically determined based on where the user is and where the data is located.

Q36. Three jobs, A through C, are started simultaneously according to the following scheduling methods: About how many minutes will elapse before Job B execution terminates?

[Jobs]

The amounts of processing time for these jobs when executed independently are as follows: Job A takes 5 minutes, Job B 10 minutes, and Job C 15 minutes. The amounts of processing time given are all in terms of CPU time.

[Scheduling Methods]

- (1) Jobs are executed in the order they are placed on the queue.
- (2) If processing does not end during a specified interval of time (this is called a “time quantum”), processing is suspended, and that job is replaced at the end of the queue.
- (3) The time quantum is set to a sufficiently small value compared to job processing time and the time required to switch jobs can be ignored.

- a) 15 b) 20 c) 25 d) 30

Q37. For a given online system, the number of CPU instructions which need to be executed in order to process a single transaction is 80,000, with an average processing time of one microsecond per instruction. If this system is upgraded, what is the minimum factor by which CPU processing performance must be increased in order to process 30 transactions per second? For this problem, assume that the limit to CPU utilization is 80%, and that processing performance is independent of I/O and determined only by the CPU.

- a) 2.0 b) 2.4 c) 3.0 d) 12.0

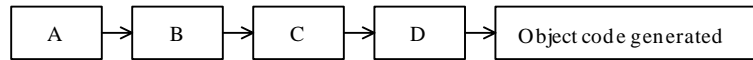
- Q38.** Which of the following is the appropriate description of throughput?
- a) Throughput is an indicator of CPU performance that does not include waiting time for I/O operations.
 - b) Throughput refers to the total elapsed time from when a job is entered into the system to when the results are completely obtained. It is affected by I/O speed and overhead time.
 - c) Throughput refers to the processing time for each job. It is affected by the operating time of the operator between the execution of jobs.
 - d) Throughput refers to the number of job processes within a unit of time. Spooling is useful in improving throughput.
- Q39.** Which of the following descriptions concerning performance evaluation for a computer system is correct?
- a) Since the benchmark program used to measure CPU performance covers a wide range of applications, it can be broadly used from computer installation to system expansion design.
 - b) When planning to enhance system resources to handle increased load on the computer system, a prototyping model based on anticipated load is not effective.
 - c) A software monitor and queue model are effective in predicting computer system performance at a stage when the system is not actually running.
 - d) For systems already in operation, it is possible to find problems regarding performance by collecting information, statistical data and charging data using a software monitor and then analyzing that information.

- Q40.** Consider a system for which the mean time between failures (MTBF) is given by x and the mean time to repair (MTTR) is given by y . Due to changes in conditions of use, both the MTBF and the MTTR have gone up by a factor of 1.5. Which of the following is the correct availability rate for the new conditions of use?
- a) Although it varies depending on the value of x and y , the availability rate has a higher value than the previous availability.
 - b) The availability rate is the same as the previous availability rate.
 - c) The availability rate is 1.5 times the previous availability rate.
 - d) The availability rate is $2/3$ times the previous availability rate.
- Q41.** Which is the appropriate description of data mining?
- a) It is a parallel access method used to quickly search through a large amount of data.
 - b) It is a technology used to statistically and mathematically analyze large amounts of data and derive rules and cause-and-effect relationships.
 - c) It is a method of saving data in a database used to store large volumes of time-series data such as sales performance records.
 - d) It is a technology used to create databases for the different departments of an organization according to the intended usages by the users in question.
- Q42.** Which of the following is the appropriate description of a commercial database service?
- a) Information gathered about a particular field or subject is provided to the user for profit.
 - b) Data gathered only in the field of business is made public to users free of charge as databases.
 - c) It gives expert advice regarding various problems that arise when designing and building a database.
 - d) This service executes for the users the administration of databases built by them.

Q43. In order to implement recursive processing, it is necessary to save status in the course of execution. Which is the proper memory management method for doing this?

- a) FIFO b) LFU c) LIFO d) LRU

Q44. The figure below represents the flow of processes executed by a compiler. Which terms fit appropriately in the boxes A through D?



	A	B	C	D
a)	Syntax analysis	Lexical analysis	Semantic analysis	Optimization
b)	Syntax analysis	Lexical analysis	Optimization	Semantic analysis
c)	Lexical analysis	Syntax analysis	Semantic analysis	Optimization
d)	Lexical analysis	Syntax analysis	Optimization	Semantic analysis

Q45. Consider the following procedure “add.” Its formal argument X is ‘call by value,’ while the formal argument Y is ‘call by reference.’ After the main program has been executed, what are the values of the variables X and Y in the main program?

Main program	Procedure “add” (X, Y)
$X:=2;$ $Y:=2;$ add (X, Y);	$X:=X+Y;$ $Y:=X+Y;$ return;

	X	Y
a)	2	2
b)	2	6
c)	4	2
d)	4	6

Q46. Which of the following descriptions concerning SGML is correct?

- a) Used to represent the structure of documents in English, SGML is not suitable for Japanese text.
- b) SGML includes as standardized items printing control codes, which allow for the standardization of printer hardware.
- c) SGML is one of the languages used to describe the structure of documents. It represents the structure of documents using tags such as <title>.
- d) SGML is a language used to standardize document layout attributes, such as font size and number of columns.

Q47. Which is the appropriate description of the goal of reverse engineering of software?

- a) To aid in the revision and/or re-development of the software in question by extracting the design specifications of the software which has already been implemented.
- b) To prove the correctness of software functions by using the mathematical systems such as set theory as a basis.
- c) To reduce the development period by performing simultaneously and in parallel different types of works that arise during the software development life cycle.
- d) To obtain the design information necessary for implementation by prototyping parts whose software designs are difficult.

Q48. Which is the appropriate description of a state transition diagram?

- a) It describes the overall structure of the program in a hierarchical structure.
- b) It describes operations in terms of elapsed time and changes in status.
- c) It describes system functions stepwise from a general overview down to details.
- d) It describes the flow of data during processing using four symbols: data flow, process, data storage and source/sink.

Q49. Of the following descriptions of requirements analysis for software, which is the appropriate description of event response analysis?

- a) This analysis method analyzes a series of operations by which the system responds to external events as time passes.
- b) In cases such as when studying proposals for system improvements, this method collects various ideas related to a given event into visual images to aid participants in coming up with new concepts from a different perspective as they view these images.
- c) An analysis method used to clarify system functions from both sides of input data and output data and to define the inter-relationships of four elements (data, information, function, and conditions.)
- d) This analysis method analyzes the structure of a system in terms of entities and relationships when modeling a target system.

Q50. Which of the following statements concerning encapsulation in a data-oriented design method is correct?

- a) Capsule users and capsule providers can be clearly distinguished because data and data operations are enclosed inside capsules.
- b) It is possible to increase the independence of sub-systems because data and data operations can be treated independently.
- c) Data security is increased because access is not possible unless the detailed structure of the data is known.
- d) The consistency of data structures can be maintained even though procedures for controlling data cannot be uniquely defined.

Q51. One level of module strength is informational strength. Which of the following is the appropriate example of a module with informational strength?

- a) A module into which multiple related functions are combined, and the function to be executed is determined by the values of arguments at the time the module is called.
- b) A module into which functions handling a particular data structure are combined.
- c) A module into which multiple functions having little relation among them are combined.
- d) A module into which multiple successive functions are combined.

Q52. Which of the following is the appropriate description of creating test data for a white box test?

- a) Test data is created by analyzing input data based on equivalence partitioning.
- b) Test data is created based on the internal structure of the program such as the algorithm used in it.
- c) Test data is created based on program functions.
- d) Test data is created based on the relationship between input and output of the program.

Q53. Which is the appropriate term for expressing the principle of designing programs from the viewpoints of safety and reliability as described below?

“A larger number of data check functions are embedded into the programs which are used by many and unspecified persons as compared to those which are used by only one person. In addition to documenting the prerequisites for using the program, it should be coded in such a way that, when any data not meeting the prerequisites are actually entered, error messages can be displayed.”

- a) Foolproof
- b) Fail safe
- c) Fail soft
- d) Fault tolerant

Q54. Which of the following programming paradigms makes the development of expert systems easier by means of the resolution principle included in the language processor if the “facts” and “rules” are described in the source programs.

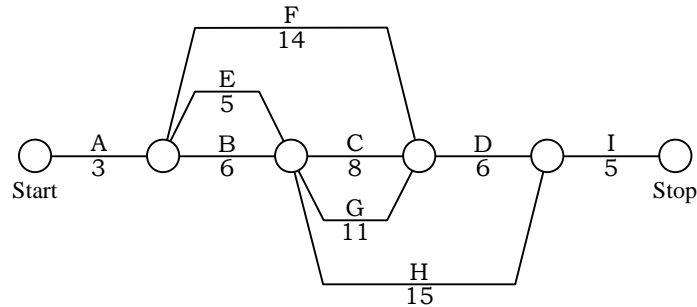
- a) Object-oriented programming
- b) Functional programming
- c) Procedural programming
- d) Logic programming

Q55. Two independent test groups, A and B, tested a system in parallel for a given period of time, and each group detected N_A and N_B of errors, respectively. Of these, N_{AB} is the number of common errors. Assume that the error detection capability and efficiency of group A are equal to those of group B. Which formula is used to predict the total number of errors in this system?

In this problem, assume $N_A > 0$, $N_B > 0$, and $N_{AB} > 0$.

- a) $N = N_A + N_B - N_{AB}$
- b) $N = N_{AB} \times N_A \times N_B$
- c) $N = (N_A + N_B) / N_{AB}$
- d) $N = (N_A \times N_B) / N_{AB}$

Q56. The figure below shows the work processes (A through I) and work days for a given project. What is the minimum number of days in which this project can be finished?



- a) 27 b) 28 c) 31 d) 32

Q57. Which of the following represents the advantages and disadvantages of the function point method?

	Advantages	Disadvantages
a)	High precision estimates can be made for small scale systems.	Decomposition into unit works at the early stage of the project is difficult. It is necessary to gather and evaluate actual data in order to set the appropriate base values.
b)	Since the effort and work period are estimated based on the scale of the software, it is not affected much by the experience level of the persons in charge.	Its application at the early stage of a project is difficult. It is not possible to estimate the scale of the development.
c)	It is possible to estimate efficiently the costs of integration, management, etc. related to the entire project from the viewpoint of the global nature of the software.	It is easy to overlook individual technical problems.
d)	It is possible to begin its application relatively early in the project. It is easy to reach a consensus with users.	It is necessary to gather and evaluate actual data in order to set the appropriate base values.

Q58. In system development, effective procedure is to divide the total period into several development processes, and to clearly define the beginning and ending of each of these. The point of time when certain decision-making is carried out during development is called a milestone. Which of the following is the most appropriate description of a milestone?

- a) The point of time when the creation of the basic design draft has ended.
- b) The point of time when 50% of coding for modules has ended.
- c) The point of time when the module specifications have been approved.
- d) The point of time when the interview for required items has ended.

Q59. In the case where a company which has a development organization commission another company to do system development using a software package with which the former has no experience, which of the following contract types with the latter is the least risky?

- a) An outsourcing contract with the seller of the software package in question.
- b) Attaching more importance to cost than to experience in developing systems with the software package in question and entering a contract agreement with the software vendor who proposes to do the development at the lowest price.
- c) A system integration agreement with a software vendor who has experience in developing systems using the software package in question.
- d) A commission agreement with the seller of the software package in question who is providing only sales and consultation.

Q60. Which is the appropriate system for managing system operations by an information system department described in the following text?

“In addition to making the user department aware of costs related to system operations, this system is a means of controlling the cost which tends to increase and securing fairness of cost allotment to the user departments.”

- a) Computation-on-commission
- b) External commissioning system
- c) Charging system
- d) Standard prime cost system

Q61. Which is the appropriate description of the maintenance of systems which have been deployed nationwide?

- a) System MTBF becomes longer by using remote maintenance.
- b) System MTBF becomes longer by doing tentative maintenance when failures occur.
- c) System MTTR becomes shorter by changing from the maintenance center at a single centralized location to distributed ones.
- d) System MTTR becomes shorter by using preventive maintenance.

Q62. Which protocol is used when sending and receiving e-mails between servers on the Internet?

- a) HTTP
- b) POP
- c) SMTP
- d) SNMP

Q63. Which protocol corresponds to the physical layer and data link layer in the OSI Basic Reference Model?

- a) CSMA/CD
- b) MHS
- c) RS-232C
- d) X.25

Q64. Which is the appropriate description of text data transmission and binary data transmission? For this problem, assume that text data consists only of character codes.

- a) Binary data can be sent using a procedure that transmits text data by converting the target data into text data character strings.
- b) In the text data transmission a character code which consists of 7 bit data plus a parity bit is used, while in the binary data transmission 8-bit character codes are used.
- c) Non-procedure is used for text data transmission, while basic mode control procedure is used for binary data transmission.
- d) It is not possible to use a transmission control protocol other than HDLC protocol for binary data transmission.

Q65. A single server and multiple clients are connected to a 100 Mbps LAN. At the peak of business activity, 600 KB of data per client is downloaded from the server every minute. What is the number of clients who can operate simultaneously without experiencing any adverse effects on their processing during the peak time? For this problem, assume the transmission efficiency of the LAN is 50%, that the internal processing time of the server and clients can be ignored, that 1 Mbps = 10^6 bits/sec, and that 1 KB = 1,024 bytes.

- a) 10
- b) 610
- c) 1,220
- d) 4,880

Q66. Which is the appropriate description of a basic ISDN interface?

- a) The B channel is used for circuit switching, but cannot be used for packet switching.
- b) Although the D channel is used for control, it can also be used for transferring packet data.
- c) Optical fiber is used without using existing telephone lines.
- d) Two DSU units are required in order to use two B channels simultaneously.

- Q67.** Which of the following is used as the frame transmission error detection method when using the HDLC procedure?
- a) CRC method
 - b) Group check method
 - c) Vertical redundancy check
 - d) Longitudinal redundancy check
- Q68.** Consider equipment used for connecting multiple LANs. Which equipment passes data based on a protocol that exists on and below the data link layer?
- a) Gateway
 - b) Bridge
 - c) Repeater
 - d) Router
- Q69.** Which of the following is the appropriate description of DSU?
- a) It converts signal formats between digital data transmission lines and terminals.
 - b) It modulates digital signals to analog signals at the time of data transmission, and also demodulates in the reverse direction.
 - c) It performs protocol conversion for connecting a non-ISDN terminal to ISDN.
 - d) The transmission system that uses a host computer performs serial and parallel conversion of data bit strings and error checking.
- Q70.** There are three data models: hierarchical, network, and relational. Which of the following descriptions concerning a hierarchical model is proper?
- a) Data can be represented in several two-dimensional tables.
 - b) It is possible for a single record to have more than one parent record.
 - c) A redundant representation results when expressing an object which has a network structure.
 - d) Since the relationship between records need not be designed beforehand, they can be dynamically established during data manipulations.

Q71. Which is the appropriate description of a relational database key?

- a) The column or set of columns to which an index is assigned is always a candidate key.
- b) A candidate key is a column or set of columns that uniquely identifies a row in a table, and there is only one per table.
- c) An index must be assigned to a candidate key.
- d) A table has only one primary key and to guarantee uniqueness, NULL values are not allowed.

Q72. When functional dependences ① through ⑦ occur as the attributes of the following relation “order,” what is the correct set of attributes for the primary key? For this problem, the notation (A, B) represents the pair of attributes A and B. In addition, the notation $A \rightarrow C$ represents C’s functional dependence on A.

Relation “order”

(order_number, order_date, customer_number, customer_name, product_number, product_name, quantity, price)

Functional dependences

- ① $order_number \rightarrow order_date$
- ② $order_number \rightarrow customer_number$
- ③ $order_number \rightarrow customer_name$
- ④ $customer_number \rightarrow customer_name$
- ⑤ $(order_number, product_number) \rightarrow quantity$
- ⑥ $(order_number, product_number) \rightarrow price$
- ⑦ $product_number \rightarrow product_name$

- a) (order_number)
- b) (order_number, customer_number)
- c) (order_number, customer_number, product_number)
- d) (order_number, product_number)

Q73. Which is the appropriate description of the purpose of normalization?

- a) To increase database access efficiency by eliminating data duplication, for all types of data models.
- b) Dependencies among attributes are identified as functional dependences and/or multivalued dependences, so that the number of physical I/O operations can be minimized.
- c) By performing normalization up to the third normal form, the same relational tables can be obtained regardless of the persons who may do it, thus eliminating personal dependency.
- d) The duplication of data is eliminated, and duplicated updates and inconsistencies which may occur as database operations are performed are thereby prevented.

Q74. Which of the following SQL statements on the two tables “PRODUCT” and “STOCK” in the answer group will obtain the same results as this one?

```
SELECT PRODUCT_NO FROM PRODUCT
WHERE PRODUCT_NO NOT IN (SELECT PRODUCT_NO FROM STOCK)
```

PRODUCT			STOCK		
PRODUCT_NO	PRODUCT_NAME	UNIT_PRICE	STOCK_NO	PRODUCT_NO	STOCK_QTY

- a)

```
SELECT PRODUCT_NO FROM STOCK
WHERE EXISTS (SELECT PRODUCT_NO FROM PRODUCT)
```
- b)

```
SELECT PRODUCT_NO FROM STOCK
WHERE NOT EXISTS (SELECT PRODUCT_NO FROM PRODUCT)
```
- c)

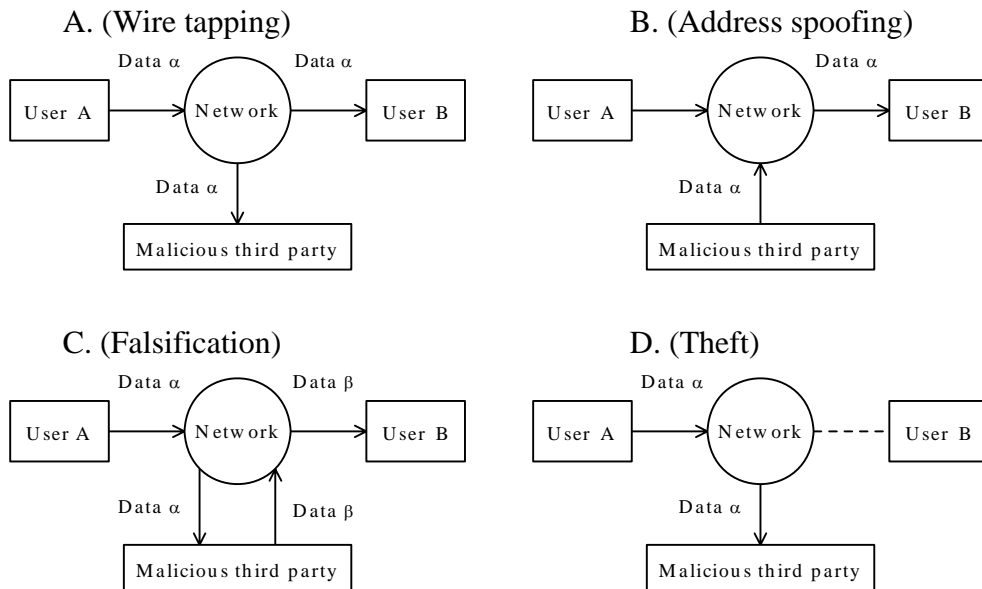
```
SELECT PRODUCT_NO FROM PRODUCT
WHERE EXISTS (SELECT PRODUCT_NO FROM STOCK
WHERE PRODUCT.PRODUCT_NO = STOCK.PRODUCT_NO)
```
- d)

```
SELECT PRODUCT_NO FROM PRODUCT
WHERE NOT EXISTS (SELECT PRODUCT_NO FROM STOCK
WHERE PRODUCT.PRODUCT_NO = STOCK.PRODUCT_NO)
```

Q75. Which is the appropriate description of access efficiency for a relational database?

- a) If one optimum access path is prepared at the beginning, efficiency does not decrease even when the data volume is increased.
- b) When it comes to read access, efficiency is always better for access paths which use indexes.
- c) If data on a column is frequently updated, then efficiency is better without assigning an index to it.
- d) Even when many transactions are being processed simultaneously, it is possible to process them without reduced efficiency by using exclusive control functions.

Q76. For which of the following four types of vulnerability and attack is message authentication effective?



- a) A and B
- b) B and C
- c) C only
- d) C and D

Q77. As a means to establish communications security, which is the method used to register beforehand the addresses of terminals authorized to be connected and to allow the mutual connection of only those terminals whose addresses are registered?

- a) SVC (Switched Virtual Connection)
- b) Number display
- c) Closed area connection
- d) Reserved connection

Q78. Which of the following descriptions concerning the security measures of an information system is proper?

- a) To prevent virus intrusion, programs and data are downloaded to each client.
- b) The duties of the security administrator include users' training and enlightenment to increase awareness of security issues.
- c) The person in charge of the operating department sets and changes passwords based on applications submitted by users.
- d) A callback system is used to confirm that a particular user is the true user himself.

Q79. Which of the following statements concerning the method of applying SLCP(ISO/IEC 12207) is correct?

- a) Requests for improvement and additional items to processes in SLCP should be made uniformly without regard to the particular circumstances of each affiliated company or department.
- b) Since SLCP defines general rules for transactions between two parties, all items should be respected and implemented.
- c) Since uniformity cannot be achieved if information is gathered from persons concerned such as business operations personnel, support personnel, and executives in charge of contracts, only the contract department should be involved.
- d) Processes and activities are selected and combined to adapt to the project environment, attributes, development models and techniques.

Q80. Which of the following descriptions concerning Unicode (UCS-2) is correct?

- a) It is an 8-bit code which was released by IBM along with its System/360, and is capable of representing 256 kinds of characters.
- b) It was adapted as the BMP (Basic Multilingual Plane) of ISO/IEC 10646, and is a two-byte character code capable of representing the characters of many of the languages around the world.
- c) It is the kanji code standard specified by JIS X 0208, in which a code is used to take two bytes for a single character. The standard is split into Level 1 and Level 2, based on the usage frequency of kanji characters.
- d) Since it is a modified version of the original JIS kanji code, it can be identified even when used together with alphanumeric/kana codes. This character code is widely used on personal computers, etc.