New FE Textbook

Commentaries and Answers

of

Exercises

Vol.1   IT Fundamentals

Vol.2   IT Strategy & Management

IPA

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New FE Textbook Vol.1
IT Fundamentals

Chapter 1　Hardware

Q1　Answer: d)

This question is related to the five major units of a computer.

Since the control flows from unit A to all other units, A is the control unit. Moreover, in unit B, data flows in from the input unit and data flows out to the output unit. Therefore, unit B is the storage unit.

Q2　Answer: d)

The number of bit patterns that can be represented with n bits is 2^n. Therefore,

- Bit patterns that can be represented with 32 bits = 2^{32}
- Bit patterns that can be represented with 24 bits = 2^{24}

  Accordingly,

  $2^{32} \div 2^{24} = 2^{32-24} = 2^8 = 256$ times.

Q3　Answer: c)

The meanings of prefixes (auxiliary units) are as follows:

Kilo (k)	$10^3 = 1{,}000$
Mega (M)	$10^6 = 1{,}000{,}000$
Giga (G)	$10^9 = 1{,}000{,}000{,}000$
Tera (T)	$10^{12} = 1{,}000{,}000{,}000{,}000$

Q4　Answer: d)

Below is the weight of each digit of binary number 101.11.

```
1   0   1   .   1   1
↑   ↑   ↑       ↑   ↑
2²  2¹  2⁰      2⁻¹ 2⁻²
```

After each digit of this binary number with binary point is multiplied by the weight, the obtained numbers are added up, and the sum is the corresponding decimal number.

$2^2 + 2^0 + 2^{-1} + 2^{-2} = 4 + 1 + 0.5 + 0.25 = 5.75$

Q5　Answer: b)

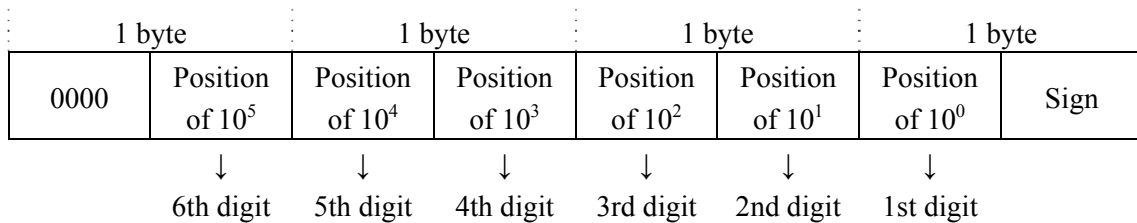The table below shows the list where the numbers in each answer group are converted into decimal.

a)	7	8	8	8
b)	10	10	10	10
c)	100	174	100	100
d)	255	255	256	255

Q6   Answer: a)

a) ASCII code is composed of 8 bits, which include code bits (7 bits) that represent an alphabet or a number, and a parity bit (1 bit) that detects an error. Although it is used in PCs, it does not have any definitions concerning Japanese characters (e.g., kanji, kana). (Correct answer)

b) EUC (Extended UNIX code) represents an alphanumeric character with 1 byte, and a kanji or kana character with 2 bytes.

c) Unicode supports characters of many countries such as kanji and hiragana/katakana, Hangul characters, and Arabic letters.

d) Shift JIS code is formed by expanding JIS Kanji code.

Q7   Answer: b)

In packed decimal, each digit of a decimal number is represented with a binary-coded decimal code (4 bits), and a sign is assigned to the lowest 4 bits. In order to use the lowest 4 bits as sign bits, 0000 is appended to the first 4 bits in the case of even digits. Therefore, a total of 4 bytes are required for a 6-digit signed decimal number to be represented in packed decimal as shown in the figure below.

1 byte		1 byte		1 byte		1 byte	
0000	Position of 10^5	Position of 10^4	Position of 10^3	Position of 10^2	Position of 10^1	Position of 10^0	Sign
	↓	↓	↓	↓	↓	↓	
	6th digit	5th digit	4th digit	3rd digit	2nd digit	1st digit	

Q8   Answer: c)

After the conversion of +5.625 into binary, 2's complement is calculated.

1) According to the fixed point format, convert +5.625 into binary.

$$+5.625 = (0101.1010)_2$$

2) Calculate 2's complement.

$$
\begin{array}{r}
100000000 \\
-\ 01011010 \\
\hline
10100110
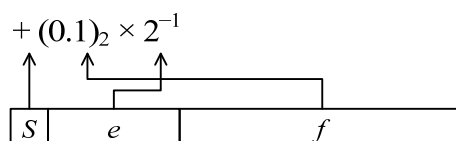\end{array}
$$

Q9   Answer: c)

First, convert the decimal number 0.25 into a binary number.

$$(0.25)_{10} = 2^{-2} = (0.01)_2$$

Normalize the binary number that is obtained above.

$$+(0.01)_2 = +(0.1)_2 \times 2^{-1}$$

With this, the values of S, e, and f are as shown below. Here, the exponent is negative, so it should be represented in 2's complement.

S:	Sign "+"	→ 0
e:	Exponent "−1"	→ 1111
f:	Fraction (mantissa) "(0.)1"	→ 10000000000

Q10 Answer: b)

When a certain number (bit string) is arithmetically shifted to the left by *n* bits, it becomes 2^n times the size of the original number. Therefore, in order to make it 32 ($32 = 2^5$) times larger, shift it to the left arithmetically by 5 bits.

Q11 Answer: c)

   a) DRAM is a volatile storage device where the recorded content is lost when the power is off.

   b) SRAM is a volatile storage device where the recorded content is lost when the power is off.

   c) Flash memory is a type of non-volatile EEPROM, and it is possible to rewrite and erase data with electric signals. It is used as a storage media that is convenient for carrying. (Correct answer)

   d) While mask ROM is a non-volatile storage device where the recorded content is not lost even when the power is off. Data cannot be rewritten nor erased because it is written beforehand.

Q12 Answer: d)

In the absolute addressing, the value of the address part is used as the effective address, and the address modification is not performed.

   a) This is a type of index addressing.

   b) This is an explanation of relative addressing.

   c) This is an explanation of base addressing.

Q13 Answer: a)

When the values of *P*, *Q*, and *R* are determined from the logic circuit in the figure, the results are as follows:

   $P = (A \text{ AND } B) = (1 \text{ AND } 0) = 0$

   $Q = (P \text{ OR } C) = (0 \text{ OR } 1) = 1$

   $R = (\text{NOT } Q) = (\text{NOT } 1) = 0$

Therefore, $P = 0$, $Q = 1$, and $R = 0$.

Q14 Answer: d)

Effective access time of each combination is as follows:

a) 10 nanoseconds × 0.6 + 70 nanoseconds × (1 − 0.6) = 6 nanoseconds + 28 nanoseconds
    = 34 nanoseconds

b) 10 nanoseconds × 0.7 + 70 nanoseconds × (1 − 0.7) = 7 nanoseconds + 21 nanoseconds
    = 28 nanoseconds

c) 20 nanoseconds × 0.7 + 50 nanoseconds × (1 − 0.7) = 14 nanoseconds + 15 nanoseconds
    = 29 nanoseconds

d) 20 nanoseconds × 0.8 + 50 nanoseconds × (1 − 0.8) = 16 nanoseconds + 10 nanoseconds
    = 26 nanoseconds   (Correct answer)

Q15 Answer: c)

When the flow of execution is shown as a diagram, the result is as follows:

Instruction 1	1	2	3	4	5	6					
Instruction 2		1	2	3	4	5	6				
Instruction 3			1	2	3	4	5	6			
Instruction 4				1	2	3	4	5	6		
Instruction 5					1	2	3	4	5	6	
Instruction 6						1	2	3	4	5	6

10 nanoseconds/step × 11 steps = 110 nanoseconds

Q16 Answer: c)

- MIMD (Multiple Instruction Multiple Data):
  This is the architecture of a parallel computer that processes multiple pieces of data with multiple instructions.
- MISD (Multiple Instruction Single Data):
  This is the architecture of a parallel computer that processes a single piece of data with multiple instructions.
- SIMD (Single Instruction Multiple Data):
  This is the architecture of a parallel computer that processes multiple pieces of data with a single instruction.   (Correct answer)
- SISD (Single Instruction Single Data):
  This is the architecture of a parallel computer that processes a single piece of data with a single instruction.

Q17 Answer: b)

Average access time of the hard disk drive is decided by the following three elements.

Average access time = average seek time + average search time + data transfer time

1) Time required for hard disk to complete one rotation
    = (1 minute × 60 seconds/minute × 1,000 milliseconds/second) ÷ 5,000 rotations
    = 12 milliseconds/rotation

2) Average search time

    = 12 milliseconds/rotation ÷ 2

    = 6 milliseconds

3) Data transfer rate

    = 15,000 bytes/track ÷ 12 milliseconds/rotation (track)

    = 1,250 bytes/millisecond

4) Data transfer time

    = 4,000 bytes ÷ 1,250 bytes/millisecond

    = 3.2 milliseconds

5) Average access time

    = 20 milliseconds + 6 milliseconds + 3.2 milliseconds

    = 29.2 milliseconds

Q18 Answer: d)

CD-R is a write-once optical disc where data can be written only once. Organic coloring matter is coated on the disc surface of CD-R, and data is written by burning the coloring matter with laser beams so as to create pits on the layer of the coloring matter. Therefore, data that is written cannot be erased.

    a) This is an explanation concerning the data recording method of MO.

    b) This is an explanation concerning the recording method of hard disk.

    c) This is an explanation concerning the recording method of DVD.

Q19 Answer: c)

- OCR (Optical Character Reader):

  This is a device that optically reads the hand-written or printed characters on the basis of the strength of the reflected light.

- XY plotter:

  This is a device that prints graphics and is used for printing drawings that are created with CAD or such applications.

- Digitizer:

  This is an input device that feeds two-dimensional and three-dimensional drawing information as coordinate information by tracing a drawing on the panel. It is used for entering drawings in a design support system called CAD and creating data of an NC (Numeric Control) machine tool.   (Correct answer)

- Light pen:

  Light pen is a pointing device that feeds the position information by directly pointing and tracing on a display screen.

Q20 Answer: d)

- CRT display:

    This is a device that emits light by applying electron beams onto a phosphor screen.

- TFT liquid crystal display:

    This is a display that uses liquid crystals whose permeation rate of light changes because of voltage. Since liquid crystals themselves do not emit light, either a reflection plate or back-light is necessary.

- Plasma display:

    This is a display where gas is sealed between two panels of glass and light is emitted by applying voltage.

- OLED (Organic Light Emitting Diode) display:

    This is a display that uses organic compounds that emit light when voltage is applied. It has features of low voltage drive and low power consumption.   (Correct answer)

Q21 Answer: a)

A laser printer is a printer that prints by affixing toner (powder ink) onto a photoconductive drum by using a laser and then transferring the toner onto paper. It is a page printer that prints in units of pages where a printer or printer driver creates a print image in the bitmap format. Therefore, as the indicators for representing its performance, in addition to resolution dpi (number of dots per one inch), the number of pages that can be printed in one minute (ppm: page per minute) is used. The higher these figures are, the higher the performance is.

Q22 Answer: b)

USB is a serial interface standard that can connect various peripheral devices such as a keyboard, a mouse, and a modem. Its features include that up to 127 devices can be connected in a tree shape, power can be supplied through the connection cable (bus powered), and it is removable with the power supply on (hot plug). Moreover, there are multiple data transfer modes (low-speed mode, full-speed mode, high-speed mode), and these modes are used according to the connected device.

- a) This is an explanation concerning IEEE 1394.
- c) This is an explanation concerning EIA RS-232C.
- d) USB is a serial interface. Centronics is a parallel interface that is used for connecting peripheral devices like printers.

Chapter 2   Information Processing System

Q1   Answer: b)

A client/server system is a system that is configured by a client that sends a processing request and a server that fulfills the request. At the client side, the processing requests to the server are collected and sent, and the returned result is processed and displayed to the user. Therefore, the appropriate function that should be processed at the server side is the process of updating the database that is not performed at the client side.

Q2   Answer: b)

- Dual system:

  It is a system that the same processing is performed in two systems and the results are cross-checked.

- Duplex system:

  Online processing is performed in the primary system, and batch processing is performed in the secondary system that is on standby. Thus, the processing is switched to the secondary system when a fault occurs in the primary system.   (Correct answer)

- Multiprocessor system:

  It is a computer system that is configured by several processors.

- Load sharing system:

  It is a multiprocessor system in which jobs or tasks (i.e., load) are distributed depending on the situation.

Q3   Answer: b)

A fault tolerant system is a system that provides redundancy to system components, such as duplexing of the hard disk, so that the overall system is maintained in a normal operating status even if a failure occurs in part of the system.

Q4   Answer: d)

a) MIPS is an indicator for evaluating the performance of the CPU and is not used in the evaluation of the overall system, such as in OLTP.

b) This is a performance evaluation that is based on the viewpoint of the user.

c) If the utilization rate of system resources falls, the waiting time reduces and the response time improves.

d) The amount of work (throughput), such as the number of transactions or jobs that can be processed within a unit time, is an important indicator for evaluation of the system performance.   (Correct answer)

Q5   Answer: c)
  (1)   Calculate the average execution time of one instruction.
          $(4 \times 0.4 + 8 \times 0.5 + 10 \times 0.1) \times (3 \times 10^{-9})$ seconds
          $= 19.8 \times 10^{-9}$ seconds $\approx 2 \times 10^{-8}$ seconds $= 0.02 \times 10^{-6}$ seconds $= 0.02$ microseconds
  (2)   Calculate the performance (in MIPS) of the CPU.
          $1 \div 0.02 = 50$ (MIPS)

Q6   Answer: a)
  • Availability:
      It is an index that represents the proportion of the operation of the system that is performing normally and uses the probability of operation of the system.   (Correct answer)
  • Integrity:
      It is an index that represents whether the system is operating accurately, without any misoperations.
  • Reliability:
      It is an index that represents whether the system is functioning in a stable manner and uses the MTBF (Mean Time Between Failures).
  • Security
      It is an index that represents the extent to which the system safeguards confidentiality (of data).

Q7   Answer: d)
The availability of the overall system configuration is the ratio of the time that device *A* or device *C* is operating, and in addition to that, device *B* or device *D* is operating, to the operation time of the overall system.
  (1)   Probability that device *A* or device *C* is operating (parallel)
          $= 1 - (1 - 0.9)^2 = 0.99$
  (2)   Probability that device *B* or device *D* is operating (parallel)
          $= 1 - (1 - 0.8)^2 = 0.96$
  (3)   Availability of the overall system (series)
          $= 0.99 \times 0.96 = 0.9504 \approx 0.95$

Q8   Answer: d)
  • Scroll bar:
      A GUI tool for moving the display area of the screen
  • Check boxes:
      A GUI tool for selecting several (i.e., more than one) items simultaneously from the selection items (i.e., buttons)
  • Progress bar:
      A GUI tool for displaying the progress status of the processing through a graphical scale (i.e., length of the bar)
  • Radio button:
      A GUI tool for selecting only one item from the selection items (i.e., buttons)   (Correct answer)

Q9   Answer: a)

A check digit is used to prevent an input error by the operator. Therefore, the purpose for appending a check digit (of the code check function) is to detect an input error of the customer code.

    b) It is the purpose of the code arrangement function.

    c) It is the purpose of the code classification function.

    d) It is the purpose of the code identification function.

Q10   Answer: b)

- GIF (Graphic Interchange Format):

  It is a still image compression and decompression format that supports 256 colors.

- JPEG (Joint Photographic Experts Group):

  It is a still image compression and decompression format that supports full color. (Correct answer)

- MIDI (Musical Instruments Digital Interface):

  It is a file format that is used when an electronic musical instrument is connected to a PC and music data is exchanged.

- MPEG (Moving Picture Experts Group):

  It is a moving image compression and decompression format.

Q11   Answer: a)

VR (Virtual Reality) refers to experiencing the virtual world that is generated by using CG (Computer Graphics) as an actually existing world.

    b) It is the explanation of interlacing. Interlacing is the technique of displaying rough images first and then gradually displaying sharp images in order to mitigate the stress at the side from where images are viewed.

    c) It is the explanation of simulation.

    d) It is the explanation of CAD (Computer Aided Design).

Chapter 3   Software

Q1   Answer: c)
- Control program:
    This is software that efficiently manages and uses resources, such as hardware, and provides an efficient operating environment. → a)
- Service program:
    This is software that provides standard functions (e.g., the data management, the disk management) to support users.   → c)
- Language processor:
    This is software that is used to translate a program that is created with a programming language into a machine language. → b)

Q2   Answer: a)
- Shareware:
    This is software that can be used free of charge for a trial period, but in order to use it after this period, a usage fee must be paid.   (Correct answer)
- Package software:
    This is software that is commercially sold for a fee.
- Public domain software:
    This is software that was researched and developed by a public institution or other organization for which the copyright has waived and can be free of charge.
- Freeware (free software):
    This is software that the developer holds the copyright but is allowed to be used for free of charge.

Q3   Answer: c)
  a) There are open source operating systems (open OSs), such as Linux, BSD-family OSs, and IRIX.
  b) Modification is allowed, but copyright is not necessarily relinquished.
  c) Open source requirements specified by the OSD define that: 1. Free redistribution and 5. No discrimination against persons or groups.   (Correct answer)
  d) Open source requirement 1 specified by the OSD defines that "Free redistribution," and this includes free of charge and not free of charge, so distribution for a fee is permitted.

Q4   Answer: d)
Spooling is a method that enables a peripheral device (i.e., an input/output device) to work independently and in parallel as a processing device. For that, it performs data transmission between a main memory unit and a low-speed input/output device via a high-speed auxiliary storage device. Therefore, it has the ability to increase the throughput (i.e., the amount of work done in a unit of time) of the overall system.
  a) This is a description concerning a dispatcher.
  b) This is a description concerning garbage collection (i.e., memory compaction).
  c) This is a description concerning interrupts.

Q5　Answer: b)

a) When the I/O processing is finished, the process makes a state transition to the ready state and waits for the CPU to be allocated.

b) The ready state is a state where resources other than the CPU are already allocated, and the process is waiting for the allocation of the CPU. Processes in the ready state form a queue and wait for the allocation of the CPU.　(Correct answer)

c) In multiprogramming, it appears that multiple programs are running simultaneously, but at any given time there is always only one process that is in the running state with the CPU.

d) With the round robin method, a process in the running state makes a state transition to the ready state after a fixed time passes.

Q6　Answer: c)

a) The variable partitioning method secures a partition (i.e., memory area) according to the required size, so fragmentation occurs in which many small unused areas (i.e., garbage) appear.

b) The fixed partitioning method uses partitions ((i.e., memory areas) of the same size, so acquisition and release of memory areas can be performed very quickly and fragmentation does not occur.

c) Fragmentation is a state in which there are many small areas of unused memory (i.e., garbage), so in some cases a single consolidated area of unused memory cannot be secured.　(Correct answer)

d) If garbage collection is performed every time a memory area is released, the overhead time increases and processing efficiency deteriorates.

Q7　Answer: b)

In segments, a virtual memory area is managed by dividing it into meaningful units (i.e., segments) such as programs. Access can be performed in a logical unit (or in units of programs) that is seen by a program, and areas can be secured dynamically according to a program. In paging, a virtual memory area is managed by dividing it into fixed sizes (i.e., pages). Since all pages are the same size, they can be stored in the actual memory area without spaces between them, so the memory usage efficiency increases, and memory management can also be performed simply in units of pages.

Q8　Answer: d)

A page replacement algorithm preferentially selects a page for which a page fault is not likely to occur, and performs a page-out. A page fault occurs when a page-out is performed for a certain page and then that page is referenced soon after, so it predicts which page will not be referenced in the farthest future after that point in time, and selects it as a page for page-out.

Q9　Answer: b)

A Java servlet is a Java program that is executed on a web server (i.e., web application server) in response to a request from a client.

a) This is a description concerning a Java applet.

b) This is a description concerning JavaBeans.

d) This is a description concerning a JVM (Java Virtual Machine).

Q10 Answer: c)
- CSS (Cascading Style Sheets):
    This is a style sheet that is separate from HTML and defines only the layout of a web page.
- HTML (HyperText Markup Language):
    This is a hypertext description language that expands SGML and can handle various elements, such as graphics, still images, and video, in addition to text.
- SGML (Standard Generalized Markup Language):
    This is a general-purpose markup language that describes the logical structure, semantic structure, and attributes of a document, and is standardized by ISO. It is now widespread as a standard markup language for documents because of the increase in networks.   (Correct answer)
- SOAP (Simple Object Access Protocol):
    This is a communication protocol for message exchange that calls data or services based on XML (eXtensible Markup Language).

Q11 Answer: c)
Optimization in a compiler is a process that performs actions such as modifying the program structure and generating code (i.e., object code) in order to increases processing efficiency during execution.
a) This is a description concerning semantic analysis.
b) This is a description concerning a cross compiler.
d) This is a description concerning a runtime compiler (i.e., JIT compiler).

Q12 Answer: c)
A DLL (Dynamic Link Library) stores components (i.e., modules) that are linked (i.e., embedded) by the OS just before execution. This process is called dynamic linking, and it is different from linking (i.e., static linking) that uses a linker (i.e., linkage editor).

Q13 Answer: c)
a) In a recursive program, the state during execution is recorded with an LIFO (Last-In First-Out) method.
b) A reentrant program has the characteristics of a reusable program, but the reverse is not true.
c) A reentrant program is divided into a variable part and a procedure part, and implements concurrent processing from multiple tasks by allocating a variable part to each task.   (Correct answer)
d) A reentrant program can execute multiple tasks concurrently.

Q14 Answer: a)
- Partitioned organization file:
    This is an organization format that is composed of a directory and multiple members, and is mainly used as a program library.   (Correct answer)
- Indexed sequential organization file:
    This is an organization format that is composed of a prime area, an index area, and an overflow area, and it enables direct access that uses an index.

- Sequential organization file:
  This is a dedicated organization format for sequential access, which writes records sequentially on storage media.
- Direct organization file:
  This is a dedicated organization format for direct access that enables access to a specific record by the specification of an address.

Q15 Answer: c)
  a) The highest directory in a hierarchy is the root directory.
  b) File management with directories can also be implemented in OSs (e.g., Unix-family OSs) that have file systems other than the FAT file system.
  c) In order to specify a certain file in a file system, an absolute path from the root directory or a relative path from the current directory is used.   (Correct answer)
  d) In the same directory, files and lower-level directories can be registered.

Q16 Answer: c)
  a) Striping only divides and registers data, so a backup is necessary.
  b) If the backup file is on the same device, it may not be usable if a fault occurs.
  c) With a restore operation that uses backup files, it becomes possible to restore lost files to the point in time of the backup.   (Correct answer)
  d) Automation is also possible for a magnetic tape (i.e., a streamer).

Chapter 4 Database

Q1 Answer: b)

The following are the features of a database system.

1) Eliminating duplication of data items … b)
2) Ensuring consistency between data (i.e., prevention of inconsistency)
3) Increasing independence of data

Q2 Answer: a)

Relational database is a database that implements the logical model where the relation of data is represented in a two-dimensional tabular form. Relation between records is correlated with the items (primary key/foreign key) in the table.

b) It is an explanation concerning the HDB (Hierarchical DataBase).
c) It is an explanation concerning the NDB (Network DataBase).
d) It is an explanation concerning the structured database.

Q3 Answer: b)

Projection is a relational operation for extracting the specified attribute.

a) It is an explanation related to the relational operation "Selection".
c) It is an explanation related to the set operation "Product" (Common).
d) It is an explanation related to the relational operation "Join".

Q4 Answer: a)

Cardinality of "Instructor" and "Class" is one-to-many. Therefore, one instructor can look after multiple classes, and one class is looked after by one instructor. Meanwhile, cardinality of "Class" and "Student" is one-to-many. Therefore, there are multiple students in one class, and one student belongs to one class.

a) One student belongs to one class, and one class is looked after by one instructor. Therefore, one student is looked after by one instructor.   (Correct answer)
b) One student belongs to one class.
c) One instructor looks after multiple classes.
d) One class is looked after by one instructor acting as the homeroom teacher.

Q5 Answer: c)

1) First normalization: Eliminates iterative items and derived items.

> SkillRecord (<u>EmployeeNumber</u>, EmployeeName, <u>SkillCode</u>, SkillName, SkillExperienceYears)

2) Second normalization: Splits partial functional dependency.

> SkillRecord (<u>EmployeeNumber</u>, <u>SkillCode</u>, SkillExperienceYears)
> Employee (<u>EmployeeNumber</u>, EmployeeName)
> Skill (<u>SkillCode</u>, SkillName)

Q6   Answer: c)

a) It is a function required at the time of updating databases irrespective of online processing or batch processing.
b) In the lock method, lock granularity can be made smaller than the relation (i.e., table).
c) Exclusive control is a function that prevents loss of data integrity by the occurrence of data inconsistency because of a lost update or such other problem.   (Correct answer)
d) Deadlock is the problem that may occur because of the lock method.

Q7   Answer: c)

• Reorganization:
  It is the process of optimizing the unused storage areas when access efficiency is decreased.
• Checkpoint:
  It is the point in time when a checkpoint file is created during the update process of a database.
• Rollback:
  It is a recovery process that restores the status before the start of a disabling transaction by reflecting the "information before the update" (i.e., "undo" information) of the journal file in the database after the disabling process.   (Correct answer)
• Rollforward:
  It is a recovery process that restores the database to the status just before the occurrence of failure by reflecting the "information after the update" (i.e., "redo" information) of the journal file in the backup file.

Q8   Answer: b)

a) It determines the average (AVG) of quantity of tuples where ProductNumber is 'NP200'. Therefore, it is $(3+1) \div 2 = 2$.
b) It determines the number (COUNT) of tuples in the "Delivery_record" table. Therefore, it is 4. (Correct answer)
c) It determines the maximum value (MAX) of quantity. Therefore, it is 3.
d) It determines the total (SUM) of quantity of tuples where Date is '20XX-10-11'. Therefore, it is $1+2=3$.

Q9   Answer: b)

SQL statement in the question means "Extracting the names of students who belong to the department with the address Shinjuku." Departments where the address in the "Department" table is Shinjuku are the Science Department and the Engineering Department. Therefore, 'Tomoko Goda' and 'Shunsuke Aoki' will be extracted from the "Student" table because the students belong to the Science Department or the Engineering Department respectively.

Q10 Answer: d)

a) Correct results will not be extracted because the conditions of WHERE clause are joined with OR.

b) Correct results will not be extracted because there is no condition that will equijoin the "Product" table and the "Inventory" table.

c) Correct results will not be extracted because they are not in the format of correlation subquery.

d) Subquery statement will extract ProductNumber from the "Inventory" table with InventoryQuantity less than 100, and information of products with ProductNumber matching with either of the results will be extracted from the "Product" table.   (Correct answer)

Q11 Answer: b)

- CLOSE statement: This statement terminates the process of cursor.
- DECLARE CURSOR statement: This statement defines the derived table to be processed and assigns the cursor.   (Correct answer)
- FETCH statement: This statement reads data from the position of cursor.
- OPEN statement: This statement starts the process of cursor.

Q12 Answer: a)

- Two-phase commitment:

  This method is composed of two phases, namely, phase 1 that checks whether or not the update process in the distributed database can be performed, and phase 2 that instructs commit or rollback on the basis of the results of phase 1.   (Correct answer)

- Data cleansing:

  It refers to removing duplication and inconsistency of notation and such other problem from the database.

- Data mining:

  It is the method of mathematically and statistically analyzing the data and finding the hidden regularity.

- Replication:

  It is a method that places a copy (i.e., replica) as the distributed database.

Chapter 5　Network

Q1　Answer: d)

The transfer time (in seconds) is calculated after the effective line speed is calculated from the line utilization rate.

$$\text{Transfer time} = \frac{10^6 \text{ bytes} \times 8 \text{ bits/byte}}{64 \times 10^3 \text{ bps} \times 0.8} = 156.25 \text{ seconds} — \text{Approx. 157 seconds}$$

Q2　Answer: d)

The Communication Control Unit (CCU) is a data communication system using a general purpose computer. It performs serial-parallel conversion (i.e., assembling/disassembling characters) of data during transmission, as well as error control and control of several lines.

- a) This is an explanation of DSU (Digital Service Unit).
- b) This is an explanation of NCU (Network Control Unit).
- c) This is an explanation of a modem (modulation and demodulation device).

Q3　Answer: b)

If bits are arranged according to the explanation that is provided in the question, it will result in the arrangement shown below. Here, it should be noted that the characters are arranged from the lower-order bit to the higher-order bit, and the PB (Parity Bit) is appended with respect to the character bit.

0	0010101	1	1
ST	Character	PB	SP

Q4　Answer: d)

- Circuit switching service:

    This uses the circuit switched network and connects the users by using circuit switching equipment.

- Leased line service:

    This provides a leased line that is linked to the communication partner in a fixed manner.

- Packet switching service:

    This is a store and forward switching method in units of packets that provides high-quality data transmission through error control.

- Frame relay service:

    This is a store and forward switching method in units of frames that provides high-speed data transmission by omitting error control and confirmation of data transfer to be performed in units of frames.　(Correct answer)

Q5   Answer: c)

TDM (Time Division Multiplexing) is a multiplexing technique that is used in a digital line. By changing the connection destination in a fixed period (i.e., time slot), small pieces of data items are sent simultaneously.

    a) This is an explanation about FDM (Frequency Division Multiplexing).

    b) This is an explanation about WDM (Wavelength Division Multiplexing).

    d) This is an explanation about CDM (Code Division Multiplexing).

Q6   Answer: a)

- Contention:

    A data link is established on the basis of an acknowledgment from the receiving side with respect to an enquiry for a transmission request.   (Correct answer)

- Token bus/Token ring:

    This is a method by which the terminal that acquires a token (i.e., transmission right) performs data transmission.

- Polling:

    This refers to the inquiry of existence of a transmission request from a control station (i.e., primary station) to a subsidiary station (i.e., secondary station).

Q7   Answer: a)

The CRC code for error control of the A, C, and I fields is recorded in FCS (Frame Check Sequence / 16 bits).

    b) This is the role of F (Flag sequence / 8 bits).

    c) This is the role of C (Control field / 8 bits).

    d) This is the role of A (Address field / 8 bits).

Q8   Answer: a)

ADSL (Asymmetric Digital Subscriber Line) is a service that provides high-speed data transmission with a different uplink and downlink speed by using an existing telephone line (i.e., twisted pair cable).

    b) This is a description of ISDN.

    c) This is a description of tethering, a method of mobile communication.

    d) This is a description of FTTH.

Q9　Answer: d)
- EDI (Electronic Data Interchange):

   This is a service that is provided by digitizing and exchanging the transaction data between companies through a network.
- PIAFS (PHS Internet Access Forum Standard):

   This is a digital data communication standard that uses PHS.
- VAN (Value Added Network):

   This is a service that is provided by borrowing a line from a facility-based telecommunications provider, and then attaching some added value.
- VoIP (Voice over IP):

   This is a technique that converts voice information (i.e., analog signal) to a digital signal and delivers the information to the partner in the form of IP packets. It is used in IP telephones. (Correct answer)

Q10　Answer: a)

The network layer provides a communication channel from end to end with the help of the path selection (i.e., routing) function for data transmission, and the function for transferring/relaying data.

- b) This is an explanation of the physical layer.
- c) This is an explanation of the application layer.
- d) This is an explanation of the data link layer.

Q11　Answer: c)
- TCP (Transmission Control Protocol):

   This is a transport layer protocol that guarantees high reliability in connection-oriented communication in which a logical communication channel is provided.
- IP (Internet Protocol):

   This is an Internet layer (or network layer of the OSI basic reference model) protocol that transfers packets by using the IP address.

Q12　Answer: b)

10BASE5 is a baseband LAN which has a transmission speed of 10 Mbps and is connected through a coaxial cable with the maximum transmission distance of 500 m.

- a) The maximum transmission distance is 500 m.
- c) The transmission medium is a coaxial cable.
- d) The transmission method is the baseband method.

Q13 Answer: b)
- CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance):

    This is a method for confirming data arrival by using the ACK signal from the receiving side in a wireless LAN that cannot detect a collision.
- CSMA/CD (Carrier Sense Multiple Access with Collision Detection):

    This is a method that is mainly used in bus LAN, and first checks whether data is flowing across the backbone cable. When a collision is detected, the transmission of data is stopped temporarily and is retransmitted after a fixed period of time.   (Correct answer)
- Token bus:

    This refers to token passing of a bus LAN. It is a method by which the terminal that acquires special data called a token (i.e., transmission right) performs data transmission. Since only the terminal that acquires the token (i.e., transmission right) can perform data transmission, a collision does not occur.
- Token ring:

    This refers to token passing of a ring LAN. As with token bus, a collision does not occur.

Q14 Answer: c)
- Gateway:

    This is used to convert the protocols of the upper layers (i.e., fourth layer through seventh layer) of the OSI basic reference model.
- Bridge:

    This relays frames on the basis of the MAC address in the data link layer (i.e., second layer).
- Repeater:

    This amplifies the signals and extends the transmission distance of LAN in the physical layer (i.e., first layer).   (Correct answer)
- Router:

    This provides the routing function on the basis of the IP address in the network layer (i.e. third layer).

Q15 Answer: b)
- IP address:

    This is an address for identifying the network or device that is included in the IP header.
- MAC address:

    This is a device (i.e., hardware) specific identifier that is included in the Ethernet header. (Correct answer)
- Sequence number:

    This is a number that represents the order of the packets that is included in the TCP header.
- Port number:

    This is a number that represents the service (protocol) that is included in the TCP header.

Q16 Answer: d)

In the IP address of class *C*, the first three digits are "110" in binary-coded notation, the 21 bits following the class bits are used as the network address part, and the last 8 bits are used as the host address part.

a) Since an IP address with the host address part of all 1s (i.e., 255) is a broadcast address, it cannot generally be assigned to a computer.

b) Since an IP address is represented as a decimal number that is separated into four portions of 8 bits each, an IP address having a value (e.g., 256) other than that between 0 and 255 cannot be assigned to a computer.

c) Since an IP address with the host address part of all 0s (i.e., 0) is a network address, it cannot generally be assigned to a computer.

d) Since the value (i.e., 128) of the host address part is within the range of 0 to 255, this IP address can be assigned to a computer. However, it is necessary to ensure that the IP address is not a duplicate.   (Correct answer)

Q17 Answer: a)

• DHCP (Dynamic Host Configuration Protocol)

This is a protocol for dynamically assigning an IP address to the devices (i.e., computers) that are connected to the network.   (Correct answer)

• DNS (Domain Name System)

This is a protocol for converting FQDN (Fully Qualified Domain Name) to an IP address. (This conversion is referred to as name resolution.)

• NAT (Network Address Translation)

This is a function that performs one-to-one conversion of the private IP address and the global IP address.

• RIP (Routing Information Protocol)

This is a protocol for selecting the path up to the target network by using the IP address. (The process of directing transmitted data to another network is called routing.)

Q18 Answer: d)

A RADIUS (Remote Authentication Dial-In User Service) server is a server that provides the service for simplifying network management by centralizing the authentication of the overall system.

a) This is a service that is provided by a DNS (Domain Name System) server.

b) This is a service that is provided by a PROXY server.

c) This is a service that is provided by a RAS (Remote Access Service) server.

Q19 Answer: d)

SMTP (Simple Mail Transfer Protocol) is a protocol for performing mail transfer from the mail client to the mail server, and mail transfer between mail servers.

a) This is an explanation of a search engine.

b) This is an explanation of HTTP (HyperText Transfer Protocol).

c) This is an explanation of FTP (File Transfer Protocol).

Q20 Answer b)

Intranet refers to the network within a company that uses Internet technologies (e.g., the web server and the web browser). Installation is relatively easy, and the initial cost can also be reduced. When a connection is to be established between Intranets within the same company, it is necessary to consider using VPN (Virtual Private Network) and PVC (Permanent Virtual Circuit) of a packet switched network to prevent leakage of information.

   a) This implies an extranet.
   c) This implies an overlay network.
   d) This implies a frame relay network.

Q21 Answer: c)

Ping is a command program for network management that checks the connection status (i.e., communication status) of a device, and performs response measurement or diagnosis. The connection status of a device is confirmed by specifying the IP address of the network device whose connection status is to be checked, sending a message, and then receiving a reply from the target device.

   a) This is the role of the "arp" command, which is used for network management.
   b) This is the role of the "ipconfig" command, which is used for network management.
   d) This is the role of a LAN analyzer.

Chapter 6   Security

Q1   Answer: d)

ISO/IEC 27001 (JIS Q 27001:2006) defines availability in information security as "the property of being accessible and usable upon demand by an authorized entity."

a) This is a definition of integrity.
b) This is a definition of authenticity.
c) This is a definition of confidentiality.

Q2   Answer: d)

Social engineering is a human threat by which information is stolen through everyday, common means. It corresponds to actions such as impersonating an authorized person (i.e., spoofing) to request a password via telephone.

a) This action corresponds to a technical threat (e.g., zero-day attack).
b) This action corresponds to a technical threat (i.e., bot).
c) This action corresponds to a technical threat (i.e., password cracking) and a physical threat (i.e., unauthorized intrusion).

Q3   Answer: c)

- DoS attack (Denial of Service):

  This is an attack that sends a large amount of data continually to the target server to place an excessive load on the server's CPU and memory, and thereby obstructs service.

- SQL injection:

  This is an attack that falsely modifies a database or fraudulently obtains information by providing part of an SQL statement as a parameter to a program in the website that is linked to the database.

- XSS (Cross Site Scripting):

  This is an attack where a vulnerable target website is used as a stepping stone; a malicious script is sent to a user who is accessing the target website, and then executed on the user's browser to enable the theft of information. (Correct answer)

- Phishing:

  An attack that leads a user to a fake website through means such as e-mail pretending to be sent from a real company, and defrauds the user of the credit card number, a bank account number, a PIN, and other personal information

Q4   Answer: b)

Encryption is a security technique that is enacted as a measure against information leakage and against tapping of communications.

a) Even if encryption is used, the loss of an encryption key cannot be prevented.

c) Since a sending log of a mail server is not encrypted, it is not possible to protect the mail server from falsification.

d) Even if encryption is used, it is not possible to prevent attacks (e.g., DoS attacks) that obstruct mail service.

Q5   Answer: c)

Public key cryptography is a method that enables anyone to disclose or distribute a public key while a private key is kept concealed by the owner. In the case of a measure against information leakage or measures against tapping of communications, in order to prevent third parties from decoding the encrypted message, encryption is performed by using the recipient's public key and decryption is performed by using the recipient's private key. Therefore, the key that the customer (i.e., the sender) uses for encryption is the public key of the retail store (i.e., the recipient).

Q6   Answer: d)

a) This method is not safe because the encryption key and decryption key are the same in common key cryptography and the use of the same key presents a risk that the encrypted content may be read by an outside party.

b) Since the encryption key is disclosed in public key cryptography, there is no need to secretly distribute the encryption key to the communication partner.

c) Since the encryption/decryption algorithms in public key cryptography are complex in order to guard against inferring a decryption key from the disclosed encryption key, its decryption is complex and time-consuming as compared with common key cryptography.

d) This method, which uses public key cryptography for the transfer of a common key and performs data encryption by using common key cryptography, is called session key cryptography (hybrid cryptography). (Correct answer)

Q7   Answer: d)

In password management, it is not allowed to give a password to other person. Since "other person" includes a security administrator, the responses a) trough c) are not appropriate. (A password could be leaked when a security administrator contacts a user.) Thus, the most appropriate response is to reset the password and have the user set a new password.

Q8   Answer: a)

Typical biometric authentication methods are shown below:

Face authentication	Facial characteristics (e.g., positional relationships among eyes, nose, and mouth)
Iris authentication	Shape, shading, and such other characteristic of the iris pattern (the folds emanating from the pupil) of the eye (Correct answer)

Voice authentication	Characteristics of the voice wave pattern
Palm authentication	Width of the palm, length of the fingers, etc.
Vein authentication	Branching angle, length, and such other characteristic of veins * Sometimes included in palm authentication
Fingerprint authentication	Characteristics (called "minutia points") of fingerprints (i.e., the patterns formed by ridges on fingertips)

Q9   Answer: a)

A message digest is calculated from a message by using a hash function, etc. and is used to confirm that the message is not falsified by comparing the message digest that is generated by the sender with the message digest that is calculated from the message received by the recipient.

Q10   Answer: d)

Digital signature is an authentication technique that combines user authentication and message authentication. By attaching a digital signature to software, both user authentication and message authentication can be achieved. The user authentication includes verification that the user who signed is the correctly authorized person, and message authentication includes verification that the software is not falsified or changed without authorization.

Q11   Answer: d)

a) A company's security policy defines an organization's perspective to consider information security, and its content does not differ according to the security-related product that is installed.

b) It is necessary to express not only behavior and judgment criteria to be followed in the form of information security measures criteria, but also security initiatives in the form of information security policy.

c) It is necessary to implement measures against information system vulnerabilities, but since external disclosure of the vulnerabilities may result in their exploitation, it is not necessary to disclose the measures.

d) Information security policy is the defined organization's perspective to consider information security. In order to achieve the targeted security level, the organization's unified behavior and decision-making criteria (i.e., standards) must be made clear in the form of information security measure criteria, to ensure that information is not handled according the judgment of individual users. (Correct answer)

Q12　Answer: d)

The ISMS (Information Security Management System) process is operated according to the PDCA (Plan, Do, Check, Act) cycle. Within this, the following tasks are implemented in Plan: the construction of an information security promotion structure, definition and determination of the scope and boundaries of ISMS, definition of ISMS policy, implementation of risk assessment (identification, analysis, and evaluation of risks), selection of control objectives and controls for the treatment of risks, authorization of ISMS implementation and operation, and preparation of a Statement of Applicability.

a) This is implemented in Do.
b) This is implemented in Act.
c) This is implemented in Check.

Q13　Answer: a)

a) In order to prioritize response by the size of risks, the following are analyzed: the frequency of occurrence of risks, the scale of impacts (damage, losses) made when the risks are exposed, or such other factor. (Correct answer)
b) Even if not all measures are completed, the precision of risk analysis can be enhanced and the enactment of better measures can be achieved by repeatedly implementing risk analysis.
c) It is acceptable to reference data collected from a similar past project to prevent future losses.
d) Not only the value of losses but also frequency of occurrence should be included in determining the order of priority of risk measures.

Q14　Answer: b)

JPCERT/CC (Japan Computer Emergency Response Team / Coordination Center) is an incorporated association that collects and communicates information concerning security. It also plays a role as a coordinating body for the Information Security Early Warning Partnership.

a) This is a description of CRYPTREC (Cryptography Research and Evaluation Committees).
c) This is a description of IPA Security Center.
d) This is a description of NISC (National Information Security Center).

Q15　Answer: b)

a) In the pattern matching method, signature files (definition files) make up a database of the characteristic portions of viruses, and are not limited to information in the first part of the virus.
b) The pattern matching method is a method for identifying and detecting known viruses registered in signature files, and thus can also identify the names of viruses. (Correct answer)
c) In general, the size of a file infected by a virus becomes larger. Moreover, whether a file can be restored after removal of the virus is not related to the size of the file.
d) The rule-based method makes determination of a virus by detecting unauthorized behavior defined in a rule base, and therefore, cannot identify a particular virus name from the behavior characteristics.

Q16 Answer: d)

OP25B (Outbound Port 25 Blocking) is a method that prohibits outbound communication from internal networks via TCP port 25 (SMTP), through routers or such other devices at the boundary with external networks. When OT25B is active, it performs filtering of e-mail transmission (SMTP communication) from internal networks to external mail servers, and can prevent unauthorized relaying of spam, etc.

   a) This is a description of a honey pot.

   b) This is a description of DKIM (Domain Keys Identified Mail).

   c) This is a description of content filtering.

Q17 Answer: d)

- APOP (Authenticated POP):

  This is a protocol that uses the POP with added security functions and encrypts passwords during login to mail servers. However, it does not encrypt the body text of e-mail.

- EAP (PPP Extensible Authentication Protocol):

  This is a protocol that is used for user authentication via remote access. Authentication methods using EAP, which adds authentication functions to PPP, include EAP-TLS (EAP Transport Layer Security) and PEAP (Protected EAP).

- OAuth:

  This is an authentication protocol that performs handover of user privileges, with user consent, between services (i.e., applications) that have already-established a relationship of trust.

- SSL (Secure Sockets Layer):

  This is a secure protocol which, between the application layer and the TCP layer, performs authentication (digital signature) between client and server and encryption of communication content (session key cryptography). TLS (Transport Layer Security) 1.0 is drafted by the IETF as RFC 2246that was standardized on the basis of SSL. (Correct answer)

Q18 Answer: b)

A reverse proxy is a server that receives requests from a client in place of a specified server, and relays the requests to the specified server. Since this flow is reversed from that of a regular proxy server, which acts as a proxy to relay access from the inside to the outside, the server is called a reverse proxy. By embedding functions to scan the content of packets and URLs during relay, access to specified servers can be restricted. A reverse proxy can also reduce the load on servers by acting as a proxy to respond to requests coming from large numbers of clients, and can speed response by storing content in cache.

   a) This is the role of a proxy server.

   c) This is the role of a quarantine network.

   d) This is the role of an IDS (Intrusion Detection System).

Q19 Answer: d)

WPA (Wi-Fi Protected Access) is an encryption method for wireless LANs. This is an improved WEP (Wired Equivalent Privacy), which performs encryption using a WEP password and SSID, uses the encryption protocol TKIP which generates and renews keys at regular intervals, and results in high security. Currently, there is another method, WPA2, which uses the new encryption protocol CCMP (sometimes labeled AES).

    a) This is a description of WAF (Web Application Firewall).

    b) This is a description of NAT (Network Address Translation).

    c) This is a description of UTM (Unified Threat Management).

Chapter 7　Data Structure and Algorithm

Q1　Answer: b)

After "Shizuoka" is inserted, the list must be traced in order of "Atami → Shizuoka→ Hamamatsu". Therefore, the pointer of "Atami" which is located just before the inserted element (i.e., Shizuoka) is set to the address 150. The pointer of the inserted element (i.e., Shizuoka) is set to the address 70 of "Hamamatsu" which is located just after the inserted element (i.e., Shizuoka).

Q2　Answer: a)

Stack is an LIFO (Last-In First-Out) data structure where data that is stored last is extracted first. Therefore, data that is stored last can be extracted first.

- b) It is an explanation of a FIFO (First-In First-Out) queue.
- c) It is an explanation of a list.
- d) It is an explanation of a hash table.

Q3　Answer: a)

An expression in the reverse Polish notation can be obtained by representing "$X=(A+B)\times(C-D\div E)$" with binary tree and extracting node values with depth-first search (i.e., post-order traversal).

Expression in the reverse Polish notation
$XAB+CDE\div-\times=$
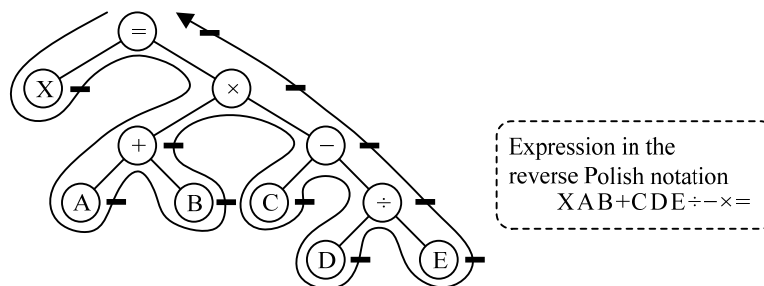
Q4　Answer: b)

- a) Relation "Left subtree < Node < Right subtree" does not hold true, because left child ② is larger than parent ①.
- b) In all nodes, relation "Left subtree < Node < Right subtree" holds true.　(Correct answer)
- c) Relation "Left subtree < Node < Right subtree" does not hold true, because right child ⑤ is smaller than parent ⑥.
- d) Relation "Left subtree < Node < Right subtree" does not hold true, because right child ② is smaller than parent ⑦.

Q5　Answer: b)

- Functional programming:
    It is a programming technique where a process is described by using functions.
- Structured programming:
    It is a programming technique that takes into account a processing sequence according to the

concept of structured theory that "If the program has one entry and one exit, it can be represented with a combination of three basic structure units (Sequence, Selection, and Iteration)."   (Correct answer)

- Parallel programming:
  It is a programming technique for doing parallel processing by using multiple processors.
- Logic programming:
  It is a programming technique for doing logical processing by using a syllogism, and so on.

Q6   Answer: d)

a) "REPEAT UNTIL iteration" is also used for representing an iteration process that is not a nested structure.

b) "IF THEN ELSE selection" executes either of the two processes depending on whether the condition is true or false.

c) "CASE selection" is a type of selection structure, not an iteration structure that returns to the process just prior to the selection.

d) "DO WHILE iteration" performs conditional decision before an iteration process, and therefore, it is possible that the iteration process may not run even once.   (Correct answer)

Q7   Answer: c)

In this algorithm, "i" (i.e., 1 through N) is added to variable x. Therefore, when variable i becomes $N+1$, the iteration can be terminated. Therefore, the ending condition is "$i > N$".

Q8   Answer: b)

Binary search is a search algorithm that can only be used when data is sorted in ascending (or descending) order. This algorithm compares the target value and the data that is located in the center of the search range, and narrows down the search range on the basis of magnitude relation.

a) Even when data is sorted in descending order, it can be correctly searched.

c) If data is not sorted, it does not mean that efficiency reduces, but that data cannot be correctly searched.

d) Data can be correctly searched even if the number of data items is an odd number.

Q9   Answer: a)

When n data items are searched, the maximum number of searches in binary search is $[\log_2 n] + 1$ times, and the order (i.e., computational complexity) of its execution time is $\log_2 n$. On the other hand, the maximum number of searches in a linear search is n times, and the order (i.e., computational complexity) of its execution time is n. In a hash search, probability of collision of hash value is small enough that it can be ignored. Therefore, the number of searches is 1 time, and the order (i.e., computational complexity) of its execution time is 1.

Q10 Answer: c)

Selection sort compares 2nd through n-th elements for deciding the 1st element. It compares 3rd through n-th elements for deciding the 2nd element. In this way, it compares n-th element for deciding the $n-1$-th element. Therefore, the number of comparisons between data items is determined as follows:

$$(n-1)+(n-2)+\cdots+1=n\times(n-1)\div 2$$

Q11 Answer: d)

Heap sort is a sorting algorithm that represents the unsorted data to be sorted with a heap (i.e., ordered tree), and then sequentially extracts the data of root that becomes the maximum value (or minimum value) in the sorted part.

    a) It is an explanation related to shell sort.

    b) It is an explanation related to quick sort.

    c) It is an explanation related to bubble sort.

Q12 Answer: d)

The Boyer-Moore method is an algorithm for string pattern matching that improves the efficiency. When the last character of the partial string does not exist in the target string, the position is shifted by the number of characters in the target string. When the last character of the partial string exists in the target string, the partial string is shifted so that the position matches with the corresponding string.

    a) It is an explanation related to the control break process (i.e., group total process).

    b) It is an explanation related to the Newton's method.

    c) It is an explanation related to the Dijkstra method.

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Chapter 1   Corporate and Legal Affairs

Q1 Answer: c)

Going concern (i.e., continuous business entities) refers to the underlying prerequisite concept for any company that "the company can continue its corporate activities indefinitely and continue to meet its social responsibilities/missions." As long as this prerequisite is in place, investors can invest in the company and customers can use the services that are provided by the company.

- a) This is an explanation of green IT.
- b) This is an explanation of disclosure (i.e., disclosure of corporate affairs).
- d) This is an explanation of CSR (Corporate Social Responsibility).

Q2 Answer: a)

- Divisional organization:

    It is a management organization that divides manufacturing, sales, and other departments up into organizational units (i.e., divisions) such as by product, client, region, or project. Each of these divisions has its own responsibility for profit and has its own decision-making authority. (Correct answer)

- Project organization:

    It is a management organization that is formed temporarily as a group of specialists from each department in order to solve a specific problem (or reach a specific goal).

- Matrix organization:

    It is a management organization that establishes an exchange between project and functional organizations in order to flexibly respond to changes in the business environment.

- Line and staff organization:

    It is a management organization which consists of a line department in charge of tasks, such as production and sales, and a staff department which is in charge of tasks such as general affairs and accounting.

Q3 Answer: d)

- Journal book:

    It is a book that records all transactions that are conducted during the fiscal year in order of time.

- General ledger:

    It is a book that organizes the contents of the journal book by account title, and transfers that information.

- Income statement (Profit and loss (P/L) statement):

    It is a financial statement that clarifies a company's business performance over a specified period (normally the fiscal year). Cost is shown on the debit (left side). Income is shown on the credit (right side).

- Balance sheet:

    It is a financial statement that is intended to clearly indicate the financial situation of a company at a specific point in time (e.g., normally the end of a fiscal period). Assets are shown on the debit (left side). Liabilities and net assets are shown on the credit (right side).

(Correct answer)

Q4 Answer: b)

In the fixed-rate method, the depreciation cost can be calculated with the expression of "End of period non-depreciated balance × Depreciation rate". By using this method, calculate the depreciation cost for the second year.

1) Calculate the depreciation rate on the basis of the depreciation cost for the first year.

Depreciation cost for the first year

= End of period non-depreciated balance of the first year × Depreciation rate

3,200 = 10,000 × Depreciation rate   =>   Depreciation rate = 0.32

2) Calculate the depreciation cost for the second year.

Depreciation cost for the second year

= End of period non-depreciated balance of the second year × Depreciation rate

= (10,000 – 3,200) × 0.32 = 2,176   =>   Approximately 2,200 yen

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Q5 Answer: b)

Operating profit = Gross profit − Selling, general and administration expense

= (Sales − Cost of sales) − Selling, general and administration expense

= (150,000,000 – 100,000 000) – 20 000 000

= 30,000,000 dollars (30 million dollars)

Q6 Answer: a)

ROE (Return On Equity) is calculated as "Current period net profit ÷ Equity capital". It is an indicator of profitability and shows how much profit is earned for the amount of equity capital.

b) This is an explanation of ROA (Return On Assets).

c) This is an explanation of ROI (Return On Investment).

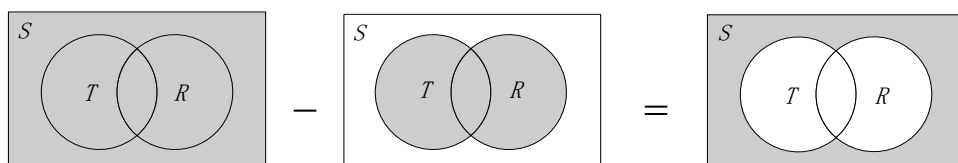d) This is an explanation of current ratio.

Q7 Answer: a)

The break-even point sales can be calculated by using the following expression.

$$\text{Break-even point sales} = \frac{\text{Fixed costs}}{1 - \dfrac{\text{Variable costs}}{\text{Sales}}} = \frac{1,000}{1 - \dfrac{8,000}{10,000}} = \frac{1,000}{0.2} \, 5,000 \text{ dollars}$$

Q8 Answer: a)

When set "$S - (T \cup R)$" is represented by using a Venn diagram, it is as shown in the shaded area of the right-hand side below.

a) $(S-T)-R=S-T-R=S-(T\cup R)$ (Correct answer)

b) $(S-T)\cup(S-R)=S-(T\cap R)$

c) $(S-T)\cup(T-R)=S-(T\cap R)$

d) $(S-T)\cap(T-R)=$ Empty set

Q9 Answer: d)

The following shows the result of organizing the conditions in the problem.

1) Proposition P = True

2) Proposition 1:   (not P) or Q = True

   => On the basis of 1), (not P) is false, so Proposition 1 is only true when the truth value of Q is true.

3) Proposition 2: (not Q) or R = True

   => On the basis of 2), (not Q) is false, so Proposition 2 is only true when the truth value of R is true.

Q10 Answer: c)

The multiplication theorem can be used to calculate the probability of drawing two red balls from the bag.

$$\begin{array}{ccc}\text{The probability that} & = & \text{The probability of the} \\ \text{both two balls are red} & & \text{first ball being red}\end{array} \times \begin{array}{c}\text{the probability of the} \\ \text{second ball being red.}\end{array}$$

$$= \frac{5}{9} \times \frac{4}{8} = \frac{5}{18} = 0.277... \quad \Rightarrow \text{Approximately 28\%}$$

Q11 Answer: d)

From the normal distribution $N(1.25, 0.50^2)$, standardize the length $x = 2.0$ at which the part fails inspection to the deviation u of the standard normal distribution of $N(0, 1^2)$, then calculate the probability from the standard normal distribution table.

1) Standardize $x = 2.0$ to the deviation u for the standard normal distribution of $N(0, 1^2)$.

$$u = \frac{|\text{Rejected product length} - \text{Average length}|}{\text{Standard deviation}}$$

$$= \frac{|x - \mu|}{\sigma}$$

$$= \frac{|2.00 - 1.25|}{0.5} = 1.5$$

2) Find the probability p where $u = 1.5$ from the standard normal distribution table. However, the allowed range is ± 2 mm, so the occurrence rate of a defective product is double the probability p.

   Occurrence rate of a defective product $= p \times 2 = 0.067 \times 2 = 0.134 \quad \Rightarrow \quad 13.4\%$

Q12 Answer: d)

- XY theory:

  This theory proposes that people hold opposing theories in the "control by direction theory X" and the "self-control theory Y," and is used for motivation management.

- Graph theory:

  This is a theory is for using a graph that is composed of vertices and branches (or edges).

- Game theory:

  This is a theory that considers the optimal strategy for a player to win a game.

- Queueing theory:

  This is a method of statistically estimating the amount of waiting time or the number of people who are waiting by modeling the queue to wait for a service or the event that involves such a queue.   (Correct answer)

Q13 Answer: c)

The linear programming is used to find the constraint expressions and objective function, and then calculate a solution which obtains the maximum value of the objective function.

1) If the manufacturing count for product M is x units and y units for product N, find the constraint expressions and objective function (i.e., the expression to calculate the sales profit).

   [Constraint expressions] $6x + 3y \le 360$ $\cdots$ (1) Sweets K

   $2x + 4y \le 240$ $\cdots$ (2) Sweets L

   $x \ge 0, \quad y \ge 0$ $\cdots$ The manufacturing count must be an integer greater than 0.

   [Objective function]   Sales profit $= 6x + 4y$ $\rightarrow$ Maximum

2) Find solutions for x and y from constraint expressions.

   (2) $\times$ 3 $6x + 12y \le 720$

   (1) $-)\ 6x + \quad 3y \le 360$

   $9y \le 360$ => $y \le 40$

   Substitute the maximum value of 40 for y in (1) to find x.

   $6x + 3 \times 40 \le 360$

   $6x \le 240$ => $x \le 40$

3) Find the maximum sales profit when products M and N are manufactured at maximum count.

   Maximum sales profit $= 6 \times 40 + 4 \times 40$

   $= 400$

Q14 Answer: d)

The earliest and latest node times in the arrow diagram in the question can be found as shown below.
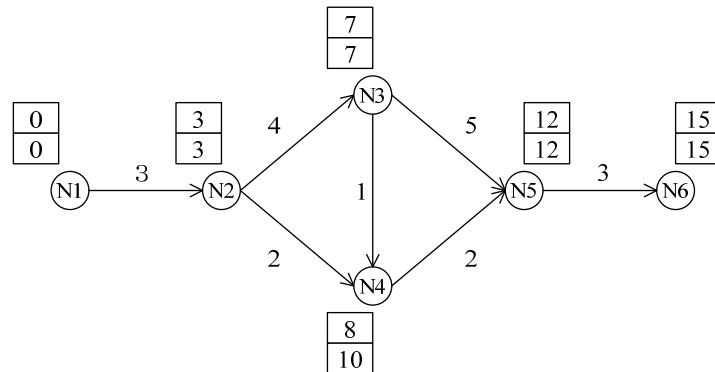
Therefore, the earliest node time for node N4 is 8, while the latest node time is 10.

Q15 Answer: b)

The EOQ (Economic Order Quantity) can be calculated by using the following expression.

$$\text{EOQ (Economic Order Quantity)} = \sqrt{\frac{2 \times \text{Total annual demand} \times \text{Ordering cost per order}}{\text{Annual storage cost per stock}}}$$

$$= \sqrt{\frac{2 \times 100{,}000 \text{ units per year} \times 1{,}000 \text{ dollars}}{50 \text{ dollars/unit per year}}} = 2{,}000 \text{ units}$$

Q16 Answer: c)

The maxi-min principle is a concept that determines the strategy which obtains the greatest benefit amongst the minimum benefit, as the optimal strategy.

1) Find a strategy that each company selects when the company uses the maxi-min principle.
   - Company *A*:   Minimum value of Strategy *a1* (−15) < Minimum value of Strategy *a2* (0)
     => Select Strategy *a2*
   - Company *B*:   Minimum Value of Strategy *b1* (−5) < Minimum value of Strategy *b2* (−20)
     => Select Strategy *b1*.
2) Find the benefit of Company *A*.
   If Company *A* selects Strategy *a2*, and Company *B* selects Strategy *b1*, Company *A* has a benefit of 5.

Q17 Answer: b)

Work sampling method is a technique that performs numerous instantaneous observations of what work status the observation target was in at certain points in time, and from that, estimates operational status, work time, and other factors.

a) This is an explanation of the stopwatch method.
c) This is an explanation of the PTS (Predetermined Time Standard) method.
d) This is an explanation of the experience estimate method.

Q18 Answer: c)

An OC curve (Operating Characteristic curve) is a figure that is used for a sampling of products.

a) The probability that a lot with a defective rate greater than *p1* passes is less than *L1*.

b) The probability that a lot with a defective rate lower than *p1* fails is less than "$1.0 - L1$".

c) The probability that a lot with a defective rate greater than *p2* passes is less than *L2*.   (Correct answer)

d) The probability that a lot with a defective rate lower than p2 fails is less than "$1.0 - L2$".

Q19 Answer: c)

A control chart is one of the seven QC tools. Data is entered for a CL (Central Line) that represents normal values, a UCL (Upper Control Line) that represents the upper limit for normal values, and an LCL (Lower Control Line) that represents the lower limit of normal values. The data (i.e., mean value) is then plotted and represented in the line graph. This type of graph is primarily used for quality management.

a) This is an explanation of a scatter diagram.

b) This is an explanation of a cause-and-effect diagram (i.e., fishbone diagram).

d) This is an explanation of a histogram.

Q20 Answer: d)

Brainstorming is a method of collecting many ideas and opinions about a problem that needs to be solved or a goal that needs to be met. By following the four rules below, participants can freely and creatively state their opinions, which can lead to fresh, new ideas.

Prohibition of criticism	Participants should not criticize what others say.
Freewheeling	Participants should speak boldly and freely, even when they stray a bit from the objective.
Quantity over quality	Participants should focus on generating many opinions rather than quality opinions.
Free piggybacking	Participants should be free to build on and combine the ideas of others.

Q21 Answer: b)

The KJ method is used to organize numerous comments that are collected through brainstorming or other means. The similar information is grouped together and organized visually into a diagram, and then the organized data is documented to determine any potential problem points. The name KJ comes from the initials of its inventor, Kawakita Jiro.

a) This is an explanation of PDPCs (Process Decision Program Charts).

c) This is an explanation of association diagrams.

d) This is an explanation of tree diagrams (logic trees).

Q22 Answer: d)

A radar chart sets a standard form for multiple evaluation items, plots ratios against those standards, and represents the balance among items by a polygonal shape connected with lines. Therefore, it is most suitable to use for "displaying the functional merits of a product on the basis of multiple evaluation items."

  a) This is most suitable for a bar graph.
  b) This is most suitable for a pie chart.
  c) This is most suitable for a line graph.

Q23 Answer: c)

ABC analysis (Pareto analysis) is a technique that manages products, service, etc. with dividing into three groups (*A*, *B*, and *C*).

  1) Each product is arranged by the number of defective products in descending order. Calculate the cumulative total number of defective products.

Product	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*
Count	182	136	120	98	91	83	70	60	35
Cumulative total	182	318	438	536	627	710	780	840	875

  2) Calculate the cumulative percentage (Cumulative total ÷ Total) of each product for each total.

Product	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*
Cumulative percentage	21%	36%	50%	61%	72%	81%	89%	96%	100%

Group *A* makes up 70% of the cumulative percentage, so the products for group *A* are five types, {*P, Q, R, S, T*}.

Q24 Answer: c)

There are four types of industrial property rights amongst the intellectual property rights: the patent right, the utility model right, the design right, and the trademark right. Copyright is an intellectual property right, but it is not an industrial property right.

Q25 Answer: c)

  a) In schools or other educational institutions, reproduction of works that were already made public, to the extent deemed as necessary, does not constitute copyright infringement. However, this is not applicable in cases that unreasonably prejudice the interests of the copyright holder. Therefore, copy of a commercially available workbook without permission from the publisher is grounds for copyright infringement.
  b) Copy of a program for backup purposes does not infringe upon copyright. However, forcefully removing any copy protection (i.e., copy guard) in place to prevent the copy of software is copyright infringement, even if it is only for a personal backup.
  c) Copy of works for personal use does not constitute copyright infringement.   (Correct answer)
  d) Adding works to a website is the same as making a copy of that data transmittable by the public, and therefore, is copyright infringement.

Q26 [Answer]: d)

a) An invention for which a patent right is obtained is protected by the Patent Act.

b) Publicly distributed information is known by the public, and therefore, cannot be considered a trade secret.

c) The information is not handled as confidential, and therefore, cannot be considered trade secrets.

d) This satisfies all the requirements for trade secrets, and therefore, is protected under the Unfair Competition Prevention Act.   (Correct answer)

Q27 Answer: d)

- Act on the Protection of Personal Information:

  This law aims to balance the use of personal information with protection of the information. It defines the duties, etc. to be observed by business entities that handle personal information.

- Electronic Signature Act:

  This law defines the certification systems and other necessary matters concerning designated certification service, to ensure the same legal trust in an electronic signature as that of a "physical signature" or a "personal seal."

- Act on the Regulation of Transmission of Specified Electronic Mail (Spam E-mail Prevention Act):

  This law regulates the transmission of e-mail by defining prohibited items and other details for transmitting specific types of e-mail for the purpose of commercial gain.

- Act on the Prohibition of Unauthorized Computer Access:

  This law is enacted to maintain the safety and order of telecommunications by preventing crime that is committed via telecommunications lines (e.g., networks) and by controlling access to computers. Breaches of this law include the misuse (or attack) of security holes in OS or software.   (Correct answer)

Q28 Answer: c)

The discretionary labor system is a system by which actual working hours are left up to the discretion of the workers, with remuneration made according to the deemed working hours. The minimum baseline for labor conditions (e.g., wages, working hours, break time/vacation, disciplinary actions, dismissal) to protect employees is defined in Paragraphs 3 and 4 of Article 38 of the Labor Standards Act.

a) This is an explanation of the Article 36 agreement.

b) This is an explanation of the flexible working hours system.

d) This is an explanation of maternity protection.

Q29 Answer: d)

a) When the "Contract" between Company *A* and Company *B* is a mandate contract with Company *A* as a mandatary and Company *B* as a mandator, an employment relationship incurs between Company *A* and Worker *C*, and Company *A* has the authority to provide instructions to Worker *C*.

b) When the "Contract" between Company *A* and Company *B* is a service contract with Company *A* as an entrustee and Company *B* as an entruster, an employment relationship incurs between

Company *A* and Worker *C*, and Company *A* has the authority to provide instructions to Worker *C*.

c) When the "Contract" between Company *A* and Company *B* is a secondment-related contract with Company *A* which loans Worker *C* to Company *B*, Company *B* has the authority to provide instructions to Worker *C*. (The employment relationship depends on the conditions of the secondment.)

d) When the "Contract" between Company *A* and Company *B* is a temporary worker dispatch contract with Company *A* as a dispatching company and Company *B* as a client, an employment relationship incurs between Company *A* and Worker *C*, and Company *B* has the authority to provide instructions to Worker *C*.   (Correct answer)

Q30 Answer: c)

- Premiums Representation Act [Act against Unjustifiable Premiums and Misleading Representations]:

    This is a law that regulates misleading representations of product or service quality, content, prices, etc., while it also prevents the sales that is accompanied by excessive premiums that are not commensurate with the products.

- Whistleblower Protection Act:

    This is a law which stipulates measures to protect whistleblowers to provide for nullity, etc. of dismissal because of whistleblowing (i.e., reports of actions in violation of the protection of citizens' lives or interests.)

- Electronic Consumer Contract Act [Act on Special Provisions to the Civil Code Concerning Electronic Consumer Contracts and Electronic Acceptance Notice]:

    This is a law that stipulates special provisions to the Civil Code in cases where there is a certain mistake in the elements comprising an electronic consumer contract executed by a consumer and an electronic acceptance notice is dispatched by a consumer with respect to a contract made by parsons at a distance. It states that if confirmation measures were not implemented by a business operator, the consumer can invalidate any unintended contracts (including mistakes in operation).   (Correct answer)

- Specified Commercial Transactions Act [Act on Specified Commercial Transactions]:

    This is a law that stipulates transactions between service providers and consumers that are prone to troubles, such as door-to-door sales and mail order sales.

Q31 Answer: d)

A site license agreement (or corporate license agreement) is an agreement which authorizes the use of multiple users and/or multiple computers in specified companies or organizations.

a) This is an explanation of volume license agreements.

b) This is an explanation of CALs (Client Access Licenses).

c) This is an explanation of shrink-wrap licenses.

Q32 Answer: b)
- IT Basic Act [Basic Act on the Formation of an Advanced Information and Telecommunications Network Society]:
     This is a law that stipulates basic principles and a basic policy on the development of strategies with respect to the formation of an advanced information and telecommunication network society.
- Financial Instruments and Exchange Act:
     This is a law that ensures the fairness in the issuance of securities and the transactions of financial instruments, by providing for necessary matters relating to persons who engage in the financial instruments business. This law requires submission of documents, such as an annual securities report and an internal control report.   (Correct answer)
- Information Disclosure Act [Act on Access to Information Held by Administrative Organs]:
     This is a law that stipulates that any person may request the disclosure of administrative documents that are made by administrative organs or corporate documents.
- E-Document Law [Electronic Document Law]:
     This law admits the preservation, etc. of documents by private businesses in the form of electromagnetic records (i.e., digital data) rather than on paper.

Q33 Answer: b)
a) It has been 10 years since the delivery of a manufactured item (i.e. the television), and so liability for compensation of damage is not incurred. Furthermore, with the technology at the time of a decade ago, it is considered that the proliferation and development of digital broadcasting could not have been known.
b) If a device (i.e., the washing machine in this example) is defective because of an error in an embedded program and this results in damages (i.e., injury), the manufacturer, etc. is responsible for providing compensation.   (Correct answer)
c) The manufactured item is a manufactured or processed movables, and therefore a program cannot be subject to compensation of damages. Furthermore, a virus is the cause of the problem, which means the problem is not caused by the fault of the manufactured product.
d) The cause of the drop (i.e., recession) in the stock's value is not a fault of the manufactured product, and therefore, the manufacturer is not responsible for damages.

Q34 [Answer]: a)
- JIS Q 14001:
     This is a standard concerning environmental management systems.   (Correct answer)
- JIS Q 15001:
     This is a standard concerning personal information protection management systems.
- JIS Q 20000:
     This is a standard concerning service management systems.
- JIS Q 27001:
     This is a standard concerning information security management systems.

Q35 Answer: c)

a) A JAN code is a bar code for displaying product codes. The universal 2-byte character code is Unicode.

b) JAN codes are compatible with other overseas standards (EAN/UPC).

c) JAN codes consist of a country code, manufacturer code, product code, and check digits. JAN codes include, a 13-digit standard version and an 8-digit shortened version, but both of these contain the country code and manufacturer code.   (Correct answer)

d) A JAN code is a 1D bar code. A 2D bar code is called a QR code.

Chapter 2   Business Strategy

Q1   Answer: d)

Core competence refers to the management resources such as proprietary technologies and knowhow of a company that are superior to those of the competitors. The management that is conducted to concentrate and invest management resources in core competence is called core competence management.
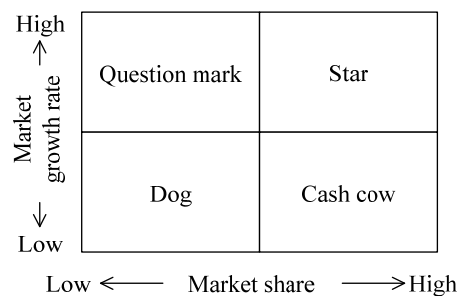
    a) This is an explanation of diversification.

    b) This is an explanation of corporate philosophy (management philosophy).

    c) This is an explanation concerning the competitive position.

Q2   Answer: c)

OEM (Original Equipment Manufacturing) is a production tie-up in which the outsourced company performs manufacturing and supply on the basis of the trademark and brand of the partner.

Q3   Answer: a)

PPM (Product Portfolio Management) is a technique of analyzing the characteristics of a business and a product from the relationship between the market growth rate and the market share. Since "Star" has a high market growth rate and a high market share, and the highest future prospects can be expected, this is the region where investments must be continued according to market growth.

	Low ← Market share → High	
High ↑	Question mark	Star
Market growth rate ↓ **Low**	Dog	Cash cow

    b) This is an explanation of "Dog."

    c) This is an explanation of "Question mark."

    d) This is an explanation of "Cash cow."

Q4   Answer: a)
- SWOT analysis:

   This is an analysis technique that clarifies the enterprise strategies of "attack" and "defense" by analyzing the internal factors (Strength and Weakness) and external factors (Opportunity and Threat) of a company. The initial letters of Strength, Weakness, Opportunity, and Threat to be analyzed are taken and referred to as SWOT analysis. (Correct answer)

- Competitive position analysis:

   This is a technique of analyzing the position in the market through the quality and quantity of management resources to be invested. The position of a company is analyzed by creating a matrix in which the "quantity" that represents the capacity of management resources is plotted on the horizontal axis, and the "quality" that represents the uniqueness of management resources is plotted on the vertical axis.

- Growth matrix analysis:

   This is an analysis technique that uses the Ansoff growth matrix that shows the direction of growth of a company. It is used when the enterprise strategy for promoting the growth of the company is examined.

- Value chain analysis:

   This is an analysis technique that divides corporate activities into primary activities and support activities, and clarifies that the added value of the products and services provided by the company is generated through which activity.

Q5   Answer: d)

Marketing mix is a combination of several elements (i.e., means) necessary for a company to achieve its objectives in the target market (or to fulfil market needs). The perspectives of the seller consist of 4Ps: Product, Price, Place, and Promotion.

   a) This is an explanation of AIDMA, which is a consumer behavior model.
   b) This is an explanation of RFM analysis.
   c) This is an explanation of 3C analysis.

Q6   Answer: c)
- Segment marketing:

   This is a technique of appealing to customers in line with the needs of the customer segments that are created through segmentation of the market.

- Test marketing (Market test):

   This is a technique of performing test sales by restricting the sales period and sales region before full-scale market entry.

- Mass marketing:

   This is a technique of performing large-volume production and large-volume distribution for all customers. Advertising is also performed simultaneously with a focus on mass advertising through television, newspapers, and magazines.   (Correct answer)

- One-to-one marketing:

   This is a technique of appealing individually in line with the likes of each individual customer.

Q7   Answer: c)

CSF (Critical Success Factor) is a factor that has a definitive impact on the achievement of strategic objectives.

a) This is an explanation of KPI (Key Performance Indicator).

b) This is an explanation of KGI (Key Goal Indicator).

d) This is an explanation of TQM (Total Quality Management).

Q8   Answer b)

CRM (Customer Relationship Management) is a concept that an important aspect of a business strategy is to value the current customers and retain them. It aims to acquire customer loyalty and maximize the lifetime value of customers through an improvement in customer satisfaction by performing centralized and continuous management of customer information, and responding immediately to customer needs.

a) This is a purpose of SFA (Sales Force Automation).

c) This is a purpose of CRP (Continuous Replenishment Program).

d) This is a purpose of ERP (Enterprise Resource Planning).

Q9   Answer b)

• M&A (Mergers and Acquisitions):

  This is the strongest alliance by which other companies are absorbed and governed through stock purchase and business transfer using TOB (Take-Over Bid / Tender Offer Bid).

• MOT (Management Of Technology):

  This is management based on the concept that a company that expands its business by focusing on technology promotes innovation by investing in technological development, and develops a sustainable business.   (Correct answer)

• R&D (Research and Development):

  This refers to the research and development of new technologies.

• TLO (Technology Licensing Organization):

  This is an organization that acts as an intermediary during transfer to a private company venture in order to utilize the research results and technologies of a university. It is supported by the country through the TLO law.

Q10   Answer: c)

• EOS (Electronic Ordering System)

  This is a system that automatically accepts and places orders.

• PHR (Personal Health Record)

  This is a system that records an electronic medical chart and information concerning the health of an individual.

• POS (Point Of Sale) (or point of sale management / over-the-counter sales management)

  This is a technique that is used in collection of product sales data, inventory and ordering management, and trend analysis in order to identify hot-selling products in retail stores, such as convenience stores.   (Correct answer)

- XBRL (eXtensible Business Reporting Language)

  This is a markup language that is based on XML and is used in the description of financial statements of companies.

Q11   Answer: a)

a) A cell production system is a system that a single operator or several operators are in charge of all processes of production.   (Correct answer)

b) A process production system is a system that products are manufactured by means of the chemical reaction of the raw materials. The system that the required products are produced at the required time and only in the required quantity is the JIT production system.

c) In a build-to-stock production system, the quantity for stock replenishment is produced on the basis of the production plan. The system that an order is received from the customer and the ordered quantity is produced is the build-to-order production system.

d) A continuous production system is suitable for low-mix high-volume production that the same product is produced continuously for a fixed period of time. The production system that is suitable for high-mix low-volume production is the individual production system.

Q12   Answer: a)

- CAD (Computer Aided Design):

  This is a system that supports activities related to the design of the product. Techniques that are used in this system include computer graphics and geometric modeling.   (Correct answer)

- CAE (Computer Aided Engineering):

  This is a system that supports research (e.g., intensity, mechanism) related to the product.

- CAM (Computer Aided Manufacturing):

  This is a system that supports the production activities of the product. It instructs the work process to the NC machine tool with the help of an NC program, and performs automatic operations.

- CAT (Computer Aided Testing):

  This is a system that automatically tests whether or not the product shape and the functions are according to the design.

Q13   Answer: b)

- e-marketplace (Electronic marketplace, Internet business center)

  This is a site that is a collection of seller companies and buyer companies on the Internet. It is a "B to B" form of transaction in which products are traded on a site.

- Online mall (cyber mall, virtual mall)

  This is a site that is a collection of retail stores and mail order houses on the Internet. It is a "B to C" form of transaction including online shopping where customers buy the products of their choice.   (Correct answer)

- Electronic auction (Internet auction)

  This is an auction that is performed over an Internet site. It is a "C to C" form of transaction between a seller (i.e., individual) and a buyer (i.e., individual).

- Electronic procurement system

  This is a system through which, when a company or a public organization procures external resources, a decision is made concerning the supplier by performing electronic bidding via the network after the required conditions have been provided. It is a "B to B" or "G to B" form of transaction.

Q14   Answer: d)

An affiliate is a result-reward type advertisement in which a company advertisement or a link to a website is posted on the web page of an individual and remuneration is paid according to the derived results.

a) This is an explanation of a pop-up advertisement.
b) This is an explanation of a listing advertisement.
c) This is an explanation of an opt-in mail advertisement.

Q15   Answer: d)

EDI (Electronic Data Interchange) is a mechanism by which the data type and data format of business transactions, such as EC, are consolidated, and the quotations, acceptance and placement of orders, and payments are exchanged electronically between companies. In EDI, the protocols are decided as described below, depending on the hierarchical level.

Convention	Content
Level 1 Information communication protocol	This is an agreement (i.e., communication protocol) concerning the type of line and the transmission control procedure, which is used for communicating information by using the network.
Level 2 Information representation protocol	This is an agreement concerning the rules of the message format and the representation method, which is used for proper exchange of information.
Level 3 Task operation protocol	This is an agreement concerning the system operation time and the countermeasures at the time of the occurrence of an error, which is used for exchange of information.
Level 4 Basic transaction protocol	This is an agreement concerning the transaction contract details and the contract, which is used for establishing the legal validity of a transaction.

a) It should be defined in the basic transaction protocol.
b) It should be defined in the task operation protocol.
c) It should be defined in the information communication protocol.
d) It should be defined in the information representation protocol.   (Correct answer)

Q16   Answer: a)

Feedback control is a method of detecting the effect of disturbances (i.e., external factors disturbing the control) on the actual measured value, and then correcting the deviation from the desired value. Among the case examples that are described in the question, the applicable control is the performance of bringing down the room temperature to the set temperature (i.e., desired value) through automatic activation of the cold blast function of the air-conditioner after it is detected that the room temperature has become higher than the set temperature.

   b) This is a case example concerning sequence control.
   c) This is a case example concerning fuzzy control.
   d) This is a case example concerning feed-forward control.

Q17   Answer: b)

   • ATM (Automated Teller Machine):
       This is a machine that can perform some of the counter services of a financial institution, such as a bank, through operations performed by the customer.
   • DLNA (Digital Living Network Alliance)
       This is an industry specification for a home LAN. If a device supporting this specification is connected to a network, it automatically becomes usable.   (Correct answer)
   • ISDB-T (Integrated Service Digital Broadcasting-Terrestrial):
       This is a digital terrestrial broadcasting method called "one seg" (i.e., one segment reception service for cellphones and mobile terminals). It is a method of digital broadcasting.
   • PDA (Personal Digital Assistant):
       This is a mobile-type digital assistant that is smaller than a PC and is about the size of the palm.

Chapter 3   Information Systems Strategy

Q1   Answer: a)

An information systems strategy is created in order to implement a business strategy, which is created on the basis of a corporate philosophy (i.e., management philosophy). Therefore, when the strategy is created, consideration should be given to consistency with the business strategy.

Q2   Answer: c)

- AA (Application Architecture):

  This is an applied processing architecture that shows the form of the most appropriate information system for a business process (e.g., centralized-type, distributed-type, SOA). ⋯ c)

- DA (Data Architecture):

  This is a data architecture that shows the details of information (i.e., system data) that is used in individual business operations and systems, and the associations between information. ⋯ b)

- TA (Technology Architecture):

  This is a technology architecture that is used in the construction of a system. It shows the technological elements of the configuration, security infrastructure, and so on. ⋯ d) (Correct answer)

- BA (Business Architecture):

  This is a business architecture that shows standardization and streamlining concerning the details of business operations, implementing bodies, and the workflow. ⋯ a)

Q3   Answer: c)

Among the six items that are mentioned in the "System Management Standards" as the policies and goals of total optimization, item 4 states that "the overall optimization plan needs to define the model (i.e., to-be model) of the information system for the overall organization." The other items in the answer group are all clarified in computerization planning.

Q4   Answer: d)

- IRR (Internal Rate of Return):

  This is the rate of discount for which the total present value of the annual cash income that is generated by an investment becomes equal to the total present value for the cash expense that is required for this investment.

- NPV (Net Present Value):

  This is a discounted present value that indicates the increase or decrease in cash inflow on the basis of an investment for each year.

- PBP (PayBack Period):

  This is the recovery period that indicates the number of years in which an invested amount can be recovered through the yearly increase in cash inflow.

- ROI (Return On Investment):

   This is an index that measures the profit that is created from invested capital.   (Correct answer)

Q5   Answer: a)

COBIT (Control OBjectives for Information and related Technology) is a collection of practical IT governance where the best practices concerning information technology management are systematically compiled. It defines the KGI (Key Goal Indicators) and KPI (Key Performance Indicators) for the purpose of increasing IT process maturity level.

   b) This is an explanation concerning ITIL (Information Technology Infrastructure Library).
   c) This is an explanation concerning SLCP (Software Life Cycle Process).
   d) This is an explanation concerning PMO (Program Management Office).

Q6   Answer: b)

If all judgment details are "As planned," the total value of the level of goal achievement that is calculated from the number of points as evaluated by using the judgment details for each evaluation item multiplied by the weighting is 100 ($= 4 \times 5 + 4 \times 8 + 4 \times 12$). In the case of the judgment details that are shown in the table, the level of goal achievement for the overall system is calculated as follows:

   Level of goal achievement for the overall system

   = "evaluation points for labor saving effect" × weighting

   + "evaluation points for period reduction" × weighting

   + "evaluation points for information integration" × weighting

   $= 4 \times 5 + 1 \times 8 + 2 \times 12$

   $= 52$ (%)

Q7   Answer: c)

- BPM (Business Process Management):

   This is an approach in which management is performed by using the PDCA cycle with the aim of continuous improvement in a business process.

- BPMS (BPM System; Business Process Management System):

   This is a platform for implementing BPM.

- BPO (Business Process Outsourcing):

   This is a form of business in which the internal business processes themselves are outsourced to an external vendor along with information system operations management.   (Correct answer)

- BPR (Business Process Reengineering):

   This refers to performing a drastic review of the current business process, and reconstructing by improving the flow of business operations and the details of individual business operations.

Q8   Answer: b)

SOA (Service Oriented Architecture)

This is a method in which functions (i.e., software components) that are constructed and organized according to the service elements of a business process are made publicly available on a network and are linked together to construct an information system with superior expandability and adaptability.

    a) This is an explanation concerning cloud computing.

    b) This is an explanation concerning SaaS (Software as a Service) or ASP (Application Service Provider).

    d) This is an explanation of systems integration.

Q9   Answer: d)

A housing service is a form of service where the network devices and servers that a user owns are installed for use in the communication facilities of a communications vendor. (An installation space is "rented.") By using a housing service, the cost of the network and facilities that are required in order to provide services with a company's servers can be reduced.

    a) This is the effect that is obtained by using SaaS (Software as a Service) or such other service.

    b) This is the effect that is obtained by using a hosting service.

    c) This is the effect that is obtained by using automatic update of operating systems and software.

Q10 Answer: a)

According to Common Frame 2013, there is a "creation of new overall operational image" as the procedure from the proposal of a computerization initiative. In addition to the new overall image of business operations, an overall image for new systems is created, and verification is performed from a viewpoint of whether there is consistency between business functions, organizational model, and new systems.

    b) This should be implemented in development of a computerization investment plan.

    c) This should be implemented in development of a total optimization plan.

    d) This should be implemented in development of a total optimization policy.

Q11 Answer: d)

    a) The system for the overall organization integrates each individual system. In order to implement (or develop) each system, a single or multiple projects are launched.

    b) In a computerization plan, consideration is given to how achievable things such as operations and effects are, and details are specified concerning how to implement the computerization initiative.

    c) In the planning process for computerization, systems that have feasibility are in the scope of the computerization planning, as described by "11) Feasibility study."

    d) In the planning process for computerization, it is necessary to fully consider the effectiveness and investment effect of an information system, as described by "14) Estimate of cost and system investment effect."   (Correct answer)

Q12　Answer: c)

In the requirements definition, the three items below are defined as stakeholders' requirements.

- Operational requirements:

    These are requirements that should be fulfilled in terms of business operations.

- Functional requirements:

    These are requirements for system functions that are necessary to fulfill the operational requirements.

- Non-functional requirements:

    These are requirements other than those for system functions that are necessary to fulfill the operational requirements.

a) Requirements for which hardware restrictions occur are not non-functional requirements.

b) Requirements for which the approval of the stakeholders is not obtained cannot be stakeholder requirements.

d) Requirements that are not directly related to business operations are not in the scope of requirements definition.

Q13　Answer: d)

An RFP (Request For Proposal) is a document that specifies the basic policy and procurement details (e.g., a scope of procurement, requirement items, conditions) for a system in order to make the details of the business contract clear, and requests the submission of a proposal. Therefore, a "request for proposal" is issued. At this time, an RFQ (Request For Quotation) is also issued, and a request for the submission of a quotation is made.

a) In "Selection of vendor," vendor selection standards (e.g., proposal evaluation standards) are used.

b) In "Decision of procurement details," the purpose of computerization, the details of business operations, and other information are disclosed, and an RFI (Request For Information) is issued in order to request the provision of information such as experience of developing similar systems and the latest information technology.

c) In "Proposal," proposals and/or quotations are submitted by candidate vendor companies.

Chapter 4   Development Technology

Q1   Answer: c)
- System integration process:

    This process integrates system elements in order to produce a complete system that satisfies the stakeholders' expectations described in the system requirements and the system design.
- System installation process:

    This process installs a system that meets the agreed system requirements in the production environment (i.e., the actual operational environment).
- System architectural design process:

    This process identifies how system requirements should be allocated to system elements (e.g., hardware, software). It clarifies hardware configuration items, software configuration items, and manual operations in the architecture at the top level of the system.   (Correct answer)
- System requirements definition process:

    This process converts the defined stakeholder requirements to technical requirements (i.e., system requirements) that can be used in system design.

Q2   Answer: a)

ISO/IEC 9126 (JIS X 0129-1) defines functionality, reliability, usability, efficiency, maintainability, and portability as quality characteristics of software. Among these, reliability is the capability of the software product to maintain a specified level of performance when used under specified conditions.

- b) This is an explanation of usability.
- c) This is an explanation of functionality.
- d) This is an explanation of efficiency.

Q3   Answer: b)

In software architectural design, requirements concerning the software configuration items are transformed into an architecture that describes its top-level structure and identifies the software components, and is documented in a software architectural design document. In addition, preliminary test requirements and the schedule for software integration are defined and documented as a specification for software integration test.

- a)   This is a deliverable of systems architecture design.
- c), d)   These are deliverables of software requirements definition.

Q4   Answer: a)
- STS partitioning:

    This is a technique that partitions program flow into three parts, each of which becomes a module: input (Source), processing (Transform), and output (Sink).   (Correct answer)
- Common functional partitioning:

    When there is a common function in multiple partitioned modules, this technique partitions such a function as a single independent module.
- Jackson method:

    This is a technique that analyzes input data and output data, and partitions modules according

to the output data structure.

- TR partitioning (Transaction partitioning):
  This is a technique that partitions each process as a module when processing differs according to the type of data.

Q5   Answer: c)

Module independence is a metric of associations between modules; that is, weaker module coupling creates better modules with higher module independence. When modules are arranged in order of higher independence (i.e., weaker module coupling), the result is as follows:

Data coupling – stamp coupling – control coupling – external coupling – common coupling – content coupling

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Q6   Answer: a)

A code auditor is a tool to verify whether the created program (i.e., source code) follows predetermined coding conventions.

  b) This is a description of code completion.
  c) This is a description of structured programming.
  d) This is a description of syntax highlighting.

Q7   Answer: a)

Decision condition coverage designs test cases that execute TRUE/FALSE at least once for every decision condition in white box testing.

Both (1) and (2) of [Completed test items] are test items that are evaluated as TRUE. Therefore, as a test item that is evaluated as FALSE, "Condition 1 is FALSE, Condition 2 is FALSE, Condition 3 is TRUE" is added.

Q8   Answer: a)

  a) The fact that the number of unfinished test items is flat suggests that the testing is not progressing. In addition, the fact that the number of unresolved bugs is flat suggests that the bugs have not been resolved. Therefore, it is considered that the project is facing bugs that are difficult to resolve, and testing is not progressing.   (Correct answer)
  b) Since the number of unfinished items is flat, test items are not completed.
  c) Since the number of detected bugs is flat, new bugs are not detected. (There are not many bugs detected in the most recent time period.)
  d) Since the number of unresolved bugs is flat, unresolved bugs have not been eliminated.

Q9   Answer: b)

a) Dummy modules that function as lower-level modules in top-down testing are known as stubs.

b) Top-down testing is performed from top-level modules to lower-level modules. Therefore, higher-level modules are used repeatedly in testing, the reliability of higher-level modules is enhanced.   (Correct answer)

c) This is a description of sandwich testing.

d) This is a description of non-incremental testing (i.e., big bang testing).

Q10 Answer: c)

• Remote maintenance:

   This is performed from a remote location, without on-site visits.

• Corrective maintenance:

   This is maintenance (i.e., changes in programs) that is implemented to resolve problems (i.e., items that do not fulfill system requirements) that are discovered after system delivery.

• Adaptive maintenance:

   This is maintenance (i.e., improvement of programs) that is implemented to resolve issues that occur because of the changes in the environment (e.g., the change in sales tax) after system delivery.   (Correct answer)

• Daily maintenance:

   This is maintenance in which the equipment that composes systems is monitored on a daily basis.

Q11 Answer: b)

The waterfall model is a technique in which development processes are partitioned into multiple phases, and development is conducted for each phase. When rework occurs because of the errors resulted from upstream processes, software development efficiency declines considerably.

a) This is a description of the spiral model.

c) This is a description of the prototype model (i.e., prototyping).

d) This is a description of RAD (Rapid Application Development).

Q12 Answer: a)
- XP (eXtreme Programming):

   This is a typical agile software development technique that simplifies the design stage and enhances programming and testing. It places importance on constant feedback, changes, and redesign rather than on setting up and proceeding processes in order.   (Correct answer)
- Test-driven development:

   This is a method that creates testing before programming (i.e., "test first"), and then creates programs which pass the testing.
- Pair programming:

   This is a method in which programming is performed by a pair of persons. One person creates a program, and the other person gives instruction while checking the program.
- Refactoring:

   This is a technique that improves the finished code without changing its action (or behavior) that is seen from the outside.

Q13 Answer: c)

HIPO (Hierarchy plus Input Process Output) is a diagramming method that represents the functions and processes of software by using a hierarchical structure. It is composed of a visual table of contents (i.e., hierarchical structure diagram) and two IPO diagrams which are a summary diagram and a detailed diagram.
- a) These are components of the MVC model.
- b) These are components of the Jackson method: data structure and program structure (or the three basic structures of structured theorem).
- d) These are components of a DFD (Data Flow Diagram).

Q14 Answer: a)
- Inheritance:

   This is the inheritance, by lower-level classes, of attributes that are defined in a higher-level class.   (Correct answer)
- Override (redefinition):

   This is the rewriting, by an inheriting lower-level class, of methods that are defined in a superclass.
- Delegation:

   This is the ability to delegate processing to other classes (i.e., objects).
- Polymorphism:

   This is the ability of actions (or behaviors) for a given message to differ according to the class (i.e., object).

Q15 Answer: a)

A sequence diagram is a type of interaction diagram that depicts exchange of messages among objects, and represents message transmission and object lifelines in a time series.

   b) This is a description of a state machine diagram (i.e., statechart diagram).

   c) This is a description of a use case diagram.

   d) This is a description of a class diagram.

Q16 Answer: b)

- Assertion checker:

  This is a development tool (i.e., a testing execution support tool) that embeds a logical expression that describes the conditions or relationships among variables at a specific point in time, and verifies the validity of the program. (This test is called assertion check.)

- Inspector:

  This is a development tool (i.e., a testing execution support tool) that writes the values of the variables used in a running program. It is often used together with a tracer that traces the running state of a program.　(Correct answer)

- Emulator:

  This is a tool (i.e., a microprogram-based tool) that creates a virtual environment including a different OS or such other, in which programs made for other computer types can be executed.

- Memory dump:

  This is a development tool (i.e., testing execution support tool) that writes the status of main memory to a dump file.

Q17 Answer: a)

a) In change management that is an activity in the software configuration management process, program (i.e., software) version management should be performed through recording of configuration status. For that reason, this problem originates in configuration management. (Correct answer)

b) The searching of test data (e.g., the trade secrets) that is used in the real working environment by a party that is not meant to see the data is considered as a result of inappropriate setting of access rights. For that reason, this problem originates in "access rights control" within design data management.

c) The maintenance of the development environment should be performed through the "maintenance management" which is a portion of "development environment operating status management." For that reason, this problem originates in maintenance management.

d) Bugs at the software unit testing level should be detected and corrected in "implementation of software unit testing" and in "evaluation of software code and test results." For that reason, this problem originates in the "software construction process."

Chapter 5   Project Management

Q1   Answer: c)

The project life cycle spans the period from the initiation of a project until its termination. The general project life cycle is as shown below.

Starting the project	The cost is low and the staff members are few.
Organizing and preparing	The cost and the staff members increase gradually.
Carrying out the project work	The cost and the staff members reach the peak.
Closing the project	The cost and the staff members fall rapidly.

"a) the extent of influence of stakeholders", "b) uncertainty of the project", and "d) risk of not being able to achieve the objectives" are the highest when a project starts, and reduce gradually as the project progresses.

Q2   Answer: d)

The project charter is a document that declares the initiation of a project that is formally approved by the organization. The descriptions of the project charter include the purpose and validation of the project, objectives and success criteria of the project, needs and requirements (requirements concerning the outcome of the project) of stakeholders, pre-requisites and constraints concerning the organization and related institutions, the overview and scope of the project, risks of the project, an overview of the overall schedule (i.e., summary milestone schedule), approximation of the overall budget (i.e., summary budget), responsibilities and authorities of the appointed project managers, a list of stakeholders, and the approver and proponent (initiator) of the project charter, and so on.

    a) This is a description of the project management plan.

    b) This is a description of the project completion report.

    c) This is a description of the change register.

Q3   Answer: c)

WBS (Work Breakdown Structure) is a hierarchical structure diagram in which the activities necessary for achieving the purpose of the project are divided in a stepwise fashion with the deliverables as the main constituent. The activities implemented in the project are subdivided by using the top-down method on the basis of the deliverables so as to simplify the management of activities.

    a) The development cost is estimated by using activities in which the work package that is the lowest component of WBS is subdivided further.

    b) The critical path is detected through PERT (Program Evaluation and Review Technique) that makes use of activities.

    d) The activity resources are estimated from usable resources by referring to the resource calendar, and the work schedule is created through PERT that makes use of activities.

Q4   Answer: b)
- Parametric estimate:

  This is a technique of estimate in which the past information is statistically analyzed and various coefficients are determined.
- Three-point estimate:

  This is a technique of estimate in which the optimistic value, pessimistic value, and the mode (average) values are used. In addition to the expression of triangular distribution that makes use of the average of three points as in the question, there is an expression of beta distribution that increases the weight of the mode value like "(Optimistic value + Mode value × 4 + Pessimistic value) ÷ 6".   (Correct answer)
- Reserve analysis:

  This is a technique of estimate in which a reserve (i.e., buffer) is provided beforehand.
- Analogous estimate:

  This is a technique of relative estimate on the basis of the performance of a similar project in the past.

Q5   Answer: d)

EVM (Earned Value Management) is a technique of quantifying and evaluating the progress of a project and the productivity (i.e., performance) of activities on the basis of the value of the amount of work completed (normally converted to the amount of money). SV (Schedule Variance) and CV (Cost Variance) are indicators that make use of PV (Planned Value), EV (Earned Value), and AC (Actual Cost), and if the progress of the project is behind schedule, SV (= EV − PV) becomes smaller than 0.

a) If CV (= EV − AC) is larger than 0, it indicates a status where the productivity of the project is high.

b) If CV is smaller than 0, it indicates a status where the productivity of the project is low.

c) If SV is larger than 0, it indicates a status where the progress of the project is ahead of schedule.

Q6   Answer: a)

The FP (Function Point) method is a technique of estimating the development cost and the development man-hours with the help of the software functions that are obtained from the number of screens and the number of forms.

(1)   The function points of each function type are totaled and the unadjusted function points are determined.

Unadjusted function points

= Σ (Number of measurements of function types × weighting coefficient)

= 1 × 4 + 2 × 5 + 1 × 10 + 0 × 7 + 0 × 4

= 24

(2)   Multiply the unadjusted function points by the correction coefficient of complexity (0.75) to calculate the adjusted function points of the application program.

Adjusted function points

   = Unadjusted function points × Correction coefficient of complexity

   = 24 × 0.75

   = 18

Q7   Answer: b)

In the quality assurance process of project quality management, in order to achieve the quality requirements and quality standards that are defined during quality management planning, the quality assurance activities are implemented according to the quality management plan.

a), c)   These are activities of quality control.

d)   This is an activity of quality plan (i.e., quality management plan).

Q8   Answer: b)

- Qualitative risk analysis

    This is a risk evaluation method in which a priority order is given to the risk on the basis of the occurrence probability (or the occurrence frequency) of the risk and the extent of impact during the time of risk being actualized, and thereafter, the risk is listed in the risk register.

- Delphi method

    This is a technique to identify (or create an agreement on) the project risks by repeatedly collecting, summarizing, and redistributing the opinions of several experts through questionnaires.   (Correct answer)

- Brainstorming

    This is a technique to uncover and reveals the project risks by exchanging opinions freely and openly with the project team and external expert groups.

- Monte Carlo method

    This is a technique to identify risks by performing several simulations or numerical analyses that make use of probability distribution and random numbers.

Q9   Answer: c)

This is a question on project resource management in which the required number of staff members is estimated in order to achieve the purpose of the project (i.e., preparation activities for the event).

 (1) Calculate the total number of persons required for the preparation activities from the standard number of staff members and the number of days required for the preparation activities for the event. In order to calculate the number of persons required for each preparation activity, multiply together the standard number of staff members and the number of days required.

Preparation activity	Standard number of staff members	Required number of days	Required person-days
A	2	5	10
B	2	5	10
C	3	10	30
D	2	5	10
E	5	10	50
		Total	110

(2) Calculate the number of persons required from the 21st day onward in order to perform the remaining activities in time for the event.

Number of persons required for daily preparation activities from the 21st day onward

= (Total number of person-days required for preparation activities

− Cumulative person-days in the first 20 days) ÷ Remaining number of days

= (110 person-days − 20 person-days) ÷ 15 days

= 6 persons

Therefore, in order to perform the remaining preparation activities in time for the event, a minimum of six staff members must be assigned per day.

Q10   Answer: c)

- Interactive communication:

    This is a method in which information is exchanged mutually between two or more parties, such as meetings, conversations, and video conferences.

- Feedback communication:

    This is a form of communication in which a return message (i.e., feedback) is sent in response to an inquiry.   It is also used as another name for interactive communication that forms a feedback loop in which opinions are mutually exchanged.

- Push communication:

    This is a method of distributing information to specific recipients who need to receive the information. Push communications include letters, e-mails, voice mails, reports, faxes, and such others.   (Correct answer)

- Pull communication:

    This is a method of obtaining information at recipients' discretion from websites on the Internet or the Intranet and from printed materials such as newspapers and magazines. It is used when there are many unspecified recipients or a large amount of information.

Chapter 6   Service Management

Q1   Answer: d)

An SLA (Service Level Agreement) is a documented agreement between the service provider and the customer and it identifies the service and the service targets. (It is also included in contracts.) It describes the scope, service to be delivered, delivery time (I.e., inquiry reception hours), targets and evaluation (e.g., recovery time in the event of a fault in the online system), billing (i.e., billing item), and so forth. It may also contain penal provisions such as a refund for part of the fee when the agreement is not fulfilled.

a) It is a description related to an NDA (Non-Disclosure Agreement).

b) It is a description related to a KGI (Key Goal Indicator) of the information systems department.

c) It is a description related to an employment agreement.

Q2   Answer: b)

The ITSMS certification system recommends construction of ITSMS with the following four steps.

- Step 1 (Gap analysis):

    The service provider investigate the current status of service management and identify gaps between the current status and the requirements.

- Step 2 (Establishment of service management system):

    The service provider forms the service management organization including the management team and clarifies responsibilities regarding service quality. Furthermore, in order to be able to perform operation management of a service appropriately, the service provider plans the documentation of operation methods/manuals and the training of the operations manager. (Correct answer)

- Step 3 (Implementation of service management plan):

    The service provider prepares and implements the service management plan.

- Step 4 (Implementation of service management processes):

    The design and transition of new or changed services and the service management processes are implemented on the basis of the service management plan.

Q3   Answer: d)

- Service support:

    If refers to day-to-day operations management that is performed for the entire IT service.

- Service strategy:

    The service provider decides the policy of the organization and the goals to be achieved related to the service.

- Service transition:

    The service provider implements a new service or modifies the existing service.

- Service life cycle:

    It treats service management as a flow of strategy, design, transition, operation, and continual improvement, and it was incorporated into ITIL v3.   (Correct answer)

Q4   Answer: c)
   a) In the big bang transition approach, the operation method is simultaneously notified (or informed) at the time of transition.
   b) In the big bang transition approach, there is a risk that unsuccessful transition (i.e., occurrence of problem) may have a widespread impact.
   c) In the big bang transition approach, the entire system is replaced all at once. Therefore, it costs less than parallel transition in which both old and new systems run in parallel. (Correct answer)
   d) In the big bang transition approach, the new system and the old system cannot be compared with each other because they are not run in parallel. A transition that implements the trial version (i.e., pilot version) of the new system in a limited number of departments and monitors (or compares with the old system) is called the pilot transition approach.

Q5   Answer: a)
Service continuity or availability management is the process where, under normal conditions and conditions after service interruption, the service provider implements the requirements regarding service continuity and availability as agreed with the customer. Therefore, the number of service interruptions is used as a KPI (Key Performance Indicator).
   b) It is used as a KPI of information security management.
   c) It is used as a KPI of capacity management.
   d) It is used as a KPI of SLM (Service Level Management).

Q6   Answer: d)
In the declining metered rate method, the fee for using the computer system becomes relatively cheap as the amount of resources that are used increases. Therefore, the slope becomes less steep as the amount of resources that are used increases, which becomes like graph d).

Q7   Answer: c)
In incident and service request management, incident handling and service request handling are performed in order to recover the services as quickly as possible that are agreed on with the customer. Main activities of incident and service request management are from occurrence and detection of an incident up to temporary resolution (i.e., service recovery).
   a), b), d) These are the main activities of problem management.

Q8   Answer: d)
- a) Even if the devices of the same type are purchased on the same day, they can be identified with Management_number.
- b) Even if the label is replaced, such an unauthorized act can be distinguished by using Production_number, and so on.
- c) Even if an additional device is purchased with the same product name, it can be identified with Management_number.
- d) Since Management_number is assigned to the set including a peripheral device at the time of purchasing the PC, the PC itself and the peripheral device cannot separately be identified (or the presence of the peripheral device cannot be checked).   (Correct answer)

Q9   Answer: c)
- a) While handling of an emergency request for change is decided on the basis of agreement with the customer, implementation is conducted in release and deployment management.
- b) Prioritization should be done according to the contents of request for change.
- c) In change management, irrespective of whether the change request is approved or not, all change requests are recorded in the beginning.   (Correct answer)
- d) The acceptance of a request for change is decided after the financial impact (i.e., cost) or such other impact is taken into consideration.

Q10 Answer: a)

General response procedure of a help desk (or service desk) is reception and recording, problem determination and primary response (i.e., emergency measures), and recording of the results of handling. "Prioritization for investigation of cause" and "investigation of cause and problem resolution" are conducted after primary response (i.e., emergency measures) as incident and service request management and problem management of the resolution process.

Q11 Answer: d)
- AVR (Automatic Voltage Regulator):
  This device absorbs and adjusts the noise of power supply voltage and is used for supplying commercial electric power in a stable manner.
- CVCF (Constant Voltage Constant Frequency):
  This device supplies power until the power supply is switched to a private power generator in the event of power outage.
- SPD (Surge Protective Device):
  This device protects power supply circuits, communication devices, or other equipment from the overvoltage (i.e., surge voltage) and the overcurrent (i.e., surge current) that is generated from overvoltage. This type of protection is called surge protection.
- UPS (Uninterruptible Power Supply):
  This device handles instantaneous outage of commercial power supply (i.e., instantaneous interruption of power supply) and supplies power only until the system shuts down normally at the time of a power outage.   (Correct answer)

Chapter 7   System Audit and Internal Control

Q1 Answer: a)

  a) An external audit is an audit that is conducted by a certified public accountant or an external association (i.e., auditing organization). In contrast, an audit that is conducted by the internal audit department of the company is called an internal audit.   (Correct answer)

  b) A business operations audit is an audit that verifies effectiveness, security, reliability, and such other aspect of business activities. Reliability of financial statements is verified in an accounting audit.

  c) An information security audit is an audit that verifies whether or not risk management pertaining to information security measures is effectively conducted. However, the list of companies providing information security auditing services is a published list that summarizes the parties (including individual business operators) that conduct audits in accordance with the "Information Security Audit Standards" and "Information Security Management Standards" that are defined by the Ministry of Economy, Trade and Industry so that the users can view this list. It does not register companies that have undergone audits.

  d) A statutory audit is an audit that is stipulated as mandatory by laws such as the Companies Act. It is a voluntary audit that can be conducted at the company's discretion according to the purpose of the company.

Q2 Answer: b)

  a) A system audit verifies or evaluates whether risk control related to information systems of the organization is appropriately developed and operated on the basis of risk assessment in order to contribute to achieving IT governance. It does not verify nor assess information system auditability (i.e., characteristic that allows effective auditing or reviewing of the correctness of process).

  b) A system audit is conducted by a system auditor from a standpoint independent of the audit target, and the system auditor gives assurance or advice with respect to the audit target. It evaluates whether risk control related to information systems is appropriately developed and operated on the basis of risk assessment, and does not take any responsibility concerning the life cycle of the system.   (Correct answer)

  c) A system audit is conducted in accordance with the "System Audit Standards" from the standpoint of whether the information system to be audited is compliant with the "System Management Standards."

  d) A system audit does not confirm official closure of a project. In addition, an audit for the project should be conducted by a system auditor from a standpoint independent of the project.

Q3 Answer: a)

a) Apparent independence means that the auditor should be independent from the audit target for objectively conducting the system audit. When the audit department is placed under the direct control of management, it ensures the audit department's independence from the internal information systems and the departments (e.g., information systems department) to be audited. (Correct answer)

b) Practical obligations mean that the auditor should adhere to the duty of care, the duty of nondisclosure, and so on.

c) Professional ethics and honesty mean that the system auditor should honestly conduct the work in accordance with the principles of professional ethics.

d) Quality management means ensuring the correctness of audit results.

Q4 Answer: b)

a) A system auditor prepares the basic plan in the preparation of system audit plans.

b) In system audit implementation, a system audit is conducted in the sequence of preliminary audit, main audit, evaluation, and conclusion on the basis of individual plans. In the preliminary audit, the actual status of the audit target is understood by performing hearings. In the main audit, this information is verified, and audit evidence that supports the audit results is collected.   (Correct answer)

c) In the system audit evaluation, the auditor evaluates the validity of the results of the system audit.

d) In system audit reporting, the auditor prepares a system audit report and presents it to the audit requester.

Q5 Answer: c)

a) Concerning the documents to be attached to an audit working paper, it is not necessary to obtain the approval of the audited department.

b) Documents to be attached to an audit working paper can also be copies instead of originals.

c) An audit working paper is a record of a system audit that is conducted by the system auditor, and it forms the basis of the audit opinion. Therefore, audit evidence and related documents must be recorded in a very orderly manner and appropriately stored so that the background for arriving at the audit opinion (i.e., conclusion of audit) is clear.   (Correct answer)

d) Documents to be attached to the audit working paper not only include the documents that are collected and prepared by the system auditor but also documents that are submitted by the audited department.

Q6 Answer: d)

• Audit module method:

It embeds a module in the system, where this module extracts and exports the data that satisfies the specified conditions, from the file to be audited into the audit file.

• Test data method:

It runs the program to be audited by using test data that is created with a generator or such other tool, and checks whether or not the expected results are obtained.

- Integrated test method / ITF (Integrated Test Facility) method:

  It creates a record for the system auditor in the files to be audited, and checks the accuracy of the process by performing various operations on this record.

- Parallel simulation method:

  In this method, the system auditor prepares a program for verifying a specific audit purpose, enters the same data in this program and the program to be audited, and compares the processing results of both programs.   (Correct answer)

Q7 Answer: c)

Availability of an information system is an index that shows that the authorized user can access the information system at any time. Therefore, the fact that system configuration devices are used without multiplexing is the finding that is related to availability. (All other items increase availability.).

Q8 Answer: b)

In the "Standards for Management Assessment and Audit concerning Internal Control Over Financial Reporting" which is released by the "Financial Services Agency," "Response to IT (Information Technology)" is defined as "establishing appropriate policies and procedures to achieve goals and to respond appropriately to IT inside/outside the organization during the course of business activities." It consists of responses to IT environment and also the use and control of IT."

Q9 Answer: a)

a) Internal control does have the function of detecting fraudulence by the management. Therefore, there is a limitation that internal control could be ignored because of fraudulent behavior or illegitimate objectives of the management.   (Correct answer)

b) Control activities can help in detecting deviation from authority by staff members.

c) Control activities can prevent fraudulence acts that arise from the concentration of authority in a specific person.

d) Risk assessment and response take rational safety measures based on measures against risks.

Q10 Answer: c)

Detective control is a control that finds incorrect operations or fraudulent acts. Therefore, a link to the workflow system where the sales department manager checks and detects any mistakes of the contents in a quotation corresponds to detective control.

a) This is for preventive control that prevents incorrect operation beforehand by teaching the method of use.

b) This is for preventive control that prevents incorrect entry (i.e., erroneous operation) of data beforehand.

d) This is for preventive control that prevents unauthorized use by users who do not have authority beforehand.

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