ITPEC-2009-TOKYO-12b

■ Information Technology Engineers Examination

Fundamental Information Technology Engineer Examination

(Level 2)

Syllabus

— Details of Knowledge and Skills Required for the Information Technology Engineers Examination —

Version 1.0

October 27, 2008

IPA
INFORMATION-TECHNOLOGY PROMOTION AGENCY, JAPAN

Corporate names or product names used in this syllabus are trademarks or registered trademarks of each company.
® and TM are not used in the syllabus.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

CONTENTS

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

◆STRATEGY◆

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

This page is intentionally left blank.

■ Introduction

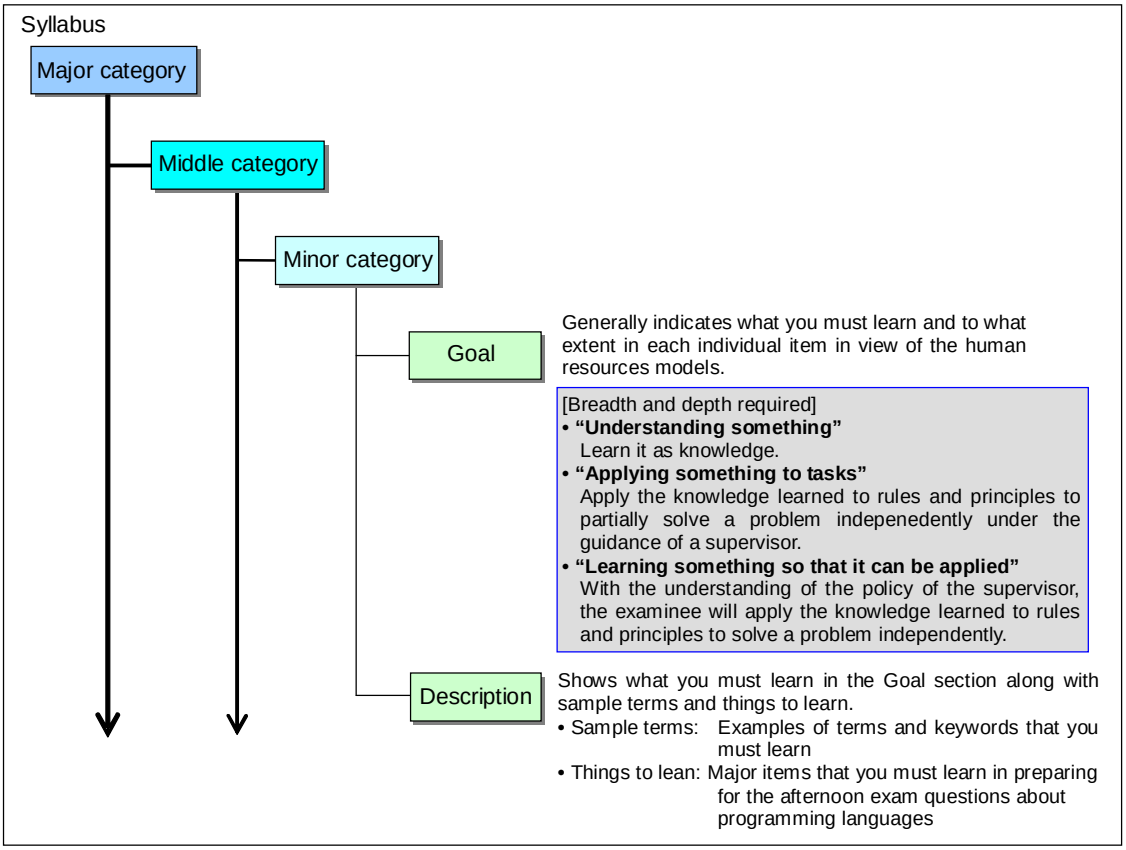
The syllabus (subtitled as “details of the knowledge and skills required for the Information Technology Engineers Examination”) for the Fundamental Information Technology Engineer Examination, in which “the scope of exam questions”[1] is described in more detail and the breadth and depth of the knowledge and skills required for Level 2 are organized and clarified, has been defined and then published here.

It is expected that this syllabus will be used effectively as learning guidelines for examinees who aim to pass the examination, and also as instructional guidelines in the educational process within companies and schools.

Please note that the detailed information in this syllabus might be added, changed, or deleted, based on technology trends and other factors.

■ Configuration of the Syllabus

This syllabus is intended to show the scope of the morning and afternoon questions on the Fundamental Information Technology Engineer Examination according to the knowledge structure of the Common Career/Skills Framework[2] as shown in the figure below, along with the learning targets and descriptions on a minor category basis.



1 “Outline of IT Engineers Examination” 7. Scope on the test
http://www.jitec.ipa.go.jp/1_00topic/topic_20081027_hani.html

2 Common Carrier/Skills Framework http://www.ipa.go.jp/jinzai/itss/csfv1.html

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Technology

Major Category 1: Basic Theory
Middle Category 1: Basic Theory

1. Discrete mathematics

[Goal]

- Understand the numeric representations handled by the computer, including the radix, radix conversion, numeric representation, and arithmetic operations and precision so that you can apply them to your tasks.
- Understand the basic rules of and techniques for sets and logical operations so that you can apply them to your tasks.

(1) Radix

Understand how the binary, octal, decimal, hexadecimal, and base-n numbers are represented and how you can convert the radixes between binary and decimal numbers, for example.

(2) Numeric representation

Understand how negative numbers (complement representation) and fractions are represented.

Sample terms: fixed point number, single-precision floating point number, double-precision floating point number, mantissa, exponent, BCD (Binary Coded Decimal), packed decimal number

(3) Arithmetic operations and their precisions

Understand the arithmetic operations performed by the computer, including addition, subtraction, multiplication, and division; range of numbers that can be represented; shift operations; and operation precision (errors and measures against them).

Sample terms: logical shift, arithmetic shift, cancellation of significant digits, loss of trailing digit, overflow, underflow, single precision, double precision

(4) Sets

Understand the sets and proposition along with the technique and concept of the Venn diagram.

Sample terms: union sets, product set (intersection set), complement set, subset, true, false, propositional logic

(5) Logical operations

Understand the logical expression representation, logical operations, and basic laws including De Morgan's laws and the technique of the truth table.

Sample terms: negation, logical sum, logical product, exclusive logical sum, negative logical sum, negative logical product, logical function, distributive property

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

2. Applied mathematics

[Goal]

- Understand the techniques for calculating and analyzing probability and statistics so that you can apply them to your tasks.
- Understand fundamental mathematical principles, including numerical analysis, graph algorithms, and queuing theory so that you can apply them to your tasks.

(1) Probability and statistics

(a) Probability

Understand the permutation, combination, number of cases, and probability and its basic theorems, probability distributions and expected values, and the overview of the Markov process.

Sample terms factorial, addition theorem, multiplication theorem, normal distribution, Poisson distribution, exponential distribution

(b) Statistics

Understand the statistical techniques, including the frequency distribution table, histogram, average, dispersion, correlation, and regression line.

Sample terms median, mean, standard deviation, variance, correlation coefficient, estimation, regression analysis

(2) Numeric calculation

Understand the basics of numerical calculations, including solution of simultaneous linear equations.

Sample terms matrix, logarithm

(3) Numerical analysis

Understand the techniques for obtaining approximate solutions, including the bisection method and interpolation, along with errors resulting during the calculation process.

Sample terms Newton's method, absolute error, relative error, rounding error, truncation error

(4) Formula manipulation

Understand the concept of formula manipulation, which symbolically and algebraically manipulates formulas using a computer.

Sample terms factorization, differentiation, integration

(5) Graph theory

Understand the basic concept of the graph theory and how to read graphs.

Sample terms directed graph

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(6) Queueing theory

Understand the components and concept of the queueing model along with simple calculations in the M/M/1 model.

Sample terms service time, waiting time, arrival interval, average arrival rate, average service rate

(7) Optimization problems

Understand optimization problems and the concepts of the linear programming, PERT, and shortest path problem.

Sample terms dynamic programming

3. Theory of information

[Goal]

- Understand the overview of information and coding theories.
- Understand the overview of theories about information, including predicate logic, formal language, and automaton.
- Understand the overview of artificial intelligence.
- Understand the overview of the compiler and programming language theories along with semantics.

(1) Information theory

Understand the concept of information contents and the relationship between event occurrence probability and information contents.

(2) Coding theories

Understand the characteristics of analog and digital representations, quantization, sampling, encoding including A/D conversion, purposes of encoding, and the effects of improvement of various factors such as reliability, efficiency, and security in information transmission.

Sample terms channel encoding, Huffman coding, data compression

(3) Character representation

Understand typical character codes including zoned decimal designed for representing decimal data.

Sample terms ASCII code, EUC (Extended UNIX Code), JIS code, shift JIS code, Unicode

(4) Predicate logic

Understand the basic concept of predicate logic and the difference between deductive inference and inductive inference.

Sample terms relational database

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Formal language

Understand the concept of formal languages along with the definitions, operations, types, and grammars. In addition, understand notations including the BNF and syntax chart, regular expressions, and the overview of context-free grammar.

Sample terms Reverse Polish Notation

(6) Automaton

Understand the concept of finite automaton, relationships with formal languages, state transition table, and state transition diagram.

(7) Computational complexity

As a technique for evaluating algorithms, understand how to determine computational complexity and the order notation.

Sample terms time complexity

(8) Artificial intelligence

Understand the overview of artificial intelligence.

Sample terms neural network, expert system, knowledge base, inference engine

(9) Compiler theory

Understand the role of the compiler and the processes of compilation along with the basic concepts of lexical analysis, syntactic analysis, and optimization.

Sample terms semantic analysis, code generation, intermediate language, object program, formal language, automaton

(10) Programming language theory and semantics

Understand that different programming languages are used in different applications. In addition, understand the concepts and application areas of typical programming languages along with their overview of syntax and semantics.

Sample terms procedural language, functional language, logic language, object-oriented language

4. Theory of communications

[Goal]

- Understand the basic technologies and typical methods for transmitting information along with their types and characteristics so that you can apply them to your tasks.

(1) Transmission theory

(a) Transmission path

Understand how data is transmitted over transmission paths.

Sample terms simplex, half duplex, full duplex, serial, parallel

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Modulation and demodulation techniques

To transmit digital date through an analog transmission path, it must be modulated before it is sent and then demodulated when it is received. Understand the types and characteristics of typical modulation and demodulation techniques.

Sample terms AM (Amplitude Modulation), FM (Frequency Modulation), PM (Phase Modulation), PCM (Pulse Code Modulation)

(c) Multiplexing

Multiplexing allows one transmission path to be concurrently used for multiple communications. Understand the characteristics of typical multiplexing techniques.

Sample terms FDM (Frequency Division Multiplexing), TDM (Time Division Multiplexing)

(d) Error detection and correction

Understand the mechanisms of the technologies for enhancing reliability, including even and odd parities.

Sample terms CRC, Hamming code, parity check, ECC, checksum

(e) Signal synchronization techniques

Signal synchronization control synchronizes transmission and reception between senders and receivers. Understand the characteristics of typical signal synchronization techniques.

Sample terms bit synchronization, character synchronization, flag synchronization, start-stop synchronization, start bit, stop bit, SYN synchronization, frame synchronization

5. Theory of measurement and control

[Goal]

- Understand the basic mechanism of signal processing.
- Understand the need for and the basic mechanism of control.

(1) Signal processing

Signal processing is intended to analyze analog waveforms for eliminating noise and extract characteristics. Understand the basic mechanism of signal processing.

Sample terms filtering, D/A conversion, A/D conversion

(2) Theory of control

(a) Mechanism of control

Understand the need for and concept of control. Understand the basic mechanisms of control techniques, including feedback control and feed-forward control.

Sample terms real-time OS, open loop, response characteristics, control stability

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Types of sensors an actuators and their operating characteristics

Understand that computer-based control uses a sensor to detect light volumes, temperatures, and pressures of the objects to be controlled, which the computer converts using an actuator to mechanical actions, including electrically-powered, hydraulically-operated, pneumatically-driven actions to control the target objects under certain conditions. Understand the need for these actions along with the basic mechanism.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 1: Basic Theory
Middle Category 2: Algorithm and Programming

1. Data structure

[Goal]

- Learn the concept and the basic mechanism of data structures so that you can apply them.
- Learn the types of typical data structures and the characteristics so that you can apply them.

(1) Data structure

Understand the concept and basic mechanism of the data structure.

(2) Types of data structures

(a) Array

Understand the concept and basic manipulation of the array.

Sample terms multidimensional array, static array, dynamic array

(b) List

Understand the basic concept of the list along with how to manipulate it.

Sample terms linear list, singly-linked list, doubly-linked list, circular list

(c) Stack and queue

Understand the characteristics and basic manipulation of the stack and queue.

Sample terms FIFO, LIFO, push, pop

(d) Tree structure

Understand the types and characteristics of tree structures, tree traversing, node addition and removal, and heap reconfiguration.

Sample terms root, leaf, branch, binary tree, complete binary tree, balanced tree, ordered tree, n-ary tree, search tree, binary search tree, depth-first search, breadth-first search, preorder, post-order, in-order

2. Algorithm

[Goal]

- Learn the basic concepts and representation techniques of the algorithm and flowchart so that you can apply them.
- Learn the basics of typical algorithms so that you can apply them.
- Learn the basic method for designing algorithms so that you can apply them.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(1) Flowchart

Understand the concepts of the algorithm and flowchart. Understand how to represent processing steps including symbols, sequence, determination, and iteration.

Sample terms terminal, process, predefined processing, decision, loop limit, data, flowline

(2) Typical algorithms

(a) Algorithms for sorting, merging, and searching

Understand the basic method for designing algorithms for sorting, merging, and searching.

Sample terms selection sort, bubble sort, merge sort, insertion sort, shell sort, quick sort, heap sort, linear search, binary search, hash table search

(b) Recursive algorithms

Understand the basics of the recursive algorithm.

(c) Graph algorithms

Understand the basics of the graph algorithms.

Sample terms depth-first search, breadth-first search, shortest path search

(d) Algorithms for character string processing

Understand the basics of the algorithms for character string processing.

Sample terms string pattern matching

(e) Algorithms for file processing

Understand the basics of sorting, merging, control break, and editing used in paperwork batch processing and the like.

(3) Algorithm design

Understand that algorithms are expressed using pseudo-languages, flowcharts, decision tables, and others. In addition, understand the basic method for designing algorithms.

Sample terms recursion, divide-and-conquer approach

3. Programming

[Goal]

- Learn the programming rules and coding conventions so that you can apply them.
- Learn the basic notations for the grammars of programming languages so that you can apply them.

(1) Programming

(a) Programming rules and coding conventions

Understand the purposes, effects, and types of programming rules and coding conventions. Understand what problems arise if the programming styles or coding conventions are not followed.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Sample terms indentation, nest depth, nomenclature conventions, prohibited use of instruction, increased functionality efficiency, usability, maintainability of a program

(b) Program structure

Understand the basic structures of programs from the viewpoints of the reliability and maintainability.

Sample terms module separation, independence, main routine, subroutine

(c) Data type

Understand typical data types used in programming languages.

Sample terms integer type, real type, Boolean type, character type, abstract data type, structure type

(d) Web programming

Understand the basic mechanism of the Web servers and clients. Understand the role of programs in Web servers and clients and how to create them.

Sample terms server-side programming, rich client, Apache, JSP (Java Server Pages)

(2) Grammar notation

Understand that BNF and other meta-languages are used to define the syntaxes of programming languages.

4. Programming languages

[Goal]

- Learn the types of programming languages and the characteristics along with the basic description methods so that you can apply to assigned tasks.
- Learn how to use C, COBOL, Java, and assembler language to create programs so that you can apply it.
- Learn how to make use of spreadsheet software so that you apply it.

(1) Programming languages

(a) Development and classification of programming languages

Understand that programming languages underwent development from machine languages to assembler languages, and then to high-level languages. Understand the classification of programming languages.

Sample terms procedural language, object-oriented language, script language

(b) Procedural languages

Understand the characteristics and basic description methods of typical procedural languages.

Sample terms Fortran，COBOL，PL/I，Pascal，BASIC，C

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Object-oriented languages

Understand the characteristics and basic description methods of typical object-oriented languages.

Sample terms Java，C++

(d) Script languages

Understand the characteristics and basic description methods of typical script languages.

Sample terms Perl，PHP，Python，Ruby

(2) Knowledge and techniques associated with C

[Subgoal]

- Learn the basics of how to create C-based programs so that you can apply them.
- Learn how to create programs for performing operations and control, and processing characters so that you can apply it.
- Learn how to use library functions so that you can apply it.
- Learn how to create a program for processing files so that you apply it.

(a) Basic programs using C

Create basic programs using C.

Things to learn main function, printf function, standard output, comment, header, etc.

(b) Numeric calculation

Create a program that uses the four arithmetic operations.

Things to lean four arithmetic operators, variable, expression, integer calculation, type conversion (cast), real number calculation, bit width of a data type, increment operator, decrement operator, comparison operator, etc.

(c) Program using selection statements

Create a program that performs conditional branching using conditional expressions.

Things to lean equality operator, relational operator, logical operator, assignment operator, *if* statement, *switch* statement, etc.

(d) Program using iteration statements

Create a program that uses iterative statements.

Things to lean *while* statement, *do* statement, *for* statement, etc.

(e) Bit operation

Create a program that uses bit-by-bit operators.

Things to lean unsigned integer type, bit shift, etc.

(f) Input processing

Create a program that uses standard input.

Things to lean *scanf* function, white-space character, address operator, etc.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(g) Array

Create a program that uses arrays.

Things to lean one-dimensional array, two-dimensional array, etc.

(h) Character processing

Create a program for processing characters.

Things to lean *putchar* function, *puts* function, *getchar* function, *gets* function, input/output of characters, input/output of strings, string literal, null character, etc.

(i) Pointer

Create a program that uses pointers.

Things to lean array of pointers, addition/subtraction of address, etc.

(j) Function

Create functions to create a program that uses them.

Things to lean function prototype, void type, recursive call, etc.

(k) Library functions

Create a program that uses library functions.

Things to lean preprocessor, #include, #define, preprocessing directive, etc.

(l) Storage-class specification

Create a program that uses storage-class specifiers.

Things to lean variable with an automatic storage duration, variable with a static storage duration, register, typedef, storage duration, external definition, etc.

(m) Structure

Create a program that uses structures.

Things to lean array of structures, self-referential structure, union, etc.

(n) File processing

Create a program for processing files.

Things to lean sequential file processing, random file processing, stream, buffering, etc.

(3) Knowledge and techniques associated with COBOL

[Subgoal]

- Learn the basics of how to create COBOL-based programs so that you can apply them.
- Learn how to create programs for performing operations and control, processing characters, and manipulating tables so that you can apply it.
- Learn how to create a program for processing files so that you can apply it.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(a) Basic programs using COBOL

Create basic programs using COBOL.

Things to lean DIVISION, SECTION, IDENTIFICATION DIVISION, ENVIRONMENT DIVISION, DATA DIVISION, PROCEDURE DIVISION, ACCEPT statement, DISPLAY statement, data structure, data item, data moving, data editing, normalization, comment, etc.

(b) Numeric calculation

Create a program that uses the four basic arithmetic operations.

Things to lean COMPUTE statement, arithmetic expression, working storage section, etc.

(c) Program using selection statements

Create a program that performs conditional branch using conditional expressions.

Things to lean IF statement, comparison operator, sign condition, class condition, logical operator, nested branch, EVALUATE statement, GO TO statement, STOP statement, etc.

(d) Program using iteration statements

Create a program that uses iterative statements.

Things to lean iterative execution with specification of the number of executions, iterative execution with specification of conditions, nested iterative execution, PERFORM statement, etc.

(e) Character processing

Create a program for processing characters.

Things to lean “reference modification” of character string, “INSPECT” of character string, “REPLACING” of character string, “STRING” of character string, “UNSTRING” of character string, etc.

(f) Table manipulation

Create a program for manipulating tables.

Things to lean concept of tables, one-dimensional table, multi-dimensional table, index, INITIALIZE statement, sequential search, non-sequential search, OCCURS clause, SEARCH statement, etc.

(g) Basics of file processing

Create a program for the I/O processing of sequential files.

Things to lean file input/output, form output, data tabulation, control break, matching, etc.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(h) Application of file processing

Create a program that uses relative and indexed files.

Things to lean record rewriting (REWRITE), record deletion (DELETE), record positioning (START), record sorting (SORT), record merging (MERGE), etc.

(4) Knowledge and techniques associated with Java

[Subgoal]

- Learn the basics of how to create Java-based programs so that you can apply them.
- Learn how to create programs for performing operations, control, and the like so that you can apply them.
- Learn how to declare classes and how to use classes by instantiating them so that you can apply them.
- Learn how to use inheritance and an interface for efficient programming so that you can apply it.
- Learn how to create exception handling, parallel processing, and the like so that you apply them.

(a) Basic programs using Java

Create basic programs using Java.

Things to lean class, method, main method, standard output, comment, javadoc comment, etc.

(b) Numeric calculation

Create a program that performs the four arithmetic operations.

Things to lean data type, type conversion (cast), variable, array, four arithmetic operators, expressions, assignment operator, comparison operator, increment operator, decrement operator, shift operator, etc.

(c) Program using selection statements

Create a program that performs conditional branch using conditional expressions.

Things to lean *if* statement, *switch* statement, etc.

(d) Program using iteration statements

Create a program that uses iterative control statements.

Things to lean *while* statement, *do* statement, *for* statement, extended *for* statement, etc.

(e) Class and instance

Create a program that uses classes by defining and instantiating them.

Things to lean instance variable, instance method, access modifier, reference variable, hiding, constructor, overload, this, class variable, class method, string class, package, fully qualified name, super, simple name, import declaration, class modifier, etc.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(f) Differential/incremental programming

Create a program that extends the functions of the existing classes and adds function using the interface.

Things to lean inheritance, final, extends, superclass, subclass, object, implements, cast, upcast, downcast, instanceof, override, dynamic bind, class library, abstract class, abstract method, base class, subclass, etc.

(g) Exception handling

Create a program that performs exception handling.

Things to lean *try* statement, *throw* statement, etc.

(h) Parallel processing

Create a program that performs parallel processing.

Things to lean thread, synchronized modifier, wait( ), notify( ) , etc.

(i) Collection and generics

Create a program that uses collections.

Things to lean add( ), remove( ), List, Set, Map, Stack, type argument, etc.

(j) Nested class

Create a program that uses nested classes.

Things to lean member class, member interface, local class, anonymous class, etc.

(k) Enumeration

Create a program that uses the enumeration type.

Things to lean enumeration constant, final variable, etc.

(5) Knowledge and techniques associated with assembler language (CASL II)

[Goal]

- Understand the specifications of the computer system COMET II.
- Learn how to use CASL II to create programs so that you can apply it.
- Learn how to create programs for performing operations and control so that you can apply it.
- Learn how to create programs including the processing using tables and the I/O processing so that you can apply it.
- Learn the mechanisms and usage of stacks and subroutine calls based on stacks so that you can apply them.

(a) COMET II

Understand the register, a component of COMET II, along with the instruction format.

Things to lean GR0 through GR7, SP, PR, FR, OF, SF, ZF, comment

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Basic programs using CASL II

Create basic programs using CASL II.

Things to lean START, END, DS, DC, LD, ST, LAD, effective address

(c) Arithmetical and logical operations

Create a program that uses arithmetical and logical operation instructions.

Things to lean ADDA, ADDL, SUBA, SUBL, AND, OR, XOR

(d) Selection and iteration processing

Create a selection-type program and a iteration-type program using comparison operation instructions and branch instructions.

Things to lean CPA, CPL, JPL, JMI, JNZ, JZE, JOV, JUMP

(e) Shift operation

Create a program that uses shift operation instructions.

Things to lean SLA, SRA, SLL, SRL

(f) Processing that uses tables

Create a program that uses tables (arrays).

Things to lean GR1 through GR7, index register

(g) Input/output processing

Create a program that uses the macro instructions IN and OUT to perform input/output processing.

Things to lean IN, OUT

(h) Stack

Create a program that performs stack manipulation.

Things to lean PUSH, POP, RPUSH, RPOP, CALL, RET

(6) Spreadsheet software

[Subgoal]

- Learn the capabilities provided by spreadsheet software, including the calculation and tabulation functions, so that you can apply them.
- Learn the types and mechanism of functions so that you can apply them.
- Learn how spreadsheet software can be used in business operations.

(a) Worksheet configuration

Sort data items. Reference and tabulate data between multiple worksheets.

Things to lean cell, blank cell, protection for cells, range, reference to a worksheet, relative reference, absolute reference, etc.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Calculation expression

Create calculation expressions using cells, range names, arithmetic operators, numeric values, functions, and the like in combination.

Things to lean arithmetic operators (+, –, ∗, /, ^), comparison operators (=, >, <, ≥, ≤), etc.

(c) Function

Create expressions by combining a function and numeric values, a function and cells, two or more functions, and so on.

Things to lean IF, argument, nesting, logical expression (true, false), logical product, logical sum, negation, count, conditional count, sum, average, square root, standard deviation, maximum, minimum, integer part, remainder, search (vertical and horizontal directions) , etc.

(d) Application of spreadsheet software

Apply spreadsheet software to perform business operations such as accounting and performance handling. More specifically, identify the target business operations and implement their algorithms on the spreadsheet software.

5. Other languages

[Goal]

- Understand the types of typical markup languages and their characteristics along with the description methods so that you can apply them.
- Understand the characteristics of other languages used in the computer.

(1) Markup languages

(a) HTML

Understand the characteristics and basic description method of HTML, which is used for creating Web pages.

Sample terms start tag, end tag, DTD (Document Type Definition), SGML (Standard Generalized Markup Language)

(b) XML

Providing the capability of defining original tags besides the functions of HTML, XML is mainly used for data exchanges over the Internet. Understand the characteristics and basic description method of XML.

Sample terms DOM (Document Object Model), SOAP (Simple Object Access Protocol), SVG (Scalable Vector Graphics), SAX (Simple API for XML), XML Schema

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) XHTML

XHTML is a markup language that re-defined HTML by using XML. Understand the characteristics and basic description method of XHTML.

Sample terms XHTML Basic, Modulation of XHTML

(d) Style sheet

Understand that the style sheet is intended for separating the structure of HTML, XML, and other markup languages from the display style. Understand the characteristic and basic description method of the style sheet.

Sample terms CSS (Cascading Style Sheets), XSL (Extensible Stylesheet Language)

(2) Other languages

Understand the characteristics of UML, a notation for object-oriented design.

Sample terms class diagram, sequence diagram, object diagram, collaboration diagram, statechart diagram, manipulation, attribute, role name

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 2: Computer System
Middle Category 3: Computer Component

1. Processor

[Goal]

- Understand the types of computers and their configurations so that you can apply them to your tasks.
- Understand the architecture, structure, scheme, and operating principles of the processor so that you can apply them to your tasks.
- Understand the indexes for processor performance so that you can apply them to your tasks.
- Understand high-speed and high-reliability technologies for processors so that you can apply them to your tasks.

(1) Types of computers

Understand the characteristics and intended purposes of the supercomputer, workstation, personal computer, and the other computers.

Sample terms general purpose computer, server, control computer, microcomputer, PDA (Personal Digital Assistant)

(2) Computer configuration

Understand that the computer consists of five components. Understand how basic control and data flows between the components.

Sample terms operation, control, storage, input, output

(3) Processor architecture

Understand that the processor architectures include RISC and CISC. In addition, understand the characteristics of the instruction structures on an architecture-by-architecture basis.

Sample terms wired logic control, microprogram control

(4) Processor structure and features

Understand the roles of the control unit and processing unit as components of the processor; the roles of the accumulator, register, and instruction decoders as components of the control unit and processing unit; and how the processor performance is related to the system performance.

Sample terms accumulator, complementer, instruction address register (instruction counter, program counter, and sequential control counter), instruction register, general register, index register, base register

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Operating principles of the processor

(a) Mechanism of operations

Understand that combinations of basic logic circuits, such as AND, OR, and NOT, implement half and full adders to perform operations.

Sample terms sequential circuit, combinatorial circuit, NAND circuit

(b) Instruction and addressing

Understand the types of typical machine language instructions, the configuration of instruction words, procedure for executing instructions (instruction fetch, instruction decode, data fetch, and instruction execution), and address modification. Understand the binary representation of machine language operations, along with the correspondence to assembler symbol representation.

Sample terms arithmetic operation instruction, logical operation instruction, transfer instruction, comparison instruction, branch instruction, shift instruction, input/output instruction

(c) Interrupt

Understand the mechanism of interrupts and the types of interrupts categorized as internal or external interrupts.

Sample terms SVC (SuperVisor Call) interrupt, input/output interrupt

(6) Processor performance

Understand the meaning of the words such as clock frequency, CPI (Cycles Per Instruction), and MIPS.

Sample terms cycle time, FLOPS, instruction mix

(7) High-speed technology for processors

Understand the overview of typical high-speed technologies for processors.

Sample terms pipeline, super-pipeline, superscalar, VLIW

(8) Parallel processing

Understand the types and characteristics of typical parallel processing.

Sample terms SISD, SIMD, MISD, MIMD

(9) Multiprocessor system

It is possible to enhance a system in terms of speed and reliability by equipping it with multiple processors. Understand the typical types and characteristics of such systems.

Sample terms loosely coupled multiprocessor system, tightly coupled multiprocessor system, Amdahl's law, synchronization, cluster

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

2. Memory

[Goal]

- Understand the types and characteristics of memory so that you can apply them to your tasks.
- Understand the mechanism of main storage including its configuration, memory system configuration, and storage hierarchy so that you can apply them to your tasks.
- Understand the types of storage media and their characteristics so that you can apply them to your tasks.

(1) Types of memory and the characteristics

Understand that memory comes in different types: semiconductor memory circuits, magnetic memory, optical memory, and so on. In addition, understand the types of semiconductor (IC) memory, along with the characteristics (volatility, non-volatility, access speed, capacity, cost, and physical size), and typical purpose.

Sample terms RAM, ROM, DRAM, SRAM, flash memory

(2) Main memory configuration

Understand the configuration of main memory along with address selection, access, and other procedures for accessing data within main memory.

Sample terms memory unit, address selection mechanism, read/write mechanism

(3) Memory system configuration and storage hierarchy

Understand how the storage hierarchy is configured along with the purpose and concept of combining storage units with different characteristics to form a hierarchy. Understand how data in cache memory is written to main memory.

Sample terms auxiliary memory, disk cache, write through, write back

(4) Access method

Understand the memory interleave for speeding up main memory.

Sample terms bank

(5) Memory capacity and performance

Understand the relationship between memory capacity and performance, including access time and cycle time, cache memory hit ratio, effective access time, and so on.

(6) Types of storage media and their characteristics

Understand the characteristics of storage media, including the types of removable storage media, storage capacity, portability, usage, and purposes.

Sample terms read-only, write-once, rewritable, hard disk, CD (CD-ROM, CD-R), DVD (DVD-ROM, DVD-RAM, DVD-R), flash memory (USB memory, SD card), floppy disk, streamer, RAM file

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

3. Bus

[Goal]

- Understand the overview of the types of buses along with their characteristics and configurations.

(1) Types of buses and their characteristics

Understand that buses are transmission paths used for exchanging data within the computer. In addition, understand the types and characteristics of buses along with the overview of classifications, such as internal bus (CPU internal bus), external bus, and expansion bus, and the transfer method.

Sample terms address bus, data bus, control bus, system bus, memory bus, input/output bus, serial bus, PCI, parallel bus

(2) Bus system configuration

Understand that the bus system configuration is available in two types: one architecture separates instruction fetch from data access, and the other uses the same bus for both instruction fetch and data access.

(3) Bus capacity and performance

Understand the bus width and clock frequency, which determine the performance of buses.

Sample terms bus access mode

4. Input/output interface

[Goal]

- Understand the types of typical input/output interfaces and their characteristics so that you can apply them to your tasks.
- Understand the basic roles and functions of device drivers.

(1) Input/output interfaces

(a) Types of input/output interfaces and their characteristics

Understand the types of typical input/output interfaces along with the characteristics, including the transfer method, transmission speed, number of connectable units, and usage.

Sample terms USB, RS-232C, IEEE 1394, SCSI, serial ATA, Bluetooth, IrDA

(b) Data transmission methods and topologies

Understand the difference between the serial and parallel data transmission methods. In addition, understand the types and characteristics of the topologies used for connecting peripherals.

Sample terms analog, digital, star connection, cascade connection, hub, daisy chain, terminator, tree connection

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Input/output control methods

Understand the DMA (Direct Memory Access) method, which is a transfer method that can transfer data without any intervention of the CPU, and the channel control method. Understand the roles of the input/output interruptions.

Sample terms program control

(2) Device driver

Understand the basic role of device drivers, the functions of plug and play and hot plug, and synchronization with devices.

5. Input/output device

[Goal]

- Understand the types of typical I/O devices along with their characteristics so that you can apply them to your tasks.
- Understand the types of typical auxiliary storage devices along with their characteristics so that you can apply them to your tasks.

(1) Input devices

Understand the types of typical input devices along with their characteristics.

Sample terms keyboard, pointing device, touch screen, mouse, joystick, trackball, scanner, OCR, OMR, sound input device, biometric authentication device, barcode reader, digitizer, tablet, digital camera, magnetic card reader, IC card reader, A/D converter

(2) Output devices

Understand the types and characteristics of typical display devices as well as the types and characteristics of typical printers. Understand how to calculate the sizes of image data, for example.

Sample terms CRT display, liquid crystal display, TFT liquid crystal, STN liquid crystal, OLED (Organic Light Emitting Diode) display, plasma display, interlaced mode, non-interlaced mode, VGA, SVGA, XGA, impact printer, non-impact printer, serial printer, line printer, page printer, laser printer, inkjet printer, plotter, D/A converter, projector, voice synthesizer

(3) Auxiliary storage devices

Understand the types of typical auxiliary storage devices and storage media along with their characteristics.

Sample terms hard disk drive, floppy disk drive, CD-R/RW drive, Blu-ray drive, DVD-R/RW drive, magnetic tape unit, track, cylinder, blocking factor, IBG (Interblock Gap), sector, defragmentation

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(4) Other I/O devices

Understand the types of typical communication control units, drive units, and imaging devices, along with their characteristics.

Sample terms wired LAN interface card, wireless LAN interface card

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 2: Computer System
Middle Category 4: System Component

1. System configuration

[Goal]

- Understand the processing modes, usage, and application areas of systems so that you can apply them to your tasks.
- Understand the types and characteristics of typical system configurations so that you can apply them to your tasks.
- Understand the characteristics and configuration of the client/server system so that you can apply them to your tasks.
- Understand the concept of reliability design for systems so that you can apply them to your tasks.

(1) Processing modes, usage, and application areas of systems

Understand the overview of centralized processing and distributed processing along with their characteristics, the types of processing modes, such as batch processing and real-time processing, and which processing mode is suitable for which business task.

Sample terms: parallel processing, client/server processing, transaction processing, interactive processing

(2) System configuration

Understand the types of typical system configurations and the characteristics. In addition, understand redundant configurations for improving system reliability, load distribution for improving the speed of response, and so on.

Sample terms: dual system, duplex system, cluster, multiprocessor system, load sharing system, backup site, hot site, warm site, cold site, primary system (currently used system), secondary system (backup system), tight coupling, loose coupling, peer to peer, grid computing

(3) High-performance computing

Understand the characteristics of HPC (High Performance Computing) used in areas that require high-precision, high-speed operations.

Sample terms: massively parallel

(4) Client/server system

Understand the characteristics and configurations of the two-tier and three-tier client/server systems. In addition, understand the characteristics of the associated technologies including the stored procedure for databases.

Sample terms: presentation layer, function layer, database access layer, client, server, thin client system, RPC (Remote Procedure Call)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Web system

Understand the characteristics, basic configuration, and mechanism of the Web system.

Sample terms Web browser, Web server

(6) RAID

Understand that the RAID technology regards multiple hard disk drives as a single drive to improve reliability and speed. Understand the types of RAID and their typical characteristics, along with NAS, SAN, and other technologies associated with storage.

Sample terms RAID0, RAID1, RAID2, RAID3, RAID4, RAID5, RAID6, striping, mirroring, parity

(7) Reliability design

Understand the concept of reliability design, including the fault tolerant and human error avoidance technologies for minimizing the effect of system failures.

Sample terms fault, fault tolerant system, fault avoidance system, fail safe, fail soft, foolproof

2. System evaluation indexes

[Goal]

- Understand the concept for measuring the performance, reliability, and cost efficiency of systems, the evaluation indexes for them, and the concept of capacity planning so that you can apply them to your tasks.

(1) Performance characteristics and evaluation of a system

(a) System performance indexes

Understand the concept of evaluation items used for evaluating system performance.

Sample terms response time, throughput, benchmark, TPC, SPECint, SPECfp, monitoring

(b) Capacity planning

Understand that system performance is identified and evaluated on a continuous basis in the following basic procedure: the purpose and concept of capacity planning and the types, amount, and time of processing required for the system are reviewed, and then the performance specifications for the server, storage, and others are estimated based on the performance requirements.

Sample terms load, sizing, capacity management

(2) Reliability characteristics and evaluation of a system

(a) RASIS

Understand that the evaluation items used for evaluating systems are Reliability, Availability, Serviceability, Integrity, and Security. Understand the concept of the indexes for them.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Reliability indexes and reliability calculation

Understand the evaluation items used for evaluating system reliability including MTBF, MTTR, and availability, along with their indexes. Understand the basic method for calculating the availability of parallel and serial systems.

Sample terms bathtub curve

(3) Cost efficiency evaluation of a system

Understand the concepts of evaluating the cost efficiency of a system and evaluating the system in terms of initial cost and TCO. In addition, understand the concept of what expenses the initial and running costs include and of what the difference between the direct and indirect costs is.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 2: Computer System
Middle Category 5: Software

1. Operating system

[Goal]

- Understand the types of OSs along with their characteristics, functions, and configurations so that you can apply them to your tasks.
- Understand the management mechanism of typical functions of OSs, including job management, task management, and memory management so that you can apply them to your tasks.

(1) Types of OSs and their characteristics

Understand the position of OSs as software and the need for them. Understand the types and typical characteristics of OSs for general-purpose computers, PCs, real-time systems.

Sample terms system software, UNIX, OS for PCs, open OS

(2) Functions and configurations of OSs

Understand the basic functions, configurations, and kernels of OSs, along with language processors.

Sample terms microkernel, monolithic kernel, middleware, kernel mode (supervisor mode), user mode, compiler, service program, process management, operations management, interrupt, multiprogramming

(3) Job management

A job is a unit of work. Understand the concept of job steps that make up a job and the overview of job management.

Sample terms reader, job scheduler, initiator, job terminator, master scheduler, writer, batch processing

(4) Task management

(a) Tasks and state transition

Understand the relationships between tasks and job steps and between tasks and threads; the state transition from initiation of tasks to execution and termination of them; and the basic role of the dispatcher.

Sample terms ready state, running state, waiting state, process

(b) Multiprogramming (multitask) and scheduling

Understand the concept of multiprogramming. Understand the scheduling techniques and the characteristics used in typical task scheduling methods.

Sample terms preemptive, non-preemptive, time slice, priority scheduling, round robin, time quantum, dispatch

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Data management

Understand the function which provides application programs with access to auxiliary storage by means of an interface independent of devices.

(6) Input/output management

Understand the overview of the functions that execute the I/O processing of physical records in accordance with the directions of data management, including input/output control and fault management during input/output.

Sample terms channel, input/output interrupt

(7) Memory management

(a) Real memory management

Understand the characteristics of memory management methods such as the fixed partition and variable partition systems, along with the concepts of fragmentation and measures against it. In addition, understand the concepts of swapping and overlays, intended for efficient use of main memory.

Sample terms roll-in, roll-out, swap-in, swap-out, overlay (segment), garbage collection, compaction

(b) Virtual memory management

Understand the relationship between real memory and virtual memory, the effectiveness of virtual memory, and the types and characteristics of virtual memory systems. In addition, understand the concept of page replacement procedures used in typical page replacement algorithms for paging systems.

Sample terms base address, segment, paged segment, thrashing, DAT (Dynamic Address Translation), page fault, page replacement, LRU, FIFO

(8) Network control

Understand the basic functions of network control programs along with the communications interface provided by OSs.

Sample terms protocol control, communications protocol, TCP/IP, OSI model, LAN, WAN

(9) Operations management

Understand the overview of the functions that provide operations with ease and flexibility including system startup process (OS initialization), system shutdown process, interaction with operators, user management facility, scheduling, and system monitoring.

Sample terms profile, user account, right to use a system, right to access a file, right to use a terminal

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(10) User management

Understand the types and characteristics of user accounts along with the concepts of how to create accounts, how to assign and change passwords, and how to add and change privileges. In addition, understand the concept of the directory service for collective management of accounts.

Sample terms superuser, root, administrator, guest, administrative privileges, LDAP

(11) Security control

Understand that OSs provide security control functions such as access control, cryptographic control, and outside-intrusion detection and protection.

Sample terms logging function, audit function, accountability, reliability process

(12) Fault management

Understand the overview of the functions performed when a fault arises, including fault detection, testing and diagnosing, automatic correction, fault recording, reconfiguration, restarting, and cause elimination.

Sample terms hardware fault, software fault

2. Middleware

[Goal]

- Understand the roles and basic functions of typical middleware so that you can apply them to your tasks.

(1) Roles and functions of middleware

Understand the roles and basic functions of middleware positioned between the OS and application software.

Sample terms linking software between application programs, DBMS, communication management system, software development tool, operations management tool, TP (Transaction Processing) monitor

(2) Role and functions of shells

Understand that shells are responsible for interpreting commands and directions received from users and for calling kernel functions such as program initiation and control.

Sample terms command interpreter

(3) API

Understand that APIs allow application programs to send down directions to the OS and middleware.

(4) Library

Understand the types and characteristics of libraries for storing programs and macros.

Sample terms source library, object library, load library, DLL, class library

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Componentware

Understand the concept of componentware, a technique for developing software by dividing software into components based on object-oriented technology.

Sample terms component, Java Beans, ActiveX, CORBA

3. File system

[Goal]

- Understand the mechanism of managing hierarchical files so that you can apply them to your tasks.
- Understand the types and characteristics of file systems so that you can apply them to your tasks.
- Understand the types and typical characteristics of file organization, access methods, and backup methods so that you can apply them to your tasks.

(1) Directory management and file management

Understand the mechanism of managing hierarchical files and the method of identifying files based on absolute and relative paths. In addition, understand the basic concept of directory management, file sharing, and access privilege.

Sample terms root directory, current directory, search techniques

(2) Types and characteristics of file systems

Understand the overview of how OSs and users can use the areas of hard disk drives and other auxiliary storage devices as file and directories (folders). Understand that each OS is provided with a unique file system. In addition, understand the characteristics of typical file systems.

Sample terms FAT file system, NTFS, HFS (Hierarchical File System), volume

(3) File organization and access methodologies

Understand file organization and access methods along with the basic processing methods including how to add, delete, and update records in each file organization.

Sample terms sequential access, direct access, dynamic access, sequential organization, partitioned organization, indexed sequential organization, direct organization, VSAM organization, overflow area

(4) Backup

Understand the types and typical characteristics of backup methods, including the methods and procedures for getting backup files for the purpose of recovering files and managing generations.

Sample terms multiplexed backup, full backup, differential backup

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

4. Development tools

[Goal]

- Understand the types of typical development tools used for developing software along with their characteristics and basic functions so that you apply them to your tasks.

(1) Types and characteristics of development tools

Understand the types and characteristics of typical development tools along with the basic functions: for example, tools that support design, programming, and testing; CASE tools intended for automation and efficiency improvement throughout all software development processes; and IDE (Integrated Development Environment) for providing consistent process support throughout the whole development activities.

Sample terms: design support tool, design tool, building tool, testing tool, tool chain, EUC, EUD, emulator, simulator, ICE (In-Circuit Emulator), tracer, inspector, snapshot, assertion checker

(2) Types and the characteristics of language processing tools

Understand the types of typical language processing tools along with the characteristics and basic functions.

Sample terms: generator, source program, preprocessor, assembler, compiler, cross compiler, interpreter, object program, linker, loader, load module

5. Open source software

[Goal]

- Understand the types of open source software along with their typical characteristics, considerations for use and trends so that you can apply them to your tasks.

(1) Types and characteristics of OSS

Understand the overview of open source licensing, including the typical types of widely used OSS (Open Source Software), such as LAMP (Linux, Apache, MySQL, PHP) and LAPP (Linux, Apache, PostgreSQL, PHP), along with their characteristics, free redistribution, and permission of modifications and derived works.

Sample terms: Linux kernel, Perl, Python, Ruby, copyleft, dual license, GPL (General Public License), BSDL (Berkeley Software Distribution License), MPL (Mozilla Public License), Apache license

(2) Unix-family OSs

Understand the types and typical characteristics of Unix-family OSs, including Unix and Unix compatible OSs, as typical OSS.

Sample terms: NetBSD, Sun OS, Solaris, AIX (Advanced Interactive eXecutive), UnixWare, IRIX, HP-UX (Hewlett Packard UniX), Linux, FreeBSD (Free Berkley Software Distribution), OpenBSD, the Open Group

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Open source community

Understand the concept of software development in the open source community.

(4) Considerations in the use and utilization of OSS

Understand the basic considerations in the use of OSS, including the scope of licenses, costs associated with support for use, and handling of problems.

Sample terms security, defect

(5) Trends in OSS

Understand the trends in development and dissemination of OSS.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 2: Computer System
Middle Category 6: Hardware

1. Hardware

[Goal]

- Understand the concept of electric and electronic circuits, which are components of the computer.
- Understand the characteristics of typical methods for electronically controlling machines.
- Understand the characteristics of components and the important points in performing logic design.
- Understand the importance of power consumption in developing embedded devices.

(1) Electric and electronic circuits

Understand the operating principles of the basic computer logic circuits, such as the AND, OR, and NOT circuits.

Sample terms NAND circuit, flip-flop

(2) Machines and their control

Understand the basic operating principles of typical electronic control of machines

Sample terms open loop control, closed loop control, sequence control, feedback control, PWM (Pulse Width Modulation) control

(3) Components/elements and their implementation

Understand typical components and elements along with their implementation.

Sample terms diode, LED, transistor, IC, LSI, VLSI (Very Large Scale Integration)

(4) Logical design

Understand that logic circuits are designed in consideration of performance, design efficiency, cost, and so on.

Sample terms circuit design

(5) Power consumption

Understand the importance of hardware power consumption in developing embedded devices.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 3: Technology Element
Middle Category 7: Human Interface

1. Human interface technology

[Goal]

- Understand the concept and purpose of the information architecture so that you can apply them to your tasks.
- Understand the types and characteristics of typical human interface technologies so that you can apply them to your tasks.
- Understand the characteristics and components of GUI along with the important points of GUI screen design so that you can apply them to your tasks.

(1) Information architecture

Understand the concept and purpose of information architecture, along with organization (e.g. alphabetical order, categorization) and structuring (e.g. hierarchization, tagging) of information.

Sample terms label, chunk, navigation

(2) Human interface

Understand the requirements that determine the interface, along with the types and characteristics of technologies for providing interfaces.

Sample terms usability, accessibility, interactive system, voice recognition, image recognition, moving image recognition, feature extraction, selective perception, analysis of user operation, physical adaptability, non-verbal interface, natural-language interface

(3) GUI

Understand the characteristics of GUI: visual display based on graphics and intuitive operation based on pointing devices. Understand the components used in GUI and the important points in designing GUI screens.

Sample terms window, icon, radio button (radio box), checkbox, list box, pull-down menu, pop-up menu, text box

2. Interface design

[Goal]

- Understand the concepts and basic procedures of screen design, form design, and code design so that you can apply them to your tasks.
- Understand desirable interfaces based on application of the concept of universal design along with the basic techniques so that you apply them to your tasks.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(1) Screen design and form design

(a) Screen design

Understand the concept of and basic procedure for screen design, along with typical methods for checking input.

Sample terms screen layout, information relationship, numeric check, format check, limit check, combination check, matching check, balance check, check character

(b) Form design

Understand the concept of and basic procedure for form design.

Sample terms form overlay

(2) Code design

Understand the types and characteristics of code. Understand the concepts of and basic procedures for code design according to the purpose of use and application area.

Sample terms sequence code, block code (classification code), group classification code, mnemonic code, synthetic code

(3) Web design

Understand that the Web design should be done in consideration of the following: the concept of usability in Web design; techniques for improving usability; unified design throughout the website using style sheets; and design to support multiple types of Web browsers.

Sample terms frame, navigation, in-site search function

(4) Human centered design

Understand the concept of human centered design, intended for improving usability.

Sample terms ISO 13407

(5) Universal design

Understand appropriate interfaces and basic techniques based on universal design, which aims at enabling as many people as possible to comfortably use information systems, regardless of age, culture, disability, capability, or any other factor.

Sample terms WAI (Web Accessibility Initiative), WCAG 1.0 (Web Content Accessibility Guidelines 1.0)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 3: Technology Element
Middle Category 8: Multimedia

1. Multimedia technology

[Goal]

- Understand the mechanisms of how characters, sound, and images are handled in the computer, along with the methods for handling them in an integrated way, so that you can apply them to your tasks.
- Understand the purposes and typical characteristics of compressing and decompressing information so that you can apply them to your tasks.

(1) Multimedia

Understand the digitization of information, integration of multiple media, such as characters, sound, and images, and the characteristics of multimedia, including interactivity. In addition, understand methods for processing multimedia, including authoring for editing and combining multiple media.

Sample terms Web content, hypermedia, streaming, authoring environment, PDF

(2) Sound processing

Understand the mechanism of sound data digitization and the characteristics of typical sound files.

Sample terms PCM (Pulse Code Modulation), MIDI, WAV (Waveform Audio Format), MP3

(3) Static image processing

Understand the basic mechanism of image representation in the computer, including the three primary colors of light (red, green, and blue) and three primary colors of pigment (cyan, magenta, and yellow), picture element (pixel), resolution, and gray scale, along with the characteristics of typical static image file formats.

Sample terms JPEG, GIF, PNG, BMP, TIFF, Exif (Exchangeable Image File Format)

(4) Moving image processing

Understand the mechanism of moving image representation in the computer, including frame and frame rate, and the characteristics of typical moving image file formats.

Sample terms MPEG, QuickTime, AVI

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Compression and decompression of information

Understand that information is compressed and decompressed according to the type of media. Understand the purposes (efficient data storage and network load reduction) of compression along with the characteristics of typical compression methods. In addition, understand that the appropriate compression method should be selected and used according to each purpose.

Sample terms JPEG, MPEG, ZIP, LZH, compression rate, lossless compression, lossy compression, MR (Modified Read), MMR (Modified Modified Read)

2. Multimedia application

[Goal]

- Understand the characteristics of multimedia systems and example applications of multimedia.

(1) Multimedia application

Understand the characteristics of multimedia systems and example applications of multimedia, including VR (Virtual Reality), Internet broadcasting, and nonlinear image editing systems.

Sample terms CG, CAD, simulator, video game, AR (Augmented Reality), video on demand

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 3: Technology Element
Middle Category 9: Database

1. Database architecture

[Goal]

- Understand the types of databases along with their characteristics, database models, and the basic concept of the three-level schema so that you can apply them to your tasks.
- Understand the purpose and typical functions of database management systems (DBMS) so that you can apply them to your tasks.

(1) Database

(a) Types and characteristics of databases

Understand the types of typical databases and their typical characteristics, including the data representation structure and method for associating a record with another.

Sample terms relational database, structured database, HDB (Hierarchical Database), NDB (Network Database), OODB (Object Oriented Database), hypertext database, multimedia database, XML database

(b) Database models

Understand that databases provide data independence by separating the following three levels: data definitions seen from system users and programs, logical data structure, and physical data structure. Understand the types of data models and the concept of the three-schema structure.

Sample terms conceptual data model, logical data model (external model), relational model, hierarchical model, network model, physical data model (internal model), conceptual schema, external schema (subschema), internal schema (storage schema)

(c) Relational data model

Understand how data is represented in a relational data model. Understand the configuration of tables and their concept and association of multiple tables.

Sample terms relation, tuple (row, pair), attribute (column, field), occurrence, domain

(2) Database management system

Understand that a DBMS provides functions of storing data according to the target data model, keeping its consistency, and efficiently retrieving it.

Sample terms database definition function, database manipulation function, database control function, maintenance function, data security protection, exclusive control, failure recovery, security

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

2. Database design

[Goal]

- Understand the concept of data analysis and database design so that you can apply them to your tasks.
- Understand the purpose of and procedure for data normalization so that you can apply them to your tasks.
- Understand the considerations in performing the physical design of database so that you can apply them to your tasks.

(1) Data analysis

Understand the concept in analyzing data: identification, analyses, and organization of the data required for the target tasks and the meaning and relation of each data item; and standardization of the data items for preventing occurrences of synonyms and homonyms.

Sample terms elimination of data duplication, metadata, data dictionary

(2) Database design

(a) Conceptual design of databases

Understand the techniques for representing data relations independent of DBMS along with the design concepts: how to represent the components, attributes, and relationships using E-R diagrams; and cardinality (one to one, one to many, many to many).

Sample terms entity, attribute, relationship

(b) Logical design of databases

Understand the concept of table design that causes no data duplication or conflict, concepts such as prime key and foreign key, and constraints such as reference constraint.

Sample terms field (item), record, file, NULL, unique constraint

(3) Data normalization

Understand the purpose and procedure for normalization, along with first, second, and third normalizations.

Sample terms full functional dependency, partial functional dependency, transitive functional dependency

(4) Physical design of databases

Understand the considerations in designing the physical structure of a database, including the formats stored on hard disks.

Sample terms disk capacity estimation, logical data structure mapping, performance evaluation

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

3. Data manipulation

[Goal]

- Understand the typical data manipulation of relational databases so that you can apply it to your tasks.
- Understand the basics of typical database languages and SQL statements so that you can apply them to your tasks.

(1) Database manipulation

Understand the typical data manipulation of relational databases such as operations of inserting or updating data, set operations (sum, difference, intersection, and direct product) and relational operations (selection, projection, join, and quotient).

Sample terms relational algebra

(2) Database language

(a) Types of database languages

Understand that database languages are broadly divided into DDLs (Data Definition Languages) and DMLs (Data Manipulation Languages). Understand that they are categorized as self-contained languages, which use SQL statements separately, or host languages, which uses SQL statements from another language.

Sample terms interactive SQL, embedded SQL, module language, command driven, form, query

(b) Database language (SQL)

(i) Data definition language

Understand the SQL statements for defining schemas, tables, views, and processing rights. Understand the data types, how to define column constraints and table constraints, and view update (updatable and non-updatable views).

Sample terms base table, character type, numeric type, date, unique constraint, referential constraint, check constraint, non-NULL constraint, access right

(ii) Data manipulation language (SELECT statement)

Understand the basic manipulations to select required data: how to make a query using a SELECT statement; how to select a specific row or column by specifying criteria; how to join tables; how to specify predicates such as BETWEEN and IN; set functions; grouping; sorting; sub query; correlation sub query; and so on.

Sample terms aggregate function, pattern character, correlation name

(iii) Other data manipulation languages

Understand basic SQL statements, including INSERT and UPDATE statements.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(iv) Embedded SQLs

Understand the overview of data manipulation based on embedded SQLs, inducing cursor manipulation, non-cursor manipulation, and connection with the host language. Understand basic SQL statements which perform a cursor declaration, initiation and termination of manipulation, and reading.

Sample terms cursor

4. Transaction processing

[Goal]

- Understand the basic mechanisms of database exclusive control and failure recovery so that you can apply them to your tasks.
- Understand the concepts of transaction management and access efficiency improvement so that you can apply them to your tasks.
- Understand the need for controlling access to data and typical access rights.

(1) Exclusive control

Understand the need for exclusive control, intended for preventing multiple transactions from updating a database concurrently to maintain the data consistency. In addition, understand the basic mechanisms of the lock, semaphore, and commitment control.

Sample terms exclusive lock, shared lock, lock granularity, deadlock, one-phase commitment, two-phase commitment

(2) Failure recovery

Understand backup as a provision for failures, the basic mechanism of recovery processing for recovering the state immediately before the failure occurrence, preparation of the environment for the usage of database, the concept of reorganization for improving access efficiency.

Sample terms journal file (log file), checkpoint, roll forward, roll back, warm start, cold start

(3) Transaction management

Understand that databases are accessed by multiple users concurrently and therefore ACID characteristics are required in transaction processing. Understand the basic concept of the four characteristics.

(4) Database performance improvement

Understand the concept of making effective use of indexes to improve the efficiency of access to databases.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Data control

Understand that accesses to data must be controlled on a user-by-user basis, and that access rights include the authorizations to connect to the database, to search for data, to add new data, and to update data.

Sample terms "read" right, "insert" right, "delete" right

5. Database application

[Goal]

- Understand how databases are used in data analyses, business systems, software development and maintenance, and other applications.
- Understand the characteristics, advantages, and considerations of distributed databases, along with the mechanism of data synchronization.
- Understand the overview of data resource management.

(1) Application of databases

Understand the characteristics of the technologies for analyzing data for effective use of it, including data warehouse, data mart, and OLAP (Online Analytical Processing). Understand that these technologies are used in enterprise accounting systems, inventory control systems, and so on.

Sample terms OLTP (Online Transaction Processing), documentation management system, SFA (Sales Force Automation)

(2) Distributed database

Understand the characteristics and advantages of distributed databases placed at multiple sites, along with the considerations in using them and the mechanism of data synchronization between sites.

Sample terms transparency, commitment control, replication

(3) Data resource management

Understand the overview of the data dictionary used to collect and manage information (metadata) – attributes, meanings and contents, and locations of data, for example – for managing data, and repository used to consolidate and unify management of a wide range of information in software development and maintenance.

Sample terms IRDS (Information Resource Directory System)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 3: Technology Element
Middle Category 10: Network

1. Network architecture

[Goal]

- Understand the definitions of LAN and WAN and their typical characteristics, along with the typical services provided by common carriers so that you can apply them to your tasks.
- Understand wired and wireless LANs and the mechanisms and typical characteristics of their switching methods so that you can apply them to your tasks.
- Understand the relationships among line speed, data amount, and transfer time so that you can apply them to your tasks.

(1) Types and characteristics of networks

Understand the definitions of LAN and WAN along with the typical characteristics, components, and running costs. In addition, understand that a WAN-based network uses the Internet connection service and other services provided by common carriers.

Sample terms Internet service provider, metered rate, flat monthly fee, IDF (Intermediate Distribution Frame), packet switched network, circuit switched network, frame relay service, ATM (Asynchronous Transfer Mode) service

(2) Wired LAN

Understand the mechanism, components, and typical characteristics of wired LAN.

Sample terms coaxial cable, twisted pair cable, optical fiber cable

(3) Wireless LAN

Understand the mechanism, components, and typical characteristics of wireless LAN.

Sample terms electromagnetic wave, infrared ray, wireless LAN access point

(4) Switching system

Understand the mechanisms of circuit switching and packet switching along with their typical characteristics.

Sample terms packet, VoIP (Voice over Internet Protocol)

(5) Calculations associated with line

Understand the relationships among the line speed, data amount, and transfer time, and how to calculate the transfer time from a given line speed, data amount, and line utilization rate.

Sample terms transfer (transmission) rate, bps (bit per second), circuit capacity, bit error rate, traffic intensity, erlang

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(6) Internet technology

Understand that the Internet is based on the TCP/IP protocol and that Web and other services are provided based on communications between hosts (servers, clients, routers, and others) to which IP addresses are assigned. In addition, understand the overview of IP packet routing.

Sample terms IPv4, IPv6, address class, global IP address, private IP address, NAT (Network Address Translation), overlay network, DNS, proxy server, firewall

2. Data communication and control

[Goal]

- Understand the basic concept and configuration of network architecture so that you can apply them to your tasks.
- Understand the types of transmission methods and lines along with their typical characteristics so that you can apply them to your tasks.
- Understand the types of internetworking devices and their typical characteristics so that you can apply them to your tasks.
- Understand the basic mechanisms and characteristics of typical control functions in networks so that you can apply them to your tasks.

(1) Network architecture

(a) Network topology

Understand the types and characteristics of typical network configurations along with how terminals and control devices are connected.

Sample terms point to point (point-to-point connection), tree, bus, star, ring

(b) OSI model

Understand the basic functions of each layer of the OSI model, which is a seven-layer network architecture developed by ISO, along with the relationships among the layers.

Sample terms physical layer, data link layer, network layer, transport layer, session layer, presentation layer, application layer

(2) Transmission methods and lines

Understand the types of lines, along with the types and typical characteristics of communication methods and switching methods used for networks.

Sample terms simplex, half duplex, full duplex, two-wire, four-wire, serial, parallel, WDM (Wavelength Division Multiplexing), circuit switching, packet switching, ATM switching, frame relay, cell relay, public line, leased line

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Internetworking devices

Understand the types of intra-LAN, inter-LAN, and LAN-to-WAN connection devices and their typical characteristics. Understand which function of each device corresponds to which layer of the OSI model.

Sample terms repeater, hub, cascade connection, switching hub, router, digital service unit, Layer-2 (L2) switch, Layer-3 (L3) switch, bridge, gateway, proxy server, spanning tree

(4) Transmission control

Understand the basic mechanism and characteristics of transmission control, which is a control function designed for ensuring data transmission between the sender and receiver.

Sample terms data link control, routing control, flow control, basic mode data transmission control procedure, contention, polling/selection, HDLC, multilink procedure, switching method, connection method, connection-less, parity check, CRC, SYN synchronization, flag synchronization, frame synchronization

(5) Media access control

Understand the basic mechanism of MAC (Media Access Control), designed for defining how to transmit and receive data and detect errors.

Sample terms TDMA (Time Division Multiple Access), CSMA/CD, token passing, collision

3. Communications protocols

[Goal]

- Understand which layer function of the OSI model is implemented by TCP/IP – one of the typical protocols – so that you can apply them to your tasks.

(1) Protocols and interfaces

(a) TCP/IP

Compare TCP/IP, a protocol widely used for LANs and the Internet, with the seven layers of the OSI model to understand the basic roles of each layer.

Sample terms packet, header

(b) Data link layer protocols

Understand the basic roles and functions of ARP and other protocols for data link layer levels used in TCP/IP networks.

Sample terms PPP, PPPoE (Point to Point Protocol over Ethernet)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Network layer protocols

Understand the basic role and functions of IP.

Sample terms IP address, subnet address, subnet mask, physical address, routing, unicast, broadcast, multicast, ICMP (Internet Control Message Protocol), CIDR (Classless Inter Domain Routing), IPv6

(d) Transport layer protocols

Understand the basic roles and functions of TCP and UDP.

Sample terms port number

(e) Application layer protocols

Understand the basic roles and functions of HTTP, SMTP, POP, FTP, DNS and other protocols.

Sample terms TELNET, DHCP, IMAP, NTP (Network Time Protocol)

(f) Interfaces for LAN and WAN

Understand the types and typical characteristics of typical interfaces for LAN and WAN, including Ethernet, wireless LAN, ISDN (Integrated Services Digital Network), and ATM.

Sample terms 10BASE-T, 100BASE-TX, 1000BASE-T, frame relay, HDLC, IEEE 802.11a/b/g/n

(g) CORBA

Understand the overview of CORBA, which is a specification that enables programs distributed on a network to link to one another.

Sample terms distributed object technology

4. Network management

[Goal]

- Understand the overview of the points to be managed in network operations management.
- Understand the overview of network management tools and protocols.

(1) Network operations management

(a) Configuration management

Understand the overview of configuration management, which involves maintenance of configuration information and recording of the modifications.

Sample terms network configuration, version

(b) Fault management

Understand the overview of fault management, which involves fault detection, analysis, and correction.

Sample terms information collection, fault isolation, fault cause identification, recovery action, record

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Performance management

Understand the overview of network performance management by, for example, analyzing the relationship between the traffic volume and transfer time.

Sample terms traffic monitoring

(2) Network management tools

Understand the overview of typical tools used for network management.

Sample terms ping, ipconfig, arp, netstat

(3) SNMP

Understand the overview of SNMP – a protocol for collectively managing the devices that compose the network.

Sample terms SNMP agent, SNMP management station, MIB (Management Information Base)

5. Network application

[Goal]

- Understand the mechanisms of e-mail used over the Internet and Web so that you can apply them to your tasks.
- Understand the characteristics of intranets and extranets so that you can apply them to your tasks.
- Understand the characteristics of network OSs so that you can apply them to your tasks.
- Understand the overview of typical communication services.

(1) Internet

(a) E-mail

Understand that the e-mail system consists of mail servers and clients and that mail messages transmitted are relayed from one mail server to another.

Sample terms SMTP, POP3, IMAP4, MIME

(b) Web

Understand that the WWW is a hypertext system provided over the Internet, which is accessed using Web servers and clients (browsers) and that Web pages are written in HTML, XML, or other markup languages, which use hyperlinks to allow users to view different pages.

Sample terms HTTP, CGI, cookie, URL

(c) File transfer

Understand the mechanisms of the FTP server and client.

Sample terms upload, download

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) Search engine

Understand the characteristics of typical search engines used in the Web environment.

Sample terms full text search, directory type, robot type

(2) Intranet

Understand the characteristics of the intranet, which is an in-house network built based on the Internet technology.

Sample terms VPN, permanent virtual connection,

(3) Extranet

Understand the characteristics of the extranet, in which enterprise intranets are interconnected.

Sample terms EC (Electronic Commerce), EDI

(4) Network OS

Understand the characteristics of the network OS, which is software specifically designed to provide network management and communication services.

Sample terms NetWare

(5) Communication services

Understand the types and characteristics of typical communication services.

Sample terms leased line service, circuit switching service, packet switching service, frame relay, cell relay, ATM, IP telephone, ADSL, FTTH, mobile communication, satellite communication service, international communication service, wide-area Ethernet, IP-VPN

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 3: Technology Element
Middle Category 11: Security

1. Information security

[Goal]

- Understand the concept of information security so that you can apply them to your tasks.
- Understand the information security technologies required in developing information systems so that you can apply them to your tasks.

(1) Concept of information security

Understand that by ensuring and maintaining the confidentiality, integrity, and availability of information, information systems and information are protected from various threats, and information systems are improved in reliability.

Sample terms accountability, authenticity, "Guideline for the Security of Information Systems and Networks: Towards a Culture of Security" adopted by OECD

(2) Technologies associated with information security

(a) Cryptography

Understand the threats removed by using cryptography. In addition, understand the types of encryption methods and the characteristics of typical cryptographies.

Sample terms public key cryptography, common key cryptography, public key, private key, DES (Data Encryption Standard), RSA (Rivest, Shamir, Adleman)

(b) Authentication technology

Understand the need for authentication along with what threats authentication technologies preclude and what they prove.

Sample terms digital signature, message authentication, time authentication, challenge-response authentication

(c) User verification

Understand the types and characteristics of technologies used for user verification.

Sample terms login (user ID and password), callback, IC card, PIN code, one time password

(d) Biometrics authentication technology

Understand the types and characteristics of biometric authentication technologies, which are used for user verification.

Sample terms fingerprint authentication, vein authentication, iris authentication, voice authentication, face authentication

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(e) Public key infrastructure

Understand the overview of the PKI (Public Key Infrastructure) along with typical applications of it.

Sample terms public key certificate, CA (Certification Authority), GPKI (Government Public Key Infrastructure), BCA (Bridge Certification Authority), SSL

2. Information security management

[Goal]

- Understand the basic concept of information security management.
- Understand the threats to information assets, the basic concept of vulnerabilities, and the method and procedure for analyzing and evaluating risks.
- Understand the basic concept of the information security policy.
- Understand the purpose of developing security regulations for corporate activities.
- Understand the mechanism of the Information Security Management System (ISMS) and the activities of security organizations.

(1) Information security management

Understand the concept of information security management in order to comprehensively and continuously implement organizational information security measures. Understand which information assets should be protected.

Sample terms physical asset, software asset

(2) Threat

Understand what can become physical, technical, or human threats to information assets.

Sample terms accident, disaster, fault, theft, error, computer crime, information leakage, unauthorized access, unauthorized invasion, wiretapping, spoofing, falsification, DoS (Denial of Service) attack, virus, worm, social engineering

(3) Vulnerability

Understand the basic concept of vulnerabilities caused by imperfect measures against threats, including defects associated with information security for information systems and imperfect and inadequate codes of conduct for businesses, organizations, and individuals.

Sample terms bug, security hole, man-made vulnerability

(4) Risk analysis and assessment

(a) Information asset review

Understand that information assets covered by risk analysis are reviewed to identify risks.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Classification by importance of information assets

Understand that the importance of information assets is reviewed in terms of confidentiality, integrity, and availability for classification in order to create the criteria for protecting information assets and define the required information security level.

(c) Risk evaluation

Understand that the risk severities of the threats to the information assets reviewed are evaluated based on the occurrence frequencies of the threats and the magnitude of the damages caused by them.

Sample terms risk type, loss of property, loss of responsibility, loss of net earnings, human cost, peril, hazard, moral hazard

(d) Measures against risks

Understand that information security measures are defined in consideration of the risk severity of each threat defined through risk assessment and the required information security level.

Sample terms risk control, risk finance, risk avoidance, risk transfer, risk retention, risk optimization, risk diversification, risk centralization

(5) Information security policy

Understand the basic concept of the information security policy in managing information security.

Sample terms basic information security policy, information security measures criteria

(6) Development of security regulations on corporate activities

Understand that security regulations are systematically developed, based on risk analysis and evaluation results, to define the basic information security policy, organizational security, asset classification and management, human security, physical and technical security, and so on.

Sample terms employment agreement, office regulations, security control regulations, documentation control regulations, information management regulations, privacy policy, security education regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedures for approving regulations

(7) Information security management system

Understand the basic mechanism of the ISMS (Information Security Management System), intended to enhance, maintain, and improve the information security level in an organization.

Sample terms ISO/IEC 27001, ISMS conformity assessment system, ISMS certification, ISO/IEC 17799 (JIS Q 27002)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(8) Security organization

Understand the activities of security organizations, which accept reports of damages caused by unauthorized access, make suggestions to avoid a repetition of problems, and carry out educational activities associated with security.

Sample terms IPA security center, JPCERT/CC

3. Security technology evaluation

[Goal]

- Understand the basic concept of security technology evaluation.

(1) Security evaluation criteria

Understand that ISO/IEC 15408 can be used as criteria to evaluate the security level of each information system.

Sample terms evaluation procedure, security functional requirements, security assurance requirements, assurance level

4. Information security measures

[Goal]

- Review measures for information security from the viewpoints of human, technical, and physical security so that you can apply them to your tasks.

(1) Types of information security measures

(a) Human security measures

Understand that there are the following human security measures: educational and training programs for reducing risks, such as human errors, thefts, and fraudulent conducts; measures for minimizing the damages caused by incidents and accidents; and so on.

Sample terms information security policy, company regulations, information security education, password management

(b) Technical security measures

Understand that technical measures are implemented for software, data, networks, and so on, to prevent damage to system development and business operations.

Sample terms measures against cracking, cryptographic processing, firewall, measures against computer viruses, OS updating, network monitoring, access control, intrusion detection

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Physical security measures

Understand that physical security measures ensure the reliability and availability of information systems by protecting them from outside intrusions, theft, water damage, lightning, earthquakes, polluted air, explosions, fire, and so on.

Sample terms RASIS (Reliability, Availability, Serviceability, Integrity, Security), RAS technology, quakeproof, fireproof equipment, monitoring camera, locking management, entrance access control

5. Security implementation technology

[Goal]

- Understand the overview of what security measures are implemented in networks and databases.
- Understand the overview of attacks on applications along with security measures against them.

(1) Network security

Understand the overview of network security measures implemented to prevent systems within an intranet connected to the Internet from being attacked by malicious Internet users.

Sample terms firewall, packet filtering, IDS (Intrusion Detection System), IPS (Intrusion Protection System), authentication server, NAT (Network Address Translation), IP masquerade, VPN (Virtual Private Network), WEP (Wired Equivalent Privacy), WPA (Wi-Fi Protected Access)

(2) Database security

Understand the overview of measures against threats, such as unauthorized access to databases, unauthorized use of databases, and destruction of databases.

Sample terms encryption, user authentication, database access control, logging, account management, password management, utilization control of external media, unauthorized access detection

(3) Application security

Understand the overview of application security measures intended for controlling attacks on e-mail and other services used over intranets and the Internet.

Sample terms security measures for Web systems, secure programming, buffer overflow attack, cross-site scripting attack

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 4: Development Technology
Middle Category 12: System Development Technology

1. System requirements definition

[Goal]

- Understand the overview of system requirements definition.

(1) System requirements definition tasks

Understand the overview of the system requirements definition process, in which the following are performed: definition of system requirements; evaluation of system requirements; and joint reviews of system requirements.

(2) Definition of system requirements

(a) Objectives and scope of computerization

Understand the overview of how the objectives and scope (affected business operations and business units) of computerization are put together.

(b) Definition of functions and performance

Understand the overview of how functional requirements and performance definition of a system are put together.

Sample terms response time, throughput, system function specifications

(c) Requirements from tasks, organizations, and users

Understand the overview of how requirements from tasks, organizations, and users, including business processing procedure for users, input/output information requirements, and operating requirements (system operations image), are clearly defined in accordance with system development items.

Sample terms database requirements, security requirements, migration requirements, testing requirements, operational requirements, maintenance requirements, failure handling, education, training, cost

(d) Other requirements

Understand the overview of how system configuration conditions, design conditions, and qualification requirements (criteria for verifying that the developed system is usable in terms of quality) are defined and how the development environment is reviewed.

Sample terms execution environment requirements, peripheral interface requirements, quality requirements

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Evaluation of system requirements

Understand the basic criteria for evaluating system requirements. Understand the overview of how the system acquirer conducts joint reviews with the supplier after system requirements are documented.

Sample terms review participants, review method

2. Systems architecture design

[Goal]

- Understand the overview of systems architecture design.

(1) Systems architecture design tasks

Understand the overview of the systems architecture design process, in which the architecture at the top level of the system is established, (preliminary) user documentation is prepared, the systems architecture is evaluated, and the joint review of systems architecture design is conducted.

Sample terms hardware configuration, software configuration, manual operation, configuration item

(2) Establishing the architecture at the top level of the system

(a) Purpose of systems architecture design

Understand that in systems architecture design, all system requirements are divided into hardware requirements, software requirements, or manual operation to determine the system configuration required to implement them. Understand the considerations in selecting the systems architecture, including whether or not system requirements specifications can be implemented, whether or not options that take risks into account can be suggested, and whether or not the system can be efficiently operated and maintained.

(b) Functional decomposition of hardware, software, and manual operation functions

Understand the overview of how the functional decomposition of hardware, software, and manual operation is reviewed and determined in terms of operating effectiveness, workload, work cost and others.

Sample terms user work scope

(c) Hardware architecture

Understand the overview of how redundant and fault tolerant design, server function allocation, reliability allocation, and others are reviewed based on the reliability and performance requirements, to determine the hardware architecture.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) Software architecture

Understand the overview of the software architecture decision process: when the software architecture is determined, it is reviewed whether the system supplier develops everything or uses some software packages and what middleware should be selected.

(e) Application architecture

Understand the overview of how centralized or distributed processing is selected according to the business operations and how the processing modes for Web systems and client/server systems are reviewed and determined.

(f) Database architecture

Understand the overview of how the type of database used in the system is determined.

Sample terms relational database, structured database, NDB (Network Database), OODB (Object Oriented Database), hypertext database, XML database

(3) System integration test design

Understand the overview of how the specifications of the system integration test should be prepared to verify that the system meets all functional requirements by reviewing the policies including the scope, plan, and procedure of the system integration test, for the systems architecture design.

Sample terms test requirements

(4) Evaluation of systems architecture

Understand the overview of how the criteria for evaluating the systems architecture, including verification of whether or not the systems architecture satisfies the system requirements and it is feasible, is prepared so that the system acquirer can conduct joint reviews with the supplier.

Sample terms review participant, review method

3. Software requirements definition

[Goal]

- Understand the techniques required in defining software requirements so that you can apply them to your tasks.

(1) Software requirements definition tasks

Understand that the following are conducted in the software requirements definition: establishment of software requirements; evaluation of software requirements; and joint reviews of software requirements.

Sample terms software configuration item

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Establishment of software requirements

Understand that in the software requirements definition, business operations models and logical data models are created to determine the functions, performance, interfaces, and others required for the software, which composes the system, and to define the software fitness requirements. In addition, understand that analysis and representation techniques such as DFDs and E-R diagrams are used to analyze business operations for requirements definition.

Sample terms interface design, security implementation method, business operations modeling, form design, data modeling, maintainability

(3) Evaluation of software requirements

Understand the criteria for evaluating software requirements, including verification that the determined software requirements are in line with the system requirements and systems architecture and that they are feasible. In addition, understand that after software requirements are documented, the system acquirer conducts joint reviews with the supplier.

Sample terms review participant, review method

(4) Techniques used for analyzing business operations and defining requirements

(a) Hearing

Understand that interviews with users are effective in identifying and understanding what is required of the software. Understand the procedure and concept of interviews.

Sample terms hearing planning, hearing minutes

(b) Use case

Understand that a use case defines the interaction between users and the system for the purpose of achieving a target.

Sample terms actor

(c) Prototype

Understand that in the software requirements analysis process, the effectiveness of external specification, missing specifications, feasibility, and so on are assessed and, in some cases, a prototype is created to prevent rework at a later stage. Understand the characteristics of prototyping.

Sample terms prototype evaluation

(d) DFD

Understand that if a business process must be represented with attention focused on the data flow, then DFD is used.

Sample terms activity, data store, data flow, process

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(e) E-R diagram

Understand that if information handled in business operations must be abstracted to represent the relationship between entities, then an E-R diagram is used.

(f) UML

Understand that UML is one of the standardized, object-oriented notations. Understand the types and characteristics of diagrams used in UML along with the basic method to represent system mechanisms using UML.

Sample terms use case diagram, class diagram, operation, attribute, role name, sequence diagram, collaboration diagram, statechart diagram

(g) Other techniques

Understand the characteristics and representation methods of other techniques used for analyzing business operations and defining requirements.

Sample terms context diagram, decision table, mini spec

4. Software architecture design and software detailed design

[Goal]

- Understand the techniques required for software architecture design so that you can apply them to your tasks.
- Learn the techniques required for software detailed design so that you apply them.

(1) Software architecture design tasks

Understand that the following are conducted in the software architecture design; architecture design of software structure and components; architecture design of external and component-to-component interfaces; design of the top level of the database; creation of (preliminary) user documents; requirements definition for software integration; evaluation of software architecture design; and joint reviews of software architecture design.

Sample terms software component, software component partitioning, software component-to-component interface design

(2) Software detailed design tasks

Understand that software detailed design tasks include the following: detailed design of the software components, software interfaces, and database; updating of user documentation; definition of requirements for software units; updating of requirements for software integration; evaluation of software detailed design and requirements; and joint review of software detailed design.

Sample terms software component unit, functional hierarchy diagram, software unit, unit partitioning, component detailed design, software component interface detailed design, software component-to-component interface design, database detailed design

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Software architecture design

Understand that in software architecture design, the software structure and components are designed based on the software requirements definition document from a developer's point of view. In addition, understand that software is divided into software components (programs) to define the functions of each software component and the processing procedure between software components and relationships between them.

Sample terms structuring, decision of software component function specifications, component, input/output design, partitioning into components, reuse

(4) Software detailed design

Understand that in software detailed design, each software component is detailed and documented based on the software architecture specifications at the level of software units (unit, class, module), which are used to perform coding, compiling, and testing.

Sample terms modular partitioning, module specifications, program design

(5) Interface design

Understand that in interface design, the physical design of data handled through input/output devices is performed based on the software requirements definition document in consideration of operability, responsiveness, viewability, hardware and software functions, and processing methods.

Sample terms input/output detailed design, GUI, screen design, form/slip design, interface design standards

(6) Design of tests for software units

Understand that in order to verify that the requirements presented in the detailed software specifications are met, the test specifications for software units should be created, including the definitions of the test scope, test plan, and test method.

Sample terms test requirements, white box test

(7) Software integration test design

Understand that in order to verify that the requirements presented in the detailed software specifications are met, the software integration test specifications should be created, including the definitions of the test scope, test plan, and test method.

Sample terms test requirements, checklist

(8) Software design evaluation

Understand the basic criteria for verifying that the details of the software design agree with the software requirements and evaluating the software design, including the internal consistency between software components and between software units. In addition, understand that the prepared software architecture specifications and detailed specifications are reviewed.

Sample terms review participant, review method

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(9) Software quality

Understand the quality characteristics for software products defined in JIS X 0129 (ISO/IEC 9126). Understand that the quality characteristics are taken into account in defining requirements and designing a system.

Sample terms functionality, reliability, usability, efficiency, maintainability, portability

(10) Software design technique

(a) Process-oriented design

Understand the basic concept and procedure for designing software based on the process-oriented design technique.

(b) Data-oriented design

Understand the basic concept and procedure for designing software based on the data-oriented design technique.

Sample terms E-R diagram, relation, normalization, one fact in one place

(c) Structured design

(i) Functional decomposition and structuring

Understand the following: the procedure for functional decomposition and structuring (arrangement of the functions, definition of the data flow, grouping of the functions, hierarchical structuring, decision of the program functions, and documentation of the function specifications) and the advantages and considerations of functional decomposition based on structured design.

Sample terms hierarchy, stepwise refinement

(ii) Structured design techniques

Understand that the techniques used for structured design include the flowchart, DFD, structured chart, and state transition diagram.

Sample terms sequence, selection, iteration, NS (Nassi-Shneiderman) chart, HIPO (Hierarchy, plus Input, Process, Output), Jackson method, Warnier method

(iii) Structured design of programs

Understand the purpose, basic concept, and procedure of the structured design of programs.

Sample terms quality characteristics, modular partitioning

(d) Object-oriented design

Understand the basic concept, procedures and techniques for object-oriented design.

Sample terms class, instance, attribute, method, encapsulation, subclass, inheritance, partitioning into components, reuse, class diagram, polymorphism, package, association, generalization, specialization, decomposition, aggregation

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(11) Design of components

(a) Concept of component splitting

Understand that the criteria for partitioning components include the processing pattern application, difference in processing timing, difference in processing efficiency, concurrently usable resources, and characteristics of input/output devices. In addition, understand the characteristics of each criterion.

Sample terms file merging, file partitioning, record processing, processing cycle

(b) Program partitioning criteria

Understand the criteria for partitioning programs.

Sample terms understandability, security, productivity in development, operability, throughput, maintainability, reusability

(12) Module design

(a) Partitioning technique

Understand that the partitioning techniques are divided into those that focus attention on the flow of data and those that focus attention on the data structure, and then multiple partitioning techniques are used in combination according to the type of the internal processing. Understand the types and characteristics of typical partitioning techniques.

Sample terms STS (Source Transform Sink) partitioning, TR (Transaction) partitioning, common functional partitioning, subroutine

(b) Partitioning criteria

Understand that the criteria for evaluating module independency include the concept of the module strength and degree of coupling along with the relationship between them and independency. Understand the criteria for evaluating amounts of partitioning along with partitioning into components and reuse of them.

Sample terms scope of control of a module, scope of effect of a module, amounts of partitioning, module repartitioning, dependent module

(c) Preparation of module specifications

Understand the concept and procedure of module specifications preparation and typical techniques used in preparing module specifications.

Sample terms flowchart, decision table, NS (Nassi-Shneiderman) chart, Jackson method, Warnier method

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(13) Partitioning into components and reuse

Understand the following: the necessity of partitioning software into components and reusing them; the types of components and their characteristics; considerations in designing components; and basic usage of software packages.

Sample terms componentware

(14) Design patterns

Understand the advantages and considerations in using design patterns based on the fact that design patterns are mainly used for object-oriented design and that they are classified into three different groups: creational patterns, structural patterns, and behavioral patterns.

(15) Review

Understand the types and purposes of reviews for evaluating the status and deliverables of project activities on a timely and coordinated manner. Understand that the review process is carried out in a procedure where a document is first prepared, then a review is conducted (the review method is determined, the review evaluation criteria are determined, the review participants are selected), and finally the review results are incorporated into the document.

Sample terms design review, inspection, moderator, documentation method, review participant, walk-through, code review, joint review

5. Software coding and testing

[Goal]

- Learn the techniques required for coding and testing software so that you can apply them.

(1) Tasks for software coding and testing

Understand that in the software coding and testing process, software units are created, the test procedure and data are prepared, the software units are tested, the user documentation and integration test requirements are updated, and the software coding and test results are evaluated.

Sample terms coding, programming language

(2) Software coding

Understand that software programming is performed in accordance with the prescribed coding conventions and the specifications of the programming language and based on the detailed software specifications.

Sample terms algorithm, data processing

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Criteria for evaluating software code and test results

Understand the criteria for evaluating software code and test results. In addition, understand that coding and unit testing are followed by reviews. Understand what reviews are conducted.

Sample terms traceability, external consistency, internal consistency, coverage of unit test, coding techniques and appropriateness of conventions, software integration and test feasibility, feasibility of operation and maintenance

(4) Coding conventions

Understand the purpose of coding standards. Understand what specific contents coding conventions should include and what problem may arise if coding conventions are not followed.

Sample terms indentation, nest, naming convention, use prohibition instruction

(5) Code review

Understand the purpose and method for code reviews. In addition, understand that it should be verified whether or not coding conventions are followed, coding is based on the detailed software design specification, and the efficiency and maintainability are appropriate.

Sample terms code inspection, peer code review

(6) Debugging

Understand the debugging methods, considerations, characteristics of desk checking and actual debugging performed by running software, and debugging methods based on development tools.

Sample terms debugging environment, static analysis, dynamic testing, assertion, debugger

(7) Software unit testing

(a) Test purpose

Understand that software units are tested in accordance with the test specifications defined in software detailed design in order to verify that the requirements are satisfied.

Sample terms failure, defect, failure analysis

(b) Test procedure

Understand a series of the following test steps: planning of the tests by determining the test schedule, and framework, along with test tools to be used; preparation of the tests, including creation of the test data and preparation of the test environment; execution of the tests; and evaluation of the test results.

Sample terms test methodology, test scope, person in charge of the tests

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Test execution

Understand the purpose of tests, implementation methods, considerations, and the roles of the tools used in the tests. Understand that after tests are implemented, the test results are recorded and analyzed, and the program is changed and/or improved.

Sample terms driver, stub, test data generator, test design and management technique, bug curve, error removal, bug control chart, coverage, experimental design

(d) Test techniques

Understand how test data is prepared in the black box and white box methods used for tests.

Sample terms test case, statement coverage, condition coverage, decision condition coverage, multiple-condition coverage, boundary value analysis, equivalence partitioning, cause-effect graph method, error embedding method

6. Software integration and software qualification tests

[Goal]

- Learn the basic concept of the software integration and qualification tests, along with the procedure and techniques so that you can apply them.

(1) Software integration tasks

Understand that the following are included in software integration: creation of software integration plan; execution of software integration test; update of user documents; preparation of software qualification test; evaluation of software integration test; and joint review of software integration.

Sample terms test requirements, test procedure, test data

(2) Tasks for software qualification test

Understand that the following are included in software qualification test: execution of software qualification test; update of user documents; evaluation of software qualification test; audit support; and preparation of software products to be delivered.

Sample terms software requirements, audit

(3) Software integration test

Understand that a software integration test is conducted in accordance with the test specifications defined in the software architecture design to check software operations.

Sample terms test plan, test preparation (e.g. test environment and test data), software integration test report, top-down testing, bottom-up testing, driver, stub

(4) Software qualification test

Understand that a software suitability test is conducted in accordance with the software qualification requirements defined in the software requirements definition to verify that the software is implemented according to the software requirements.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Test result evaluation

Understand that the following are conducted after test execution: recording of test results; analysis and evaluation of test results, change and improvement of programs; and, as required, update of software architecture design specifications and user documents.

7. System integration and system qualification tests

[Goal]

- Understand the techniques required for system integration and system qualification tests so that you can apply them to your tasks.

(1) System integration tasks

Understand that the following are included in system integration: creation of system integration plan; execution of system integration test; update of user documents; preparation of system qualification test; evaluation of system integration test; and joint reviews of system integration.

Sample terms hardware configuration item, software configuration item, manual operation

(2) Tasks for system qualification test

Understand that the following are included in system qualification test: execution of system qualification test; evaluation of the system; update of user documents; audit support; preparation of software products to be delivered; and preparation of software products to be inherited to operation and maintenance.

Sample terms system requirements

(3) System integration test

Understand that the system integration test is conducted in accordance with the test specifications defined in systems architecture design to verify that the system implemented by combining software, hardware, manual operation, and other systems, if any, satisfy the requirements.

Sample terms test plan, test preparation (e.g. test environment and test data)

(4) System qualification test

Understand that the system qualification test is conducted in accordance with the qualification conditions defined in system requirements definition to verify that the system is implemented according to the requirements.

Sample terms test plan, test preparation (e.g. test environment and test data)

(5) Test result evaluation

Understand that the following are conducted after test execution: recording of test results; analysis and evaluation of test results, system tuning; and, as required, update of documents.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

8. Software installation

[Goal]

- Understand the overview of software installation.

(1) Software installation tasks

Understand the overview of the software installation, where a software installation plan is created and then software is installed.

(2) Creation of software installation plan

Understand the overview of software installation planning and documentation prior to software installation, including the installation of the software to the actual environment, how the old system should be migrated to the new system, what should be considered besides the effects on the data integrity and business operations, and how the schedule and system should be planned.

Sample terms: software installation requirements, system migration requirements, criteria for determining whether or not software can be installed, creation of installation plan, installation operation

(3) Execution of software installation

Understand that software is installed in accordance with the software installation plan. Understand the considerations in installing software. In addition, understand the overview of how software and databases are initialized as prescribed by the agreement to build an execution environment and how actual software installation operations are documented.

Sample terms: software installation procedure, software installation system, user department, system operating department

(4) User support

Understand the overview of the tasks for supporting the users prior to software installation.

9. Software acceptance

[Goal]

- Understand the overview of software acceptance.

(1) Tasks for software acceptance support

Understand the overview of the software acceptance support: acceptance review of the system acquirer; support of acceptance test; delivery of software products; and execution of education, training, and support for the system acquirer.

Sample terms: delivery

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Acceptance review and acceptance test

Understand the overview of how the system supplier supports software acceptance and tests by the system acquirer, along with the purposes of the acceptance review and test and how they are carried out. In addition, understand the overview of how the system acquirer receives acceptance support from the supplier, and, in consideration of the results of the joint review, software qualification test, and system qualification test, prepares for the acceptance, conducts an acceptance review and test, and documents the results.

Sample terms acceptance procedure, acceptance criteria, acceptance test execution, receiving inspection, receiving inspection criteria

(3) Delivery and acceptance of software products

Understand the overview of how the system supplier and acquirer mutually verify that the software product is completed as per the agreement before delivering and accepting it.

Sample terms preparedness for acceptance

(4) Education and training

Understand the overview of how the system supplier provides the system acquirer with educational/training programs and support for initial and continuous software operation and how the system acquirer builds a framework and plans and implements educational/training programs based on support from the supplier.

(5) User manuals

Understand that the business operations of the system acquirer and the procedures for operating the computer and using the business application programs must be documented as user manuals.

Sample terms operation manual, operation regulations

10. Software maintenance

[Goal]

- Understand the basic concept, styles, and procedure of software maintenance so that you can apply them to your tasks.

(1) Significance of software maintenance

Understand that maintenance requirements must be determined in consideration of the requirements from the organization that receives the maintenance, including the purpose and service level of the software maintenance, and the feasibility and the cost of the maintenance from the maintenance provider's point of view. In addition, understand that in the maintenance process, the current software is corrected and/or changed to resolve problems, improve the software, and respond to requests to expand functions.

Sample terms maintenance procedure, maintenance framework, feasibility of maintenance, maintenance test, regression test

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Software maintenance style

Understand how software is maintained along with the styles of software maintenance and considerations in maintaining software. Understand what is performed in software maintenance and how each maintenance method is different from the others.

Sample terms maintenance agreement, maintenance requirements definition, hardware maintenance, daily check, scheduled maintenance, preventive maintenance, on-site maintenance, remote maintenance, life cycle evaluation

(3) Software maintenance procedure

(a) Preparations for initiating the maintenance process

Understand that preparations are made for initiating maintenance tasks.

Sample terms taking over the deliverables from the development process, change procedure establishment, preparation of maintenance documentation

(b) Identification of problems/requests and analyses of changes

Understand the process of resolving problems in the system to be maintained and addressing requests for improvement.

Sample terms analyses of problems and change requests, reproduction or verification of problems, change method

(c) Implementation of changes

Understand how changes are implemented after the implementation method is determined.

Sample terms determination of the software and associated documents to be changed, function addition, performance improvement, correction of problems

(d) Maintenance review and acceptance

Understand the operational check and completion approval of the changed software.

(e) Implementation of preventive measures against recurrence

Understand that in order to prevent recurrence of problems, cause and effect analyses are performed to extract the root causes, the possibility of similar accidents is reviewed, and then software is improved or manuals are revised.

(f) Migration

Understand the system migration procedure, software integrity retention, and the considerations in system migration, including the effect on business operations.

Sample terms planning and implementation of the migration, notification to the users, parallel operation of the old and new environments, verification of the migration, evaluation of the migration

(g) Disposal of systems and software

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Understand the procedure for disposing of the systems and software that become unnecessary because new systems and software have been installed or the existing system and software have been updated.

Sample terms disposal planning, notification to the users, parallel operation of the old and new software products, disposal notification, data integrity

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major Category 4: Development Technology
Middle Category 13: Software Development Management Techniques

1. Development process and methods

[Goal]

- Understand the basic concepts of typical techniques associated with the software development process so that you can apply them to your tasks.

(1) Software development methods

(a) Software development model

Understand the concept of and the need for software development models used for improving software development in efficiency and quality. Understand the concepts of typical software development models.

Sample terms waterfall model, spiral model, prototyping model, RAD (Rapid Application Development), agile, software product line, iterative mode, incremental model, evolutionary model

(b) Software life cycle process

Understand the purpose and overview of SLCP (Software Life Cycle Process).

Sample terms SLCP-JCF2007，JIS X 0160

(c) Process maturity level

Understand that CMMI, an approach that models the system development organization and process maturity levels, can be used in evaluating and improving the development and maintenance processes. Understand the basic concept of CMMI, which defines five process maturity levels, for example.

Sample terms initial, managed, defined, quantitatively managed, optimizing

(d) Reuse of software

Understand that in order to improve the productivity and quality of software development, software must be divided into components so that they can be reused; that software components must be designed and created on the precondition that they are reused; and that in some cases, software packages can improve the productivity and quality of development.

Sample terms module independence, standardization, customization

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(e) Reverse engineering

Understand that reverse engineering is an approach that analyzes existing software to understand the basic design policy; that software developed and sold based on the result obtained through reverse engineering, without permission from the entity that holds the rights to the original software, may infringe the intellectual property rights to the original product; and that some license agreements prohibit reverse engineering.

Sample terms compatibility, call graph

(2) Structured methods

Understand that for large systems and complicated processing, structured methods are used to secure proper quality and facilitate program maintenance. Understand the procedure and effect of structured methods.

Sample terms hierarchical structuring, stepwise detailing, structured chart, state transition diagram, HIPO (Hierarchy, plus Input, Process, Output), DFD, software structure

(3) Formal method

Understand that the formal method uses a formal specification description language instead of a traditionally used natural language to strictly describe the formal specifications according to specific rules for the purpose of improving the quality of software.

Sample terms VDMTools

(4) Mashup

Understand that mashup is a technique for building new services by combining APIs from multiple suppliers. Understand the productivity of mashup along with its characteristics in quality.

Sample terms Web 2.0

2. Intellectual property application management

[Goal]

- Understand the overview of intellectual property rights along with the characteristics, coverage, and management.

(1) Copyright management

Understand the concept as to the ownership of the copyright of the software to be developed.

Sample terms author of the program, employee work

(2) Patent management

Understand the concepts of how inventions created during the software development process are protected and how a patent held by a third party is licensed if it must be used.

Sample terms patent right, exclusive license, non-exclusive license

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) License management

Understand that if a company must develop software using another software for which the company does not hold the rights, then that software must be licensed to the company, and that the obtained license must be managed so that the use and the number of users can comply with the license agreement.

Sample terms licenser, licensee

3. Development environment management

[Goal]

- Understand the overview of the need for development environment management along with the objects to be managed and the details of the management.

(1) Development environment construction

Understand that for efficient development activities, development tools, including hardware, software, a network, and a simulator for development, must be prepared according to the development requirements.

Sample terms configuration item, software license, security

(2) Objects to be managed

(a) Development environment operation status management

Understand that for efficient development activities, an appropriate development environment, including computer resources and development support tools, must be prepared, and that the operation status of the resources must be properly identified and managed.

Sample terms resources management, operations management

(b) Design data management

Understand the need for design data management: version control of the data associated with the design, shared data management in a project, security management, and so on. In addition, understand that the data with trade secret and personal information must be stringently managed, including who used the data for what purposes and whether or not the data has been taken out or falsified.

Sample terms change history control, access right control, search

(c) Tool management

Understand that if many people are involved in development activities, then problems associated with compatibility between the developed software programs may arise because they may use different versions and tools for the development. In addition, understand that the tools must be managed by unifying the tools and versions because the reliability of the software to be developed may be affected by the selection of tools, which may cause bugs and security holes.

Sample terms configuration item, version control

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) License management

Understand that a violation of license requirements is unauthorized use of the license, which is regarded as illegal for which a penalty is imposed. In addition, understand why it must be verified that the license is correctly understood and properly used by regularly checking the number of programs installed and licenses held against the license requirements.

Sample terms unauthorized copying, version control, inventory taking

4. Configuration management and change control

[Goal]

- Understand the overview of configuration management and change control.

(1) Configuration management

Understand the overview of the configuration management process, where configurations are managed by establishing a configuration identification system for identifying what configuration items compose entire software and defining the method for managing the configuration identification system.

Sample terms SCM (Software Configuration Management), SCI (Software Configuration Item), SLCP (Software Life Cycle Process), configuration management plan

(2) Change control

(a) Configuration status recording

Understand the importance of managing and documenting the status and history information of the reference software items. In addition, understand the overview of recording the number of changes in the project, latest version, and migration status in the appropriate documents.

(b) Assurance of the completeness of items

Understand the necessity for determining and assuring the functional completeness and physical completeness of software items.

Sample terms consistency, accuracy

(c) Release management and shipment

Understand the overview of performing a series of procedures, such as the shipment of the new version of software and its related documents, after the integrity assurance of the configuration items. In addition, understand the overview of maintaining the software code and documents until the end of the software life.

Sample terms version control, retention period

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Management

Major category 5: Project management
Middle category 14: Project management

1. Project integration management

[Goal]

- Understand the overview of the purpose and concept of project management along with the process groups and knowledge areas.
- Understand the overview of project frameworks as well as the need for and the details of self-management.
- Understand the overview of the purposes, concepts, and processes of project integration management.

(1) Purpose and concept of project management

(a) What are projects and what is project management?

Understand that a project is a set of fixed-term activities conducted for achieving a goal. In addition, understand that smooth promotion of a project for achieving a goal requires a management cycle called PDCA: planning (Plan), doing activities as planned (Do), checking the differences between the plan and real accomplishments (Check), and acting against the causes of the differences (Act).

Sample terms PMBOK (Project Management Body of Knowledge)

(b) Five process groups in project management

Understand the overview of the five process groups in project management.

Sample terms initiating process group, planning process group, executing process group, controlling control process group, closing process group

(c) Nine knowledge areas in project management

Understand the overview of the nine knowledge areas in project management.

Sample terms project integration management, project scope management, project time management, project cost management, project quality management, project human resources management, project communications management, project risk management, project procurement management

(2) Project frameworks and self-management

(a) Project frameworks

Understand the types and characteristics of project frameworks

Sample terms functional, matrix, projectized,

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Self-management

Understand the points, reports, notifications, and consultations to be self-managed in a project framework.

Sample terms activity planning, communication, progress management

(3) Purpose and concept of project integration management

Understand that project integration management is intended for managing and adjusting all areas of the project management activities in an integrated manner.

Sample terms project charter, scope

(4) Processes in project integration management

Understand the overview of the processes included in project integration management.

Sample terms project charter preparation, preparation of a preliminary project scope description document, preparation of a project management plan, direction and management of project implementation, controlling of project activities, integrated change control, project termination, change form, CCB (Change Control Board)

2. Project scope management

[Goal]

- Understand the purpose and concept of project scope management.
- Understand the purpose and characteristics of WBS.
- Understand the overview of the processes in project scope management.

(1) Purpose and concept of project scope management

Understand that project scope management aims to ensure that a project properly includes all necessary activities so that it can be successfully accomplished.

Sample terms scope, WBS, WBS dictionary, work package

(2) WBS

Understand that the WBS is a structure that defines and represents the entire scope through step-by-step, hierarchical element decomposition of the deliverables and activities of a project based on the project plan and that it is used for planning and managing the budget, processes, and quality.

(3) Processes in project scope management

Understand the overview of the processes included in project scope management.

Sample terms scope planning, scope definition, WBS creation, scope verification, scope control

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

3. Project time management

[Goal]

- Understand the purpose and concept of project time management so that you can apply them to your tasks.
- Understand the purposes, basic roles, and functions of the processes in project time management so that you can apply them to your tasks.
- Understand the types of schedules along with typical techniques for managing them so that you can apply them to your tasks.

(1) Purpose and concept of project time management

Understand that project time management aims to ensure that a project is completed at a given time period. In addition, understand the importance of progress management performed by individual project members.

Sample terms activity

(2) Processes in project time management

Understand the purposes, basic roles, and functions of the processes included in project time management.

Sample terms activity definition, activity sequencing, activity resources estimating, activity duration estimating, schedule development, schedule control

(3) Typical management techniques

(a) Types of schedules

Understand that there are several types of schedules in accordance with the purpose.

Sample terms master schedule, intermediate schedule, detailed schedule

(b) Techniques for managing schedules

Understand the characteristics of typical techniques for developing and managing schedules along with the basic usage.

Sample terms progress report, EVM (Earned Value Management)

4. Project cost management

[Goal]

- Understand the purpose and concept of project cost management so that you can apply them to your tasks.
- Understand the purposes, basic roles, and functions of the processes in project cost management so that you can apply them to your tasks.
- Understand typical techniques for estimating and managing costs so that you can apply them to your tasks.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(1) Purpose and concept of project cost management

Understand that project cost management aims to ensure that a project is completed within the planned budget. In addition, understand the importance of the cost management, including the self-management of person-hours, performed by individual project members.

Sample terms cost baseline

(2) Processes in project cost management

Understand the purpose, basic roles, and functions of the processes included in project cost management.

Sample terms cost estimation, cost budgeting, cost control

(3) Typical techniques for estimating and managing costs

Understand typical techniques for estimating and managing costs along with the characteristics and basic usage. Also, understand that costs are summarized using a cost estimation technique and given conditions and that costs generated within the scope of your tasks are recorded and summarized.

Sample terms FP (Function Point) method, three-point estimate, analogous estimating, bottom-up estimating, LOC (Lines of Code) method, COCOMO (Constructive Cost Model), EVM (Earned Value Management)

5. Project quality management

[Goal]

- Understand the purpose and concept of project quality management so that you can apply them to your tasks.
- Understand the purpose, basic roles, and functions of project quality management so that you can apply them to your tasks.
- Understand typical quality management techniques so that you can apply them to your tasks.

(1) Purpose and concept of project quality management

Understand that project quality management aims to define a quality policy, objectives, and commitment to quality for the purpose of satisfying the needs addressed by the project and to ensure that the required processes are performed to achieve the defined quality policy, objectives, and commitment to quality. In addition, understand the importance of the quality management performed by individual members.

Sample terms JIS Q 9000 family standards

(2) Processes in project quality management

Understand the purpose, basic roles, and functions of the processes included in project quality management.

Sample terms quality planning, quality assurance, quality management

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Typical quality management techniques

Understand the basic techniques of typical quality management.

Sample terms benchmark, walk-through, review, test, quality index, control chart

6. Project human resources management

[Goal]

- Understand the purpose and concept of project human resources management.
- Understand the overview of the processes in project human resources management.

(1) Purpose and concept of project human resources management

Understand that project human resources management aims to ensure that each project member fulfills their roles and responsibilities so that the entire project team can properly function for the purpose of achieving the project goal.

Sample terms project manager, project member

(2) Processes in project human resources management

Understand the overview of the processes in project human resources management.

Sample terms human resources planning, project team organization, project team development, project team management

7. Project communications management

[Goal]

- Understand the purpose and concept of project communications management so that you can apply them to your tasks.
- Understand the processes in project communications management so that you can apply them to your tasks.

(1) Purpose and concept of project communications management

Understand that project communications management aims to connect information with people by properly creating, distributing, and disposing of project information. In addition, understand the importance of the communications management performed by individual members.

Sample terms stakeholder

(2) Processes in project communications management

Understand the purposes, basic roles, and functions of the processes included in project communications management.

Sample terms communications planning, information distribution, performance reporting

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

8. Project risk management

[Goal]

- Understand the purpose and concept of project risk management.
- Understand the overview of the processes in project risk management.

(1) Purpose and concept of project risk management

Understand that project risk management aims to reduce the probability of events that adversely affect the project and to lessen the effect on the project.

Sample terms risk

(2) Processes in project risk management

Understand the overview of the processes included in project risk management. In addition, understand that the project members contribute to project risk management through regular meetings, status reporting, and others.

Sample terms risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, risk monitoring and control

9. Project procurement management

[Goal]

- Understand the purpose and concept of project procurement management.
- Understand the overview of the processes in project procurement management.

(1) Purpose and concept of project procurement management

Understand that project procurement management aims to properly settle and manage the contracts required for purchasing and obtaining the resources and services required for carrying out activities.

Sample terms buyer, supplier

(2) Processes in project procurement management

Understand the overview of the processes included in project procurement management.

Sample terms plan purchases and acquisitions, plan contracting, request seller responses, select sellers, contract administration, contract closure

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 6: Service management
Middle category 15: Service management

1. Service management

[Goal]

- Understand the purpose and concept of service management.
- Understand the overview of ITIL and the purpose and concept of SLA.
- Understand the overview of the role of the system operations manager, evaluation and verification of operations assessment indicators, and handing over of operations.

(1) Purpose and concept of service management

Understand that IT service management is an integrated process approach intended to provide system operations and maintenance services in an efficient manner by regarding them as IT services that satisfy customer requests.

Sample terms service quality, service management, JIS Q 20000, ISO/IEC 20000

(2) ITIL

Understand the overview of ITIL (Information Technology Infrastructure Library), a framework for IT service management, globally used as the de facto standard.

Sample terms service support, service delivery, ITSMS (IT Service Management System)

(3) Role of system operations manager

Understand the role of system operations managers. Understand that a system operations manager must be properly developed and trained. In addition, understand the overview of the activities that are required on a day-to-day basis for managing the IT services and infrastructure.

Sample terms system operations management

(4) SLA

Understand that an SLA is concluded to clearly state the scope and quality of the IT services for the purpose of providing the services agreed upon between the customer and service provider. In addition, understand the purpose and effect of an SLA and the basic requirements that should be defined by it.

Sample terms SLM (Service Level Management), availability, reliability, performance, data integrity, customer satisfaction

(5) Evaluation and verification of operations assessment indicators

Understand the need for evaluating system operations along with the items to be evaluated.

Sample terms functionality evaluation index, reliability evaluation index, usability evaluation index, performance index, index regarding resources usage, index regarding safety and security

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(6) Handover of operations

Understand the overview of the activities carried out to hand over the operations of a new or an updated information system, including the documentation of the necessary and sufficient information, preparation of a handover record and approval of the hand-over activities.

Sample terms assets for operations, system transfer management, operational test planning

2. Operations design and tools

[Goal]

- Understand the basic activities for system operations design, installation, and migration so that you can apply them to your tasks.
- Understand the types and characteristics of operation support tools so that you can apply them to your tasks.

(1) Schedule design

Understand the basic concept of system operations design and the basic activities to be carried out in designing the operation schedule.

Sample terms non-functional requirements, job network, predecessor job, temporary work, backup, abnormal end, rerun, job recovery

(2) Design of operations during failures

Understand the basic activities to be carried out in designing the operations during failures, including how to recover data and switch to the standby system.

Sample terms cold standby, hot standby, RTO (Recovery Time Objective), RPO (Recovery Point Objective)

(3) System installation

Understand the basic activities to be carried out in installing a system into the operational environment, including handing over the resources for the operations, preparation of the operational environment associated with the operation tasks, implementation planning associated with the system installation, establishment of an operations evaluation criteria, operational test planning, operational tests, and system installation.

Sample terms operational service level agreement, assets to be handed over, version control

(4) System migration

Understand the basic activities to be carried out in commencing system operations, including migration planning, notification of the migration plan to the system users, migration, parallel operations under the old and new environments, and evaluation of the migration.

Sample terms migration planning, migration preparation, migration implementation

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Operations support tools

(a) Monitoring tools

Understand the types and characteristics of tools that monitor the statuses of system operations and information security to detect and report abnormalities. In addition, understand the specific objects monitored by these tools includes the working statuses of application systems and OS; usage rate of the CPU, memory, disks, and network; and the number of accesses to servers and files.

Sample terms automatic operation tool, server monitoring tool, network monitoring tool

(b) Diagnostic tools

Understand the types and characteristics of tools that support decision making by comprehensively judging the information from monitoring tools and the operation status to provide basic figures that allow the users to identify operation problems, security violations, and the achievement of the service level agreed upon in the SLA in terms of service management.

Sample terms automatic diagnosis, server diagnostic tool, network diagnostic tool

3. Service support

[Goal]

- Understand the purpose and concept of service support so that you can apply them to your tasks.
- Understand the roles and concepts of the processes that make up service support.
- Understand the basic activities of risk management and computer operations/management so that you can apply them to your tasks.

(1) Service support

(a) Purpose and concept of service support

Understand that service support is a series of activities associated with the daily operations. In addition, understand the roles and concepts of the processes that make up service support.

(b) Service desk (help desk)

Understand that a service desk performs a series of the following activities: providing a single point of contact to the inquiries from service users; handing over the inquiries to appropriate departments; recording the handling results; manages these records; and so on.

Sample terms service desk, customer support, SPOC (Single Point Of Contact)

(c) Incident management (fault management)

Understand that incident management is a series of processes from incident detection to resolution and that these activities are intended for quickly recovering services to minimize the impact on business operations.

Sample terms incident, service request, service quality, escalation

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) Problem management

Understand that problem management is a series of activities for identifying the root causes of problems to present solutions to prevent a recurrence of such problems.

Sample terms problem, known error, RFC (Request For Change)

(e) Configuration management

Understand that configuration management is a series of activities for defining the information about CIs (Configuration Items) such as hardware, software, and documents that make up IT services to retain accurate configuration information.

Sample terms configuration item, CMDB (Configuration Management Database)

(f) Change management

Understand that change management is a series of activities for reliably assessing, approving, implementing, and reviewing all changes in a controlled manner to avoid risks and make changes efficiently.

Sample terms RFC, urgent change, change log

(g) Release management

Understand that release management is a series of processes for delivering, distributing, and tracking the changes approved in the change management process.

Sample terms release, urgent release, distribution

(2) Risk management

Understand that risk management is a series of activities for continuously repeating the following processes: identification of the risks in system operations; evaluation and prioritization of risks; implementation of measures against risks on an as-needed basis; and management of the results.

Sample terms risk to information assets, security risk assessment, information security management

(3) Computer operations and management

Understand the activities required for operations and management of computers, including operations monitoring, problem identification and resolution, and operational environment improvement.

Sample terms operations management, job management, data management, security management

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

4. Service delivery

[Goal]

- Understand the considerations in system operations so that you can apply them to your tasks.
- Understand the roles and concepts of the processes that make up service delivery so that you can apply them to your tasks.
- Understand the purposes of SLM and SLA in service delivery so that you can apply them to your tasks.
- Understand the purposes of user management, system resource management, and information asset management so that you can apply them to your tasks.

(1) System operations

Understand that the systems must be operated according to documented work instructions and that a log of operations must be kept.

Sample terms job scheduling, data input/output, operations manual

(2) Service delivery

(a) SLM

Understand that SLM (Service Level Management) is a series of activities for maintaining and improving the services based on the PDCA management cycle using an SLA concluded between the service user and service provider and that the SLA and processes are reviewed according to the monitoring results. In addition, understand the role of OLA (Operational Level Agreement).

Sample terms service level, service reporting, periodic review

(b) Capacity management

Understand that capacity management is a series of activities for managing system capacities, including volume and capabilities, for the purpose of ensuring the current and future stable operations of systems.

Sample terms CPU utilization, memory utilization, file usage, network utilization

(c) Availability management

Understand that availability management is a series of activities for maintaining and managing the individual functions that make up IT services to ensure that service users can use services when they want to use them.

Sample terms availability, reliability, maintainability, serviceability, MTTR

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) IT service continuity management

Understand that IT service continuity management includes activities for ensuring that the service continuity agreed upon by the customer is fulfilled under any condition and that the requirements associated with the service continuity must be identified based on the business plan, SLA, and risk assessment.

Sample terms service continuation, service continuation planning, recovery plan

(e) IT service financial management

Understand that IT service financial management is a series of activities for forecasting the costs associated with IT services, calculating the actual costs, and managing billing data.

Sample terms TCO

(3) User management

Understand that user management is a series of activities for setting user accounts and database access rights for the purpose of defining the rights of service users to enable operations under different settings and environments.

Sample terms access management, user authentication, password, administrative privileges

(4) System resource management

Understand that system resource management is a series of activities for ensuring that the facilities, computer systems, data, manuals, created deliverables, system operations staff, and the associated costs are maintained and managed so that they can properly conform to the goals of the organization.

Sample terms hardware resource management, software resource management

(5) Information asset management

Understand that information asset management is a series of activities for supporting the provision of optimal IT services by maintaining and managing the catalogue of the information assets (computers, communications equipment, peripherals, documents, and other information) required for providing services.

Sample terms security management, confidentiality, integrity, availability

5. Service management foundation

[Goal]

- Understand the overview of the concept and techniques of IT service management construction.

(1) Concept of service management foundation

Understand that IT service management is intended for accomplishing the purpose of service management based on the management cycle called PDCA: Plan, Do, Check, and Act.

Sample terms JIS Q 20000

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Techniques for service management foundation

(a) Gap analysis

Understand the overview of gap analysis as one of the present state analysis techniques. In addition, understand that gap analysis is intended to define improvements for existing systems by comparing the customer business goal and JIS Q 20000-1 required specifications with the current IT service environment to identify the problems.

(b) Risk assessment

Understand the overview of the procedure for identifying the risks associated with IT services and assessing the risk levels, whether or not they are acceptable, and the priorities of the measures.

Sample terms ISMS (Information Security Management System)

(c) Requirements establishment

Understand the overview of the procedure for establishing the requirements based on the results of a gap analysis and a risk assessment and in consideration of technology trends, cost conditions, and the IT literacy of the system users.

6. Facility management

[Goal]

- Understand the overview of facility management.

(1) Facility management

(a) Purpose and concept of facility management

Understand the overview of facility management in managing and operating the design and foundation of the facility infrastructure for computer systems and networks.

Sample terms customer service

(b) Facility management

Understand that the purpose of managing data centers and other facilities and computers, networks, and other equipment is to reduce costs and to ensure comfort and security.

Sample terms UPS, private power generator, security wire

(c) Maintenance and protection of facilities

Understand the importance of maintaining and protecting the facilities and equipment in a proper state.

Sample terms inspection, amortization, migration, disposal

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 6: Service management
Middle category 16: System audit

1. System audit

[Goal]

- Understand the purposes and types of audits.
- Understand the purposes, procedures, and target business tasks of system audits along with the concept of system auditability.
- Understand the concepts of system audit planning, implementation, reporting, and evaluation.
- Understand the overview of system audit standards.

(1) Audit tasks

Understand the types and purposes of audits associated with information systems.

Sample terms accounting audit, operations audit, system audit, information security audit, statutory audit, voluntary audit

(2) Purpose and procedure of system audits

(a) Purpose of system audits

Understand that a system audit aims to ensure that an independent, professional system auditor verifies or evaluates whether or not the control for the risks associated with the information systems in an organizational entity is properly maintained and managed based on a risk assessment in order to assure it or give advice for the purpose of contributing to IT governance.

Sample terms list of companies providing auditing services

(b) System audit procedure

Understand that a system audit is based on a given audit plan in the following order: comprehensive inspection and evaluation of the information system; explanation of audit results to the client; recommendation of items to be improved; verification of improved status; and guidance for improvement.

Sample terms system auditor, system audit standards, audit evidence

(3) Targeted business operations of system audits

Understand that system audits target the whole lifecycle, covering system planning, development, operations, and maintenance. In addition, understand that the purpose and targeted business operations of system audits must be clearly defined by documented regulations or agreements.

Sample terms internal audit charter

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(4) System auditability

Understand that for smooth system audit implementation, the information systems must be constructed and maintained with an awareness of auditability.

Sample terms log, trace

(5) System audit planning

Understand that for effective, efficient audit implementation, the system auditor drafts an audit plan that defines the details of the audit procedure, and the timing and scope of the audit.

Sample terms documented system audit plan

(6) System audit implementation (preliminary audit, main audit, evaluation, and conclusion

Understand that the system auditor conducts a sufficient study based on the audit plan to verify or evaluate the system.

Sample terms system audit technique, audit evidence, audit work papers

(7) System audit reporting

Understand that the system auditor reports the audit results to the client and takes necessary follow-up actions to ensure that required measures are implemented.

Sample terms system audit report, assurance opinion, advisory opinion, recommended improvements

(8) System audit evaluation

Understand why the validity of system audits needs to be evaluated.

(9) Other system-related audits

Understand the overview of information security audit, personal information protection audit, and compliance audit.

Sample terms Information Security Audit Standards, Information Security Management Standards, list of companies providing auditing services, JIS Q 15001, Privacy Mark System, Copyright Act, Unfair Competition Prevention Act, Labor Standards Act

(10) Laws and regulations concerning system-related audits

Understand that the procedure and details of system audits are defined by the Information Security Audit Standards established by the Ministry of Economy, Trade and Industry. In addition, understand that system auditors are required to have basic knowledge about the related regulations and standards according to the business operations as well as information security.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

2. Internal control

[Goal]

- Understand the purposes and concepts of internal control and IT governance at corporations and other organizations.

(1) Internal control

Understand that internal control is a mechanism for corporations and other organizations to take the initiative in building and operating a framework that delivers healthy, efficient organizational operations and that the actualization of this framework requires the defining of the business process, segregation of duties, development of enforcement rules, and establishment of a check system. In addition, understand what role IT plays in performing internal control.

Sample terms compliance, COSO (Committee of Sponsoring Organizations of the Treadway Commission) framework

(2) IT governance

Understand that IT governance is an effort by corporations and other organizations to develop an information systems strategy and control the implementation for the purpose of improving competitiveness. Understand the efforts that are made to achieve IT governance, including system audits, information security audits, and software asset management.

Sample terms CIO (Chief Information Officer)

(3) Evaluation and improvement of compliance

Understand that information systems must be constructed and operated in compliance with the applicable laws and regulations concerning relevant business systems. In addition, understand that the compliance with the laws and regulations must be evaluated and improved in a timely and proper manner.

Sample terms Companies Act, Financial Instruments and Exchange Law

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Strategy

Major category 7: System strategy
Middle category 17: System strategy

1. Information systems strategy

[Goal]

- Understand the overview of the purpose and concept of information systems strategies along with the procedure for establishing an information systems strategy.
- Understand the overview of the enterprise architecture technique.
- Understand the overview of program management and its framework, quality control, and information systems strategy management.

(1) Information systems strategy

(a) Purpose and concept of information system strategy

Understand the purpose and concept of the information systems strategy in corporate activities.

Sample terms information systems strategy evaluation, CIO (Chief Information Officer), total computerization planning

(b) Procedure for developing information systems strategy

Understand the overview of the steps for developing an information systems strategy.

[Examples of steps]

(i) Checking the business strategy; (ii) Examining and analyzing the business operations environment; (iii) Examining and analyzing the business operations, information system, and information technology; (iv) Developing the fundamental strategy; (v) Creating the new image of the business operations; (vi) Selecting the targets for the information systems and developing an investment goal; (vii) Developing a proposed information systems strategy; (viii) Approving the information systems strategy

(c) Organization form

Understand that the organizations that plan, develop, operate, and maintain information systems include functionalized organizations, divisional organizations, matrix organizations, and project organizations.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) Total computerization planning

(i) Total optimization policy

Understand that a total optimization plan is a policy that indicates the direction in which the business operations and the systems in the entire organization should go.

Sample terms total optimization goal, IT governance policy, ideal information system (to-be model), fundamental information security policy

(ii) Total optimization planning

Understand that total optimization planning is intended to integrate the rules and information systems established by the individual business units in a business and to improve efficiency and effectiveness based on the total optimization plan.

Sample terms standardization policy and quality policy for system construction and operations, system management standards

(e) Computerization investment planning

Understand that computerization investments are planned in consideration of consistency with the business strategy and that when a computerization investment plan is developed, multiple options must be reviewed from the viewpoints of the impact, effect, duration, and feasibility.

Sample terms computerization investment policy

(f) Computerization planning

Understand that each individual computerization plan is made up according to the total computerization planning and that the systems for improving corporate strategic characteristics include the system that provides integrated management of the entire corporation or business activities and the system that helps integrated operation between corporations.

Sample terms mission critical system, ERP (Enterprise Resource Planning), SCM, CRM, SFA, KMS (Knowledge Management System)

(g) Model

Understand the overview of the models for corporate management systems.

Sample terms business model, business operations model, information systems model

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Enterprise architecture

(a) Purpose and concept of enterprise architecture

Understand that EA (Enterprise Architecture) is a technique for designing and managing an organization for the purpose of modeling business operations and systems across the organization using a unified technique to improve business operations and systems at the same time. Understand that it is necessary to create an architecture model for total optimization and to define objectives clearly. Understand that the architecture model involves the components of the business operations and systems to represent the current and ideal states of the entire systems by summarizing across the organization the business processes, information used in the business operations, components of the information systems, and the architectures for the areas (business, data, application, and technology) of the information technologies to be used.

Sample terms Zackman framework, business operations and system optimization, as-is model, to-be model, best practice

(b) Business architecture

Understand that BA (Business Architecture) represents the systematized goals and business operations of an organization.

Sample terms business description, DMM (Diamond Mandara Matrix), DFD, WFA (Work Flow Architecture), UML

(c) Data architecture

Understand that DA (Data Architecture) represents the systematized structures and the relationships between the data items required by the goals and business operations of an organization.

Sample terms data definition table, information systemization summary chart (UML class diagram), E-R diagram

(d) Application architecture

Understand that AA (Application Architecture) is an architecture that systematically describes the relationships business operations for achieving the goal as an organization and applications for actualizing those business operations.

Sample terms information system relationship diagram, information system function configuration diagram, SOA (Service Oriented Architecture)

(e) Technology architecture

Understand that TA (Technology Architecture) represents the systematized technologies, including the hardware, software, and network, for actualizing business operations.

Sample terms hardware configuration diagram, software configuration diagram, network configuration diagram

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Program management

Understand that a program is a set of organically combined projects. Understand that program management is a practical ability to flexibly adapt the implementation performance of an organization while adapting to changes in external environments for the purpose of achieving the total mission, and is a set of activities for integration to enhance the total value by optimizing the relationships and bindings between the projects for achieving the total mission.

Sample term PMO (Program Management Office)

(4) Framework

Understand that the entire organizational structure must include an organization responsible for information systems, that the position and mission of that organization must be clearly defined, and that the requirements for information systems control must be defined and clarified.

Sample terms COBIT (Control Objectives for Information and related Technology), ITIL (Information Technology Infrastructure Library), System Management Standards, SLCP-JCF2007, KGI (Key Goal Indicator), KPI (Key Performance Indicator)

(5) Quality control

Understand that quality control is an organization, framework, and a set of activities for ensuring the compliance with the standards associated with information systems, monitoring continuous compliance, and assuring the quality of the information systems.

Sample terms quality control framework, management process

(6) Information systems strategy implementation management

Understand that information systems strategy implementation management is a series of activities for monitoring the implementation status of the information systems strategy to ensure that it is implemented.

Sample terms monitoring indicator, variation analysis, response to risk

2. Business process

[Goal]

- Understand the overview of business improvement and problem solving.

(1) Business improvement and problem solving

Understand the concept that the existing organizational structure and business processes are reviewed to make effective use of systems and optimize business operations and systems.

Sample terms BPR (Business Process Reengineering), BPMS (Business Process Management System), BPO (Business Process Outsourcing), workflow system, SFA, JIT (Just In Time)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

3. Solution business

[Goal]

- Understand the basic concept and typical services of solution business.

(1) Solution business

Understand that the progression of information technology and the management environments that are increasing in complexity have developed the solution business, which proposes and provides services that solve the management issues of customers, and that in conducting the solution business, it is important to provide solutions based on the identification of the issues of customers and to build and maintain a relationship of trust with customers.

Sample terms solution, solution provider, business system proposal, business package, problem solving support, systems integration

(2) Types of solution services

Understand that a variety of solution services, intended for specific industries, business operations, and issues are provided. In addition, understand what are typical services, along with their types and characteristics.

Sample terms SaaS (Software as a Service), ASP, outsourcing service, hosting service, housing service, SOA (Service Oriented Architecture), security solution, CRM solution

4. System utilization promotion and evaluation

[Goal]

- Understand the concept of information systems utilization promotion and evaluation.
- Understand how important it is to objectively evaluate and verify the utilization of information systems for the purpose of improving them.
- Understand the concept of information systems disposals.

(1) System utilization promotion and evaluation

(a) Purpose and concept of system utilization promotion and evaluation

Understand that in order to make effective use and take advantage of information systems in business management, activities for promoting the utilization, popularization, and raising the awareness of information systems are continuously conducted, even during the construction of such systems, to evaluate and verify actual use for the purpose of improvements. In addition, understand the purposes and concepts of these activities.

(b) Information literacy

Understand how important it is to establish information literacy to make safe, effective, and efficient use of information toward the business objectives.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Data utilization

Understand how important it is to analyze the data stored in the information systems so that it can be used for future business development strategies.

(d) Popularization and awareness raising

Understand how important it is to conduct popularization and awareness-raising activities, including educational/training programs for utilizing information systems.

Sample terms system usage manual, business operations manual, e-Learning, seminar

(e) Evaluation and verification of information system utilization

Understand how important it is to identify and evaluate the operation status and the actual usage of the information systems, including changes to business operations and job flows and the performance and reliability of the information systems, for the purpose of defining the improvement guideline and goal.

Sample terms log analysis, log monitoring, learning management system

(f) Information system disposal

Understand that if an information system or software is deemed to be at the end of its useful life as a result of evaluating and verifying it from the viewpoints of functionality, performance, serviceability, expandability, and cost; it must then be disposed of and the installation of a new information system must be considered.

Sample terms system life cycle, information security policy, data erasing

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 7: System strategy
Middle category 18: System planning

1. Computerization planning

[Goal]

- Understand the overview of the purposes and basic concepts of the computerization conception and planning along with the procedures.

(1) Computerization initiative

Understand the purposes and basic concepts of computerization initiative. In addition, understand that in the computerization initiative process, the purposes of the information computerization in accordance with the business and information systems strategies as well as the expected result (goal) are defined, the target business operations are defined, the total "target picture" is created, an investment goal is set, and approvals are given.

Sample terms: system optimization technique, shared computerization initiative, system design

(2) Computerization planning

Understand the purpose and basic concept of computerization planning. In addition, understand that in the computerization planning process, the target business operations and system issues are defined, the target business operations and systems are examined and analyzed, the computerization planning is summarized, and approvals are given. Furthermore, understand the overview of the steps for developing an information systems development plan.

Sample terms: total computerization planning, individual computerization planning, system application scope, total development schedule, development project framework, staff education plan, return on development investment, system life cycle, information systems installation risk analysis

2. Requirements definition

[Goal]

- Understand the purposes and basic concepts of requirements analysis and requirements definition along with the procedures so that you can apply them to your tasks.

(1) Requirements analysis

Understand the basic steps consisting of the identification and analysis of the requirements, arrangement of the computerization needs, arrangement of the preconditions and constraint conditions, reviewing of solutions, analysis of the feasibility, and proposal of a new business model and workflow.

Sample terms: user needs study, current state analysis, definition of problems/issues, requirements specification

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Requirements definition

(a) Purpose of requirements definition

Understand that requirements are defined for the purpose of clarifying the framework of the systems and entire business operations and the scope and functions of computerization.

(b) Definition of requirements

Understand that requirements definition is divided into three types: operational requirements definition for defining the requirements to be satisfied in terms of business operations; functional requirements definition for defining the functions necessary to satisfy the operational requirements; and non-functional requirements definition for defining the requirements associated with the performance, reliability, migration, and others. In addition, understand that different stakeholders have different requirements, which are different in importance.

(c) Verification of stakeholder requirements

Understand that the feasibility and validity of the defined requirements along with consistency with the system strategy are verified, and then the requirements are agreed upon and approved by the stakeholders.

Sample terms stakeholder, UML, DOA (Data Oriented Approach)

3. Procurement planning and implementation

[Goal]

- Understand the overview of procurement planning and the purpose and concept of procurement implementation.

(1) Procurement and procurement planning

Understand the overview of the procurement procedure, where procurement is planned by selecting a procurement method from among purchase of ready-made products and/or services, system development at an internal organization, and outsourcing system development to an external organization, based on the requirements definition, and then defining the procurement targets, requirements, and conditions. In addition, understand how important it is to manage system and software assets to maintain the appropriateness of procurement.

Sample terms internal and external manufacturing criteria, software supply chain management

(2) Procurement implementation

(a) Procurement methods

Understand typical procurement methods along with the basic concepts.

Sample terms proposal competition, open bidding

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Request for information

Understand that the purpose of the computerization and the details of business operations are presented to the vendor to prepare an RFI (Request For Information).

(c) Request for proposal

Understand that an RFP (Request For Proposal) that indicates the system to be procured, requested items to be proposed, and procurement conditions must be presented to the vender to request that it should submit proposals and written quotations.

(d) Request for proposal and quotation

Understand that based on the request for proposal, the vendor considers the system configuration and development techniques to prepare proposals and written quotations and submit them to the client.

Sample terms RFQ (Request For Quotation)

(e) Vendor selection

Understand that before selecting vendors, the procedure, including the weight assignments to the proposal evaluation criteria and conformity to the requirements, for selecting vendors is established to compare and evaluate the certainty, reliability, cost breakdown, schedule on a process-by-process basis, final delivery, and others of the development based on the proposals and quotations from each vendor.

(f) Procurement risk analysis

Understand that procurement requires the knowledge about risk management in terms of internal control, compliance, CSR (Corporate Social Responsibility) procurement, and green procurement, and measures based on the analyses and evaluations of risks.

(g) Conclusion of a contract

Understand that negotiations are conducted with each of the selected vendors to verify the delivered system, cost, delivery time, and role sharing between the client and vendor before a contract is closed.

Sample terms software development outsourcing model contract, information system/model transaction contract, (quasi-)mandate contract, underpinning contract, intellectual property right license agreement

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 8: Business strategy
Middle category 19: Business strategy management

1. Business strategy techniques

[Goal]

- Understand the basic concept of business strategies.
- Understand the overview of the corporate strategy and enterprise strategy along with typical business strategy techniques.

(1) Business strategy

Understand the basic concept about business strategies.

Sample terms corporate philosophy, diversification, benchmarking, best practice

(2) Corporate strategy

Understand the concept of corporate strategies along with the overview of typical strategies and techniques.

Sample terms competitive superiority, CS (Customer Satisfaction), group management, core competence, outsourcing, M&A (Mergers and Acquisitions), alliance, PPM (Product Portfolio Management)

(3) Enterprise strategy

(a) Competition strategy

Understand what factors determine the competitive conditions in a given industry. Understand the concepts of the three basic strategies for overcoming competitors espoused by Michael Porter.

Sample terms cost leadership strategy, differentiation strategy, focus strategy

(b) Enterprise strategy techniques

Understand the overview of typical techniques for developing enterprise strategies, intended for evaluating the strengths and weaknesses of the company by analyzing the external and internal environments.

Sample terms SWOT (Strength, Weakness, Opportunity, Threat) analysis, value chain analysis, growth matrix

2. Marketing

[Goal]

- Understand the basic concept of marketing and typical marketing techniques.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(1) Marketing theory

(a) Marketing analysis

Understand that a marketing analysis targets the market size, customer needs, and the management resources, performance, and competitors of the company. In addition, understand the overview of typical techniques used for market research.

Sample terms 3C (Customer, Competitor, and Company) analysis, market research, segmentation, targeting, positioning, sampling, questionnaire, observation method, experimental technique

(b) Marketing mix

Understand the basic concept of marketing mix.

Sample terms merchandising

(c) CS (Customer Satisfaction)

Understand that as the economy matures and consumption activities become more sophisticated, it is more important for businesses to provide their customers with mental and subjective satisfaction.

Sample terms customer loyalty, brand strategy

(2) Marketing techniques

Understand the overview of typical marketing techniques

Sample terms mass marketing, one-to-one marketing, relationship marketing, direct marketing, market testing (test marketing)

3. Business strategy and goal/evaluation

[Goal]

- Understand the overview of the development/evaluation of a business strategy and its goal along with the procedure for it.
- Understand the overview of typical information analysis techniques for developing and evaluating goals.

(1) Development and evaluation of business strategy and its goals

Understand the overview of the purpose and concept of the development of business strategies and their goals and evaluations along with the steps for them.

[Examples of steps]

(i) Analyzing the business environment and planning a business strategy based on the corporate philosophy, corporate vision to set specific strategic targets; (ii) Defining on which CFS (Critical Success Factors) importance should be placed to achieve the goals; and (iii) Setting the indicators for measuring the goal achievement levels and evaluating them

Sample terms KGI (Key Goal Indicator), KPI (Key Performance Indicator), monitoring

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Techniques for setting and evaluating targets

Understand the overview of typical information analysis techniques used for setting and evaluating business strategy targets.

Sample terms needs/wants analysis, competition analysis, value engineering, six sigma, TQM (Total Quality Management)

4. Business management system

[Goal]

- Understand the overview of typical business management systems.

(1) Business management system

Understand that the business management systems include corporate systems, division-specific systems, and so on. In addition, understand that the typical business management systems for accomplishing business strategies include a system that helps management with decisions making and a system that provides integrated management of business activities.

Sample terms ERP, SFA, KM (Knowledge Management), CRM, SCM

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 8: Business strategy
Middle category 20: Technological strategy management

1. Planning of technology development strategy

[Goal]

- Understand the purpose and basic concept of technology development strategies.

(1) Technology development strategy

(a) Purpose and concept of technology development strategies

Understand that for sustainable development of a business, it is important to establish a technology development strategy that promotes innovation in parallel with investments in technology development to combine technologies with market needs so that the business can achieve success.

Sample terms MOT (Management of Technology)

(b) Planning of technology development strategy

Understand the basic concept of technology development strategy planning, including analyses of the product trend and technology trend, determination of the core technologies, and flexible use of external resources.

Sample terms core technology, technology research, technology acquisition, technology licensing, technological tie-up, cooperation among government, industry-academia-government collaboration, standardization strategy

2. Technology development plan

[Goal]

- Understand the purpose and basic concept of technology development plans.

(1) Technology development plan

Understand the purpose and basic concept of technology development planned on the basis of business strategy and technology development strategy.

Sample terms technology development investment planning, technology development site planning, human resources planning, optimal distribution of management resources, return on investment, concurrent engineering, pilot production, intellectual property right management, market needs

(2) Technology development road map

Understand the purpose and basic concept of road maps, intended for indicating the scientifically supported, agreed-upon future visions on the time series as concrete scenarios for technology development

Sample terms technology road map, product application road map, patent acquisition road map, market needs

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 8: Business strategy
Middle category 21: Business industry

1. Business system

[Goal]

- Understand the types and characteristics of typical information systems used in business areas.

(1) Internal operations support system

Understand the types and characteristics of typical information systems used for internal operations.

Sample terms: bookkeeping/accounting/financial system, XBRL, human resource/payroll system, SFA (Sales Force Automation), groupware, workflow system

(2) Mission-critical task support systems and business packages

Understand the types and characteristics of typical software packages for information systems and business systems intended for supporting business operations.

Sample terms: distribution information system, logistics information system, over-the-counter sales management, sales management, ordering management, inventory control, customer management, financial information system, medical information system, POS system, production management system, ERP package, operations-specific package, industry-specific package

(3) Administration system

Understand the types and characteristics of typical information systems used for administrative activities and public information systems.

Sample terms: e-Japan initiative, e-Gov, electronic government, LGWAN (Local Government Wide Area Network), Basic Resident Register Network, EDINET (Electronic Disclosure for Investors' Network), public information system, GPS (Global Positioning System) application system

2. Engineering system

[Goal]

- Understand the purpose and basic concept of engineering system development and design.
- Understand the purposes and basic mechanisms of automatic production control, production systems, production management, and computer-aided systems.

(1) Purpose and concept of engineering systems

Understand the purpose and basic concept of using information technology in development and design.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Automatic production control

Understand the purpose and basic mechanism of automatic control of production processes.

Sample terms production system, production line organization, JIT (Just In Time), NC (Numerical Control), automatic monitoring equipment, automated guided vehicle, automatic warehouse

(3) Production system

Understand that as a system intended for automating production processes, an FA (Factory Automation) system efficiently automates processes ranging from equipment control to factory management by incorporating a production management system and the tools that support production planning for the purpose of streamlining such processes as design, assembly, inspection, shipment, and inventory control.

Sample terms CAP (Computer Aided Planning), CAPP (Computer Aided Process Planning), MRP, FMS (Flexible Manufacturing System), FMC (Flexible Manufacturing Cell), productivity indicator

(4) Computer-aided system

Understand the overview of computer-aided systems for computer-based analyses, design, and development; support systems for supporting project planning and management for the purpose of improving the productivity; and systems for providing integrated management of production, distribution, and the supply and distribution of products.

Sample terms CAD, CAE, CAM, PDM (Product Data Management), CIM

3. e-business

[Goal]

- Understand the mechanism and characteristics of e-business, including EC and EDI, performed over the Internet.
- Understand typical standards for data exchange.

(1) EC (Electronic Commerce)

(a) Electronic ordering system

Understand the mechanisms and characteristics of electronic ordering and procurement systems.

Sample terms on-line mall, on-line shopping, electronic bidding

(b) Electronic payment system

Understand the mechanism and characteristics of electronic payment systems. In addition, understand the electronic money types and the relationships to financial trading.

Sample terms financial trading, Internet banking, EFT (Electronic Fund Transfer), smart card, IC card/RFID application system, SSL

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) How to promote e-business

Understand the concept of promoting e-business

Sample terms internet business, BtoB (Business to Business), BtoC (Business to Consumer), CtoC (Consumer to Consumer), GtoB (Government to Business), GtoC (Government to Citizen), e-marketplace

(2) EDI

(a) Mechanism and characteristics of EDI

Understand the system configuration for EDI and the ordering and settlement mechanisms of EDI along with their characteristics.

Sample terms Web-EDI

(b) Standards used in data exchange

Understand typical standards associated with data exchange, which are intended to efficiently support a variety of transaction forms and several slip formats in interchanging electronic transaction data.

Sample terms JIS X 7011-1, JIS X 7012-1, STEP (Standard for the Exchange of Product Model Data), Japanese Bankers Association protocol, XML-EDI, XBRL, information communication protocol, information representation convention, task operation convention, basic transaction convention, JCA (Japan Chain Stores Association) protocols

4. Consumer appliances

[Goal]

- Understand the overview of embedded systems.
- Understand the characteristics, trends, and typical examples of consumer appliances.

(1) Embedded system

Understand that computers are embedded into consumer appliances and industrial devices. In addition, understand the mechanism for controlling these appliances and devices along with the overview of embedded systems.

Sample terms microcomputer, embedded OS, real-time OS, real-time control, event, sensor, firmware

(2) Consumer appliances

(a) Characteristics and trends of consumer appliances

Understand that computers are embedded into a wide range of products, which provides exacting control and functions. In addition, understand the trends in recent years, including downsizing, weight reduction, networking, personalization of information equipment, and enhanced interactivity.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Examples of consumer appliances

Understand that examples of consumer appliances are household electrical appliances, such as rice cookers, washing machines, and air conditioners; audio and visual equipment, such as digital TV sets, and DVD players; personal information appliances, such as cell phones and PDAs (Personal Digital Assistants); and industrial terminal equipment, such as educational/entertainment devices, POS terminals, handy terminals, and banking terminals.

Sample terms computer peripheral/OA equipment, consumer communications terminal, intelligent home appliance, appliance, home network, ubiquitous computing, wearable computer, sensor network

5. Industrial devices

[Goal]

- Understand the characteristics, trends, and typical examples of industrial electronic devices.

(1) Industrial devices

(a) Characteristics and trends of industrial devices

Understand that computers are embedded into a wide range of products, which provides exacting analyses, measurements, and control based on the embedded systems. In addition, understand the trends in recent years, including labor saving, automation, networking, and enhanced interactivity.

(b) Examples of industrial devices

Understand that examples of industrial devices are communications devices such as routers, transport equipment such as vessels, analytical/measurement instruments for detecting drugs, and equipment items such as air conditioners.

Sample terms industrial robots, automated warehouse, vending machines, ATM (Automated Teller Machine), medical devices, patient monitoring equipment

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 9: Corporate and legal affairs
Middle category 22: Corporate activities

1. Management and organization theory

[Goal]

- Understand the overview of corporate activities, business management, and management organizations.
- Understand the changes in and issues to the business environment.
- Understand the need for and effectiveness of computer literacy at businesses.

(1) Corporate activities

(a) Corporate activities and management resources

Understand that a corporation is an organic organization with multifaceted attributes, such as economic functionality, commercial activities, separation between ownership and management, and independency in marketplaces. In addition, understand the importance of management of people, materials, money, and information.

Sample terms corporate philosophy, CSR (Corporate Social Responsibility)

(b) Corporation forms

Understand the forms of corporations and their typical characteristics. Understand the characteristics of general incorporation, limited liability, and the spinning off.

Sample terms membership company ((limited) partnership), stock company

(c) Characteristics of corporations

Understand the characteristics of corporations, including separation between ownership and management, going concern (continuous entity), and diversified corporate objectives.

Sample terms corporate governance, IR (Investor Relations), BCP (Business Continuity Plan)

(2) Business management

(a) What is business management?

Understand the overview of business management, which is intended for smoothly conducting corporate activities for the purpose of attaining corporate objectives and creating and operating a framework for optimal allocation and effective use of corporate resources.

Sample terms business objectives, financial affairs management, property management, human resource management, information management, PDCA, TQM (Total Quality Management)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Human resources management

Understand that human resources management plays an important part in business management. In addition, understand the overview of human resources management, including OJT, objective management, human resources development, and discretionary labor system.

Sample terms performance-based system, competency, work-life balance, case study, e-Learning

(c) Behavioral science

Understand how people should behave in a corporate organization, including leadership, communication, and negotiation. In addition, understand the importance of motivation management, intended for communicating technical writing, presentations, and the like, and conflict management.

Sample terms logical thinking, brainstorming, hygiene theory, XY theory

(d) Risk management

Understand how important it is to make up a plan for selecting critical business operations and continuing them by estimating risks and analyzing the effects of them as efforts to maintain and increase the corporate value and to develop a plan that acts as the guidelines for maintaining and improving feasible frameworks.

Sample terms BCP (Business Continuity Plan), ISO/TC 223

(3) Management organization

Understand the types and characteristics of typical organizational structures, the functions of business managers, the roles of the CEO (Chief Executive Officer), CIO (Chief Information Officer), and other positions.

Sample terms hierarchical organization (pyramid organization), functional organization, line and staff organization, divisional system organization, matrix organization, company system organization, project organization, CFO (Chief Financial Officer), COO (Chief Operating Officer)

(4) Changes in the business environment

Understand the recent changes in the business environment and the relationships between businesses, including globalization, business diversification, working styles in consideration of work-life balance, and CSR (Corporate Social Responsibility).

Sample terms SRI (Socially Responsible Investment), satellite office, telecommuting, SOHO (Small Office Home Office)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Computer literacy

Understand that it is essential for businesses to use computers to conduct corporate activities. In addition, understand why enhancing computer literacy is required, which means being able to make effective use of computers.

2. OR and IE

[Goal]

- Understand basic techniques for typical OR and IE so that you can apply them to your tasks.
- Understand the basic techniques for collecting, organizing, analyzing, and visually representing data so that you can apply them to your tasks.

(1) Linear programming

Understand the basic techniques for LP (linear programming), formalization of problems, and the cases for which linear programming is effective.

Sample terms simplex method, allocation problem, transportation problem

(2) Inventory problem

Understand the basic concept of inventory control and the basic mechanisms of fixed quantity ordering system and periodic ordering systems.

Sample terms safety stock, EOQ (Economic Ordering Quantity), order point

(3) Scheduling

Understand the basic techniques of PERT and CPM (Critical Path Method).

Sample terms scheduling, arrow diagram, critical path

(4) Game theory

Understand the basic concept of game theory.

Sample terms zero-sum two-person game, maximin principle, decision tree

(5) IE (Industrial Engineering) analysis techniques

Understand the overview of typical job measurement methods, including the working hour analysis, PTS (Predetermined Time Standard) method, and work sampling method.

Sample terms therblig, work analysis, operation analysis

(6) Inspection techniques

Understand the overview of typical inspection techniques including the sampling inspection, OC (Operating Characteristic) curve, sampling, and simulation.

Sample terms fraction defective, failure rate curve (bathtub curve)

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(7) Quality control techniques

Understand the overview of the techniques of the seven tools mainly used for quantitative analyses and the new seven tools mainly used for qualitative analyses along with how to use them.

Sample terms quality characteristics, quality function deployment, fraction defective estimation, time series analysis

(8) Demand forecasting

Understand the overview of typical demand forecasting techniques, including regression analysis and time series analysis.

Sample terms least squares method, correlation coefficient, moving-average method

(9) Job analysis and operational planning

Understand the basic techniques for analyzing and planning business operations and for achieving efficient decision-making (decision theory), including data collection techniques, various diagrams and graphs, and techniques for organizing and analyzing data.

Sample terms Pareto analysis, focus group, data mining, brainstorming, radar chart, cluster analysis method, Delphi method, Monte Carlo method, decision tree

3. Accounting and financial affairs

[Goal]

- Understand the relationship between sales and profit, the procedure for corporate accounting, and the basic way to read the financial statements so that you can apply them to your tasks.
- Understand "financial accounting" and "management accounting" along with the purpose and concept of "cash flow accounting" so that you can apply them to your tasks.
- Understand the purposes and concepts of asset management, along with cash planning and cash management and so that you can apply them to your tasks.

(1) Corporate activities and accounting

(a) Sales-profit relationship

Understand the relationships between amounts of sales, profits, and costs along with such basic terms as fixed, variable, and initial costs as well as the concepts of them. In addition, understand associated calculation methods including that for the break-even point.

Sample terms opportunity loss, break-even point

(b) Procedure for corporate accounting

Understand that in accordance with corporate activities, the flow of transaction information is recorded (journal entry). In addition, understand that the accounts are settled and the actual performance is evaluated every accounting term.

Sample terms journal book, general ledger

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Mechanism of closing account

Understand the purpose and mechanism of closing accounts along with the types and characteristics of the statements as well as how to read them. In addition, understand the purpose of consolidation accounting, which regards a group of companies including subsidiaries as a single organization.

Sample terms trial balance sheet, work sheet, financial statements, balance sheet, income statement

(d) Financial statements

Understand the purposes of the balance sheet, income statement, and cash flow statement; recorded items; basic terms such as asset, liability, and capital along with their concepts; and basics of how to read the financial statements. In addition, understand how to calculate gross profit, operating profit, and ordinary profit.

Sample terms current assets, fixed assets, deferred assets, current liability, fixed liability, net assets, capital stock, cost, income, "selling, general and administration expense", no operating profit and loss, extraordinary items

(2) Financial accounting and management accounting

Understand that corporate accounting involves two forms: financial accounting, which is a legally prescribed mechanism for disclosing information, and management accounting, which is a mechanism for managing information directly connected with reviews of corporate activities and management planning.

Sample terms accounting standards, financial indicator, profit indicator, ROE (Return On Equity), ROA (Return On Assets), safety index, equity to total asset, current ratio

(3) Cash flow accounting

Understand the purpose and concept of cash flow accounting.

Sample terms cash flow management

(4) Cash planning and cash management

Understand the purpose and concept of cash planning and cash management, which are arranged for raising the funds required for operational activities, continuing effective investments, and maintaining a proper cash flow.

Sample terms cash management

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(5) Asset management

Understand the following: the purpose of asset management; how to evaluate inventories; the concepts of the depreciation and amortization cost. In addition, understand the characteristics of leasing and rental.

Sample terms inventory valuation, first-in first-out method, periodic average method, moving average method

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

Major category 9: Corporate and legal affairs
Middle category 23: Legal affairs

1. Intellectual property rights

[Goal]

- Understand the basic concept of intellectual property rights so that you can apply them to your tasks.
- Understand the basic concepts of copyright protection and rights infringement so that you can apply them to your tasks.
- Understand the basic concepts of rights protection and infringement defined by the four laws which play a central part of the Industrial Property Law so that you can apply them to your tasks.
- Understand the basic concept of the Unfair Competition Prevention Act so that you can apply it to your tasks.

(1) Intellectual property rights

Understand that under the current situation where software and other intellectual property rights are increasing in importance along with growing development and distribution activities, laws are being developed and improved for protecting the interests of developers so that they can make fair profits.

Sample terms Intellectual Property Strategy Headquarters, Intellectual Property Basic Act, industrial property right, patent right, utility model right, design right, trademark right, copyright, circuit layout right, trade secrets

(2) Copyright Act

Understand that a copyright is a set of multiple rights. Understand that in Japan, the principle that copyright protection is granted automatically has been adopted, which means that at the point when a work is created, the copyright for it is granted and retained for a certain period. Understand what types of works are protected by the Copyright Act (understand that programs and databases are also protected). Understand what are considered as infringements of rights. Understand that a work can be used without permission of the copyright owner if certain requirements are satisfied.

Sample terms moral right (right of publication, right of name announcement, and right of avoidance of modification), copyright and property rights (right of reproduction, right of public transmission, right of distribution, right of transfer of ownership, right of public rental), employee work, derivative work, transmittable, quote, private use, library, educational institution, examination question

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(3) Industrial Property Law

Understand that the Industrial Property Law was instituted for the purpose of contributing to industrial development. Understand what are protected by the Patent Act, Utility Model Act, Design Act, and Trademark Act. In addition, understand what are considered as infringements of rights.

Sample terms invention, device (as used with regard to a utility model), design, trademark, software patent, patent for a business method

(4) Other associated laws, etc.

Understand the basic concept of the Unfair Competition Prevention Act concerning unauthorized uses of business names and trademarks, illicit obtainment and unauthorized uses of trade secrets, protection of interests, and actions against infringements of interests. In addition, understand that the software copyrights are protected by means of, for example, the Copyright Act, Patent Act, and license agreements as appropriate.

Sample terms trade secrets, illicit obtainment of a domain name, cancel of copy guard, volume license agreement, site license agreement, shrink-wrap license, OSS (Open Source Software) license, CAL (Client Access License), free software, shareware, GPL (General Public License), LGPL (Lesser General Public License), copyleft

2. Laws on security

[Goal]

- Understand the overview of the "Act on the Prohibition of Unauthorized Computer Access".
- Understand the overview of the laws concerning electronic signatures, certification services, and so on.
- Understand the overview of the "Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders".

(1) Act on the Prohibition of Unauthorized Computer Access

Understand the overview of the "Act on the Prohibition of Unauthorized Computer Access", which evenly regards network invasions, provision of code for access control, and others as crimes while the criminal law prohibits data falsification and erasure as acts for which penalties are imposed.

Sample terms access control function, unauthorized access, act that facilitates unauthorized accesses

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(2) Laws concerning electronic signatures and certification services

Understand that the requirements for electronic signatures and certification services have been defined for smooth socioeconomic activities through networks, including electronic commerce based on the Internet.

Sample terms accredited certification business operator, electronic certificate

(3) Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders

Understand that as the use of websites and electronic commerce become widespread and expand, individual rights are violated through mental abuse and the disclosure of someone's personal information without consent posted to a bulletin board or the like on the Web. In addition, understand the overview of the "Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders", which defines who should be liable for such individual rights violations and how.

3. Laws on labor and transaction

[Goal]

- Understand the overview of typical laws on labor and transaction.
- Understand the overview of typical contracts concerning transactions between businesses.

(1) Laws on labor

(a) Labor Standards Act

Understand the overview of the Labor Standards Act, which defines the minimum standards associated with labor conditions such as wages, working hours, on-the-job accidents and injuries, and dismissal/resignation/age retirement systems.

Sample terms Article 36 agreement, discretionary labor system, flexible working hours system, maternity protection

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved Working Conditions for Dispatched Workers

Understand the overview of the "Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved Working Conditions for Dispatched Workers", including what agreements are concluded between the worker, company to be supplied with labor, and employment agency and how they are related to one another in a case where a worker is dispatched. In addition, understand the difference between the dispatch contract and service contract.

Sample terms temporary worker dispatch contract, employment agreement, authority to provide instructions, disguised contract work, prohibition of secondary dispatch of temporary worker

(c) Other laws

Understand the overview of the other laws on labor.

Sample terms Industrial Safety and Health Law; Act on Securing, Etc. of Equal Opportunity and Treatment between Men and Women in Employment; Act on the Welfare of Workers Who Take Care of Children or Other Family Members Including Child Care and Family Care Leave; Act on Improvement, etc. of Employment Management for Part-Time Workers

(2) Laws on transaction

(a) Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors

Understand the overview of the "Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors", including the purpose and coverage.

Sample terms manufacturing contract, service contract, information-based product, main subcontracting entrepreneur, subcontractor, capital

(b) Civil law

Understand the overview of the trading regulations defined by the civil law, including the basics of contracts and the settlement, force and effect, and fulfillment/non-fulfillment of sales contracts, and the overview of the mechanisms of the systems important in conducting business transactions.

Sample terms (quasi-)mandate contract, service contract, authority to provide instructions, responsibility for completing deliverables

(c) Commercial law

Understand the overview of the commercial law including what interests it is intended to protect.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(d) Others

Understand the overview of what laws must be taken into account in cases where business transactions are conducted over the Internet, for example.

Sample terms "Act on Special Provisions to the Civil Code Concerning Electronic Consumer Contracts and Electronic Acceptance Notice", "Act on Specified Commercial Transactions"

(3) Contracts associated with transactions between businesses

(a) Outsourcing contract

Understand that an outsourcing contract is concluded when a business outsources part of its business operations to an external organization and that it must be concluded in consideration of the pertinent laws.

(b) Non-disclosure agreement

Understand that in a case where a business discloses its confidential information to an external organization to which it outsources part of its business operations, an NDA (non-disclosure agreement) is concluded.

(c) Software license agreement

Understand that if the owner of software intellectual property licenses the appropriate software to a third party, a software license agreement is concluded to define the requirements for the software license.

(d) Software development agreement

Understand that a software development agreement is concluded to define the requirements for performing software development on a consignment basis.

Sample terms software development consignment model contract, information system/model transaction contact

4. Other laws, guidelines, and engineer ethics

[Goal]

- Understand the overview of the "Basic Act on the Formation of an Advanced Information and Telecommunications Network Society".
- Understand the overview of compliance, engineer ethics, and the laws and standards to be followed.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(1) Basic Act on the Formation of an Advanced Information and Telecommunications Network Society

Understand that the "Basic Act on the Formation of an Advanced Information and Telecommunications Network Society" has been instituted as the basic law with the aim of using IT to appropriately accommodate abrupt, substantial changes to the social socioeconomic structure and to swiftly and specifically promote measures for forming a network society.

Sample terms IT Strategic Headquarters (the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society), formation of an advanced information and telecommunications network society, promotion of electronic commerce, computerization of the administration, use of the information and communication technology in the public sector

(2) Compliance

Understand that businesses assume an obligation and responsibility to comply with the laws and regulations. Understand the legal sanctions and risks against compliance violations.

Sample terms corporate philosophy, corporate ethics, human rights, corporate governance, CSR (Corporate Social Responsibility), internal control, export-related laws and regulations, System Management Standards, Software Management Guidelines

(3) Information ethics and engineer ethics

Understand the importance of the laws and regulations for protecting users from inappropriate use of information, information ethics concerning courtesy, and engineer ethics that advanced expert engineers are required to assume. In addition, understand why engineers actually need to act ethically.

Sample terms code of ethics for engineers, social responsibility of engineers, moral (awareness about law abiding), professionalism

(4) Other laws and standards

(a) Act on the Protection of Personal Information

Understand the overview of the Act on the Protection of Personal Information, including what personal information is protected and what businesses are covered by this law and how a business is affected if it violates the law.

Sample terms a business operator handling personal information, Guidelines on Personal Information Protection, privacy mark

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(b) Network-related laws and regulations

Understand the overview of typical laws and regulations that define the requirements for communication common carriers that remotely exchange data and construct information networks.

Sample terms Telecommunications Business Law, Radio Law, ISP Liability Law, Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders, Law on Communications Interception During Criminal Investigations

(c) Standards concerning information security

Understand the overview of the standards and guidelines concerning information security.

Sample terms Computer Crime Prevention Law, Standards for Measures against Computer Viruses, Standards for Measures against Unauthorized Access to Computers, Standards for Information System Safety Measures

(d) Financial Instruments and Exchange Act

Understand that the Financial Instruments and Exchange Act aims to develop the nation's economy healthily and protect investors through systems for disclosing the details of businesses and ensuring trading fairness.

Sample terms annual securities report, internal control report

(e) Companies Act

Understand that the Companies Act systematically defines the requirements for the systems for corporate design and organizational restructuring including mergers.

Sample terms stockholders meeting, director, executive officer, auditor, company with committees, business report, internal control

(f) Tax laws

Understand why accounting operations must be fairly conducted in compliance with the tax laws.

Sample terms Corporation Tax Law, Consumption Tax Law

(g) e-Document Law

Understand that documents that must be retained as required by law and regulations can be stored in electronic document files.

Sample terms electromagnetic records

(h) Law Concerning Preservation of National Tax Records in Electronic Form

Understand that the "Law Concerning Preservation of National Tax Records in Electronic Form" defines the requirements for the storage of national tax records using magnetic media.

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(i) Product Liability Act

Understand the overview of the PL (Product Liability) Law intended for addressing losses caused by the use of hardware containing a defective program.

(j) Criminal law

Understand the types of illegal acts concerning the use of computers for which criminal penalties are imposed.

Sample terms computer fraud; obstruction of business through destruction of a computer, etc.; unauthorized creation and use of electromagnetic records; unauthorized creation of electromagnetic records for cards for payment

(k) Act on Access to Information Held by Administrative Organs

Understand that anyone can request that national administrative bodies and independent administrative agencies disclose administrative documents and corporate documents.

5. Standardization

[Goal]

- Understand the overview of typical standards and specifications, standardization organizations, and the framework of international certification.

(1) Standards/specifications and standardization organizations

(a) Japanese Industrial Standards

Understand that the JIS (Japanese Industrial Standards) are established by the competent minister based on the Industrial Standardization Act and reports from JISC (Japanese Industrial Standards Committee).

Sample terms JIS X segment (information processing), JIS Q segment (management system), JIS Q 9000, JIS Q 15001, JIS Q 20000, JIS Q 27001, JSA (Japanese Standards Association)

(b) International standards

Understand that the IS (International Standards) are established by the ISO (International Organization for Standardization) and that the ISO consists of the representative standardization organizations in the respective countries and aims to develop international standards for industrial products in areas other than electric and electronics segments.

Sample terms international certification, ISO/IEC 9000, ISO/IEC 14000, ISO/IEC 27001

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

(c) Other standards

Understand the overview of the other related standards/specifications and standardization organizations.

Sample terms ITU (International Telecommunication Union), IEC (International Electrotechnical Commission), IETF (Internet Engineering Task Force), ANSI (American National Standards Institute), IEEE (Institute of Electrical and Electronics Engineers)

(2) De facto standards

Understand that de fact standards are specifications, standards, and products widely used as virtual standards.

Sample terms OMG, W3C (World Wide Web Consortium), de jure standard

(3) Standards for development and transactions

(a) Standardization of development and transaction processes

Understand the overview of the standards for the tasks and role sharing at each process of software development and transactions.

Sample terms SLCP-JCF2007, JIS X 0160, JIS X 0170

(b) Standards for environment and IT security evaluation

Understand the overview of the standards for environment and IT security evaluation.

Sample terms ISO/IEC 14000, JIS Q 14001, ISO/IEC 15408, JIS X 5070

(4) Standards for software

Understand the overview of the standards that provide a platform for object-oriented programming.

Sample terms CORBA, OMG, EJB (Enterprise Java Beans)

(5) Standards for data

Understand the overview of typical standards for the character and bar codes used in electronic data exchange.

Sample terms character and other codes, JIS code, Unicode, JAN code, QR code, ITF code, ISBN code

(6) International certification framework

Understand the overview of the framework for international certification.

Sample terms conformity assessment, conformity assessment body, accreditation body, certification body, inspection body

Copyright(c) Information-technology Promotion Agency, Japan. All rights reserved 2008

This page is intentionally left blank.

Information Technology Engineers Examination
– Fundamental Information Technology Engineer Examination (Level 2) –
Syllabus (Version 1.0)

Information-technology Promotion Agency, Japan

IT Human Resources Development Headquarters, Japan
Information-Technology Engineers Examination Center (JITEC)

15th Floor, Bunkyo Green Court, 2-28-8, Hon-Komagome,
Bunkyo-ku, Tokyo 113-6591 Japan

Tel: 03-5978-7600 (main switchboard)
Fax: 03-5978-7610
Website: http://www.jitec.ipa.go.jp/

2008-10-27