■ Information Technology Engineers Examination

IT Passport Examination

(Level 1)

Syllabus

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

Version 4.0

IPA
INFORMATION-TECHNOLOGY PROMOTION AGENCY, JAPAN

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■ Introduction

The syllabus (subtitled as “details of the knowledge required for the Information Technology Engineers Examination”) for the IT Passport Examination, in which “the scope of exam questions”[1] is described in more detail and the breadth and depth of the knowledge required for Level 1 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

As shown in Figure 1, this syllabus provides a set of a learning goal and a description for every item.

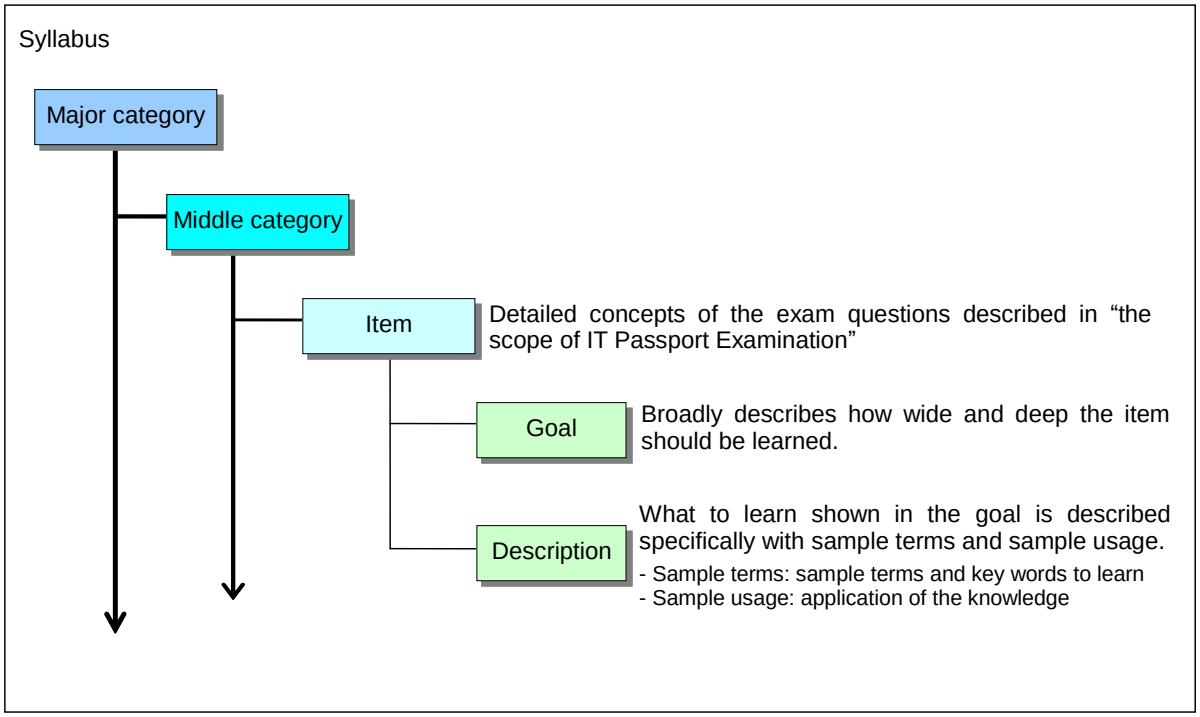

Figure 1 Configuration of the syllabus

[1] “Outline of IT Engineers Examination” 7. Scope on the test
http://www.jitec.ipa.go.jp/1_04hanni_sukiru/_index_hanni_skill.html

■ Revision history

[Ver. 4.0] August 2018

➢ Page	➢ Change
➢ Overall	➢ Addition of sample terms and review and settlement of terms

[Ver. 3.0] Jun 2015

➢ Page	➢ Change
➢ Overall	➢ Addition of sample terms and review and settlement of terms

[Ver. 2.0] May 2012

➢ Page	➢ Change
➢ Overall	➢ Addition of sample terms and sample usage and review and settlement of terms
	➢ Deletion of sample questions

[Ver1.1] October 27, 2008

➢ Page	➢ Change
➢ 3	➢ Addition of (4) Computer literacy
➢ 21	➢ Addition of 21. System utilization promotion and evaluation
➢ 22	➢ Addition of sample questions
➢ 23	➢ Addition of basic computerization policies as a description in (1) Computerization planning
➢ 25	➢ Addition of the term “user manual” to [Sample terms] in (e) Software acceptance
➢ 30	➢ Review of terms (The term “service level contract” was changed to “service level agreement” and the term “service level management” to another equivalent term in Japanese version.)
➢ 33	➢ Review of terms (The term “audit trail” was changed to audit evidence.)

[Ver1.0] First edition, June 26, 2008

Strategy

Major category 1: Corporate and legal affairs
Middle category 1: Corporate activities

1. Management and organization theory

[Goal]

- Understand the fundamental concepts about corporate activities and business management.

[Description]

- ✓ Understand the fundamental activities in a whole company to understand the assigned business tasks for which you may be responsible.
- ✓ Understand the necessary concepts and techniques, such as PDCA, to grasp and solve the problems regarding assigned business tasks.

(1) Corporate activities and management resources

・the fundamental concepts about corporate activities and management resources

(a) Corporate activities

・the purposes of corporate activities

Sample terms: management principles (corporate philosophy), shareholder meeting, closing account, CSR (Corporate Social Responsibility), disclosure, audit, green IT

(b) Management resources

・the concepts on people, materials, money, and information, and the meaning and need for, the management and techniques for them in business management

Sample terms: stakeholder, corporate brand, work life balance, diversity, OJT, Off-JT, e-learning, adaptive learning, coaching, mentoring, CDP (Career Development Program), mental health, HR Tech

(2) Business management

・the fundamental concepts of business management

Sample terms: business objectives; financial affairs, property, human resources, information management; PDCA (Plan, Do, Check, and Act), BCP (Business Continuity Plan), BCM (Business Continuity Management), risk assessment, MBO (Management By Objectives), HRM (Human Resource Management), talent management

(3) Management organization

・the fundamental concepts of management organizations

Sample terms: hierarchical organization, divisional organization, functional organizations, matrix organization, company system, project organization, in-house company, CEO (Chief Executive Officer), CIO (Chief Information Officer)

2. OR and IE

[Goal]

- Analyze familiar business tasks, and understand and utilize typical techniques for solving problems.
- Understand practical methods of how to visually describe business tasks and utilize them.

[Description]

- ✓ Understand familiar business tasks, and understand and utilize the typical visual representations, OR (Operations Research) and IE (Industrial Engineering) techniques, required for analysis.

(1) Understanding business tasks

・visual representations such as a workflow diagram to understand details of business tasks

(2) Job analysis and operational planning

・job analysis and operational planning using typical techniques, such as diagrams

Sample terms: Pareto chart, ABC analysis, PERT (arrow diagram), critical path method, scatter diagram, radar chart, control chart, histogram, regression analysis

Sample usage: data analysis using tables or graphs, business improvement using a Pareto chart or using regression analysis

(3) Decision making

・efficient decision making to solve a problem

Sample terms: cause and effect diagram (fishbone diagram), simulation, inventory control, credit control, ordering method

Sample usage: decision making under the provided conditions, understanding of business tasks dealing with inventory control

(4) Problem-solving techniques

・the fundamental concepts of techniques for solving problems

Sample terms: brainstorming, decision tree, affinity diagram

3. Accounting and financial affairs

[Goal]

- Understand the fundamental concepts of accounting and financial affairs for corporate activities and business management.

[Description]

- ✓ For corporate activities or business management, understand the meanings and concepts of basic terms about accounting and financial affairs, such as a break-even point, and utilize them in familiar business tasks.

(1) Accounting and financial affairs

・the relationship between sales and profits

(a) Relationship between sales and profits

・the terms and concepts

Sample terms: profit, gross profit, operating profit, break-even point, cost, variable cost, fixed cost, volume of sales, variable expense ratio

Sample usage: simple calculation of a break-even point and profit ratio

(b) Types and roles of financial statements

・the types and roles of financial statements in companies, such as an income statement, and

account titles

Sample terms	balance sheet, cash flow statement, assets (net assets, current assets, fixed assets, deferred assets, tangible assets, intangible assets), liabilities (current liabilities, fixed liabilities), current ratio, profitability, efficiency, safety, return on investment
Sample usage	reading of fundamental financial statements and analysis taking advantage of financial indexes

Major category 1: Corporate and legal affairs
Middle category 2: Legal affairs

4. Intellectual property rights

[Goal]

- Understand the fundamentals of types of intellectual property rights, rights that should be protected by law, and kinds of actions that are illegal.

[Description]

- ✓ Understand that the rights to intellectual creations, such as computer programs, music, and images, are protected by the related laws.

(1) Copyright Act

- intellectual creations, such as music, movies, and computer programs, are covered by copyright and that copying without permission is illegal
- copyright is associated with the people who present the work, such as singers and broadcasting companies, and presenting the work to the public without permission is illegal

(2) Laws on industrial property rights

- there are rights protected by registering an invention or a design
- unapproved use is illegal

Sample terms: Patent Act, business model patent, Utility Model Act, Design Act, Trademark Act, trademark, service mark

(3) Unfair Competition Prevention Act

- there are laws to protect trade secrets that are not protected by the Copyright Act nor the laws on industrial property rights

(4) Software license

- a software license is a contract with the person or corporate body who owns the rights to grant permission to use the software

Sample terms: license agreement, open source software, free software, public domain software

Sample usage: understanding terms and conditions of a license, and the contract suitable for the purpose, activation, subscription

(5) Other rights

- there are “rights of portrait” and “rights of publicity” under legal precedents, even if the clearly stated law is undefined

5. Laws on security

[Goal]

- Understand the outline of typical laws on security.

[Description]

- ✓ Understand the outline that there is a law defining the basics policies regarding the national cyber security (Basic Act on Cyber Security).
- ✓ Understand that there is a law governing unauthorized access (Act on the Prohibition of Unauthorized Computer Access) that can punish even if there is no actual damage.
- ✓ Understand the outline of various laws on information security.

(1) Basic Act on Cyber Security

・the purpose and the fundamental concepts of "Basic Act on Cyber Security "

(2) Act on the Prohibition of Unauthorized Computer Access

・the types of acts of unauthorized access and how to prevent it
・the fundamental concepts of the Act on the Prohibition of Unauthorized Computer Access

(3) Act on the Protection of Personal Information

・personal information to be protected, the relevant employers, and the duty regulations

Sample terms: business operator handling personal information, Personal Information Protection Commission, special care-required personal information, anonymously processed information, Act on the Use of Numbers to Identify a Specific Individual in Administrative Procedures

(4) Other laws on Information Security

・the outline of various laws on information security

Sample terms: Act on Regulation of Transmission of Specified Electronic Mail, Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers, crime on electromagnetic records of unauthorized commands (penalty on computer virus creation)

(5) Various standards and guidelines

・the Standards of Measures against Computer Viruses, the Standards of Measures against Unauthorized Access to Computers, and the System Management Standards are used as norms for information systems

Sample terms: Cybersecurity Management Guidelines, Information Security Countermeasure Guideline for Small and Medium - Sized Enterprises, Information Security Management Standards

6. Laws on labor and transaction

[Goal]

- Understand the outline of familiar laws on labor.
- Understand the outline of familiar laws on transaction.

[Description]

✓ Learn that there are laws on labor and transaction to improve various conditions associated with labor and transaction, and understand their outlines.

(1) Laws on labor

・the fundamental concepts of Labor Contract Act, Labor Standards Act, and Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved Working Conditions for Dispatched Workers

(a) Labor Standards Act

・the law regulates what must be observed in a labor contract, such as minimum wages, overtime work wages, and working hours

Sample terms: Flextime, free time system

(b) Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved

Working Conditions for Dispatched Workers

- there are regulations that dispatching business operators must observe, such as a license required to dispatch workers

(c) Nondisclosure agreement

- there is a contract governing trade secrets that should be kept confidential

(d) Contract types

- the fundamental characteristics of a service contract and a dispatch contract as contract types

Sample terms (quasi-)mandate contract, employment contract

(2) Laws on transaction

- the fundamental concepts of the Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors and the Product Liability Act

(a) Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors

- This law protects the interests of the subcontractors by preventing a delay in payment of subcontract proceeds, etc.

Sample terms Act on Specified Commercial Transactions

(b) Product Liability Act

- a manufacturer is liable for damages when the consumers suffer loss of or injury to life, body, and property because of a defective product

(c) Other laws on transaction

- there are laws for IT utilization in the financial sector, such as Payment Services Act and Financial Instruments and Exchange Act
- there is a law for collecting and recycling of used PCs, Act for Promotion of Use of Recycled Resources

Sample terms Payment Services Act, Financial Instruments and Exchange Act, Act for Promotion of Use of Recycled Resources

7. Other laws, guidelines, and engineer ethics

[Goal]

- Understand the concepts about the norms of companies or the like and control your actions rightly.
- Understand the fundamental concepts of information disclosure requests to governmental agencies.

[Description]

- ✓ Understand the practical approaches to compliance and corporate governance to clarify the norms of companies or the like.
- ✓ Understand the concepts of related laws and guidelines.
- ✓ Understand the information disclosure requests for documents created by governmental agencies.

(1) Compliance

- in order to support improvements in compliance by companies or the like, the codes of ethics that should be observed in addition to laws in performing business tasks

(2) Information ethics

- the legal imperatives and social norms that you should comply with in an information society, such as protection of intellectual property, personal information, and privacy, as well as morals and netiquette

(3) Corporate governance

- the practical approaches to corporate governance to improve the health of management activities for winning the trust of customers and markets

Sample terms Whistleblower Protection Act, internal control reporting system

(4) Information disclosure requests to governmental agencies

- anyone can submit a request for disclosure of documents created by governmental agencies

Sample terms Act on Access to Information Held by Administrative Organs

8. Standardization

[Goal]

- Understand the significance of standardization.

[Description]

- ✓ Understand that standardization organizations and industrial organizations, such as ISO and IEC, standardize for compatibility, and recognize the significance of the activity, along with familiar examples of standardization.

(1) Standardization

- the need and significance of standardization

Sample terms De facto standard

(2) Examples of the standardization in IT

- the examples and the characteristics of familiar standardizations in IT

Sample terms bar code, JAN (Japanese Article Number) code, QR Code

(3) Standardization organizations and specifications

- typical international standardization organizations, domestic standardization organizations, and the familiar examples of specifications

Sample terms ISO (International Organization for Standardization),

IEC (International Electrotechnical Commission),
IEEE (Institute of Electrical and Electronics Engineers),
W3C (World Wide Web Consortium),
JIS (Japanese Industrial Standards),
ISO9000 (quality management system),
ISO14000 (environmental management system),
ISO/IEC 27000 (information security management system)

Major category 2: Business strategy
Middle category 3: Business strategy management

9. Business strategy techniques

[Goal]

- Understand the fundamental concepts about typical analysis methods of management information.
- Understand the solution and efficiency of business tasks through utilizing office tools (software packages).

[Description]

- ✓ Use the techniques of analyzing the information about corporate activities, and understand the fundamental concepts of analysis methods of management information for establishing business strategy.
- ✓ For solving problems and increasing efficiency for assigned business tasks, understand the purpose and characteristics of office tools, and utilize them.

(1) Analysis methods of management information

・the typical techniques about utilizing information for business strategy, and utilization of analysis results

Sample terms: SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, PPM (Product Portfolio Management), external environment, internal environment, 3C analysis

Sample usage: sales, market, and product analysis using analysis methods

(2) Terms on business strategy

・the typical terms on business strategy

Sample terms: competitive superiority, innovation, core competence, niche strategy, alliance, outsourcing, M&A (mergers and acquisitions), OEM (Original Equipment Manufacturer), fables, franchise chain, MBO (Management Buy-Out), TOB (Take-Over Bid), scale economy, experience curve, vertical integration, commoditization, benchmarking, logistics, cannibalization

(3) Using office tools

・Utilizing office tools (software packages), such as spreadsheet software, database software, and presentation software, for solving problems and increasing the efficiency of assigned business tasks

Sample usage: selecting tools according to usage; using tools for arrangement, search, analysis, processing, and representation of data

10. Marketing

[Goal]

- Understand the fundamental concepts relevant to marketing.

[Description]

- ✓ Learn the existence and purpose of marketing, and understand the concepts of using information in marketing by collection and analysis of related data.

(1) Basics of marketing

・the fundamental concepts and information utilization about marketing

Sample terms: marketing research, sales; product and purchase plan, sales promotion, customer satisfaction, UX (User Experience) 4P, 4C, RFM (Recency: last purchase day, Frequency: purchase frequency, Monetary: cumulative purchase amount) analysis, Ansoff growth matrix, opinion leader, segment marketing, direct marketing, omnichannel, search advertising, push strategy, pull strategy, brand strategy, product life cycle, positioning, web marketing

Sample usage: sales promotion dealing with customer analysis

11. Business strategy and goal/evaluation

[Goal]

➢ Understand the typical information analysis techniques for planning business strategies.

[Description]

✓ Understand the techniques aiming at target setting and evaluation as the typical information analysis techniques for planning business strategies.

(1) Information analysis techniques for business strategy planning and evaluation

・the fundamental information analysis techniques and terms for target setting and evaluation about planning of business strategies

・the missions as the corporate philosophy and the visions as what the company wants to be

Sample terms: BSC (balanced score card), CSF (critical success factors), KGI (Key Goal Indicator), KPI (Key Performance Indicator), value engineering

Sample usage: job analysis using the fundamental information analysis techniques

12. Business management system

[Goal]

➢ Understand the fundamental concepts of the business management system.

[Description]

✓ Learn that there is a business management system to perform business management effectively and understand its fundamental concepts.

(1) Business management system

・the fundamental terms and concepts about business management system

Sample terms: CRM (customer relationship management), value chain management, SCM (supply chain management), TQC (Total Quality Control), TQM (Total Quality Management), ERP (Enterprise Resource Planning) package, six sigma, knowledge management, TOC (Theory Of Constraints)

Major category 2: Business strategy
Middle category 4: Technological strategy management

13. Planning of technology development strategy and technology development plan

[Goal]

- Understand the significance and the purpose of technology development strategies.

[Description]

- ✓ Understand that technology development is promoted by the road map created based on the prediction of technology trends.

(1) Technology development strategy and technology development plan

- the technology development strategies are created, which consider technical cooperation if needed, by surveying and analyzing technology trends and product trends, and evaluating technology owned by the company, for the purpose of obtaining competitive power in the future market
- specific technology development will be advanced based on a road map after an approach to technology based on a technological strategy is planned
- there are terms representing concepts relating to the fields above

Sample terms: MOT (Management Of Technology), technology portfolio, patent strategy, technology estimate method, process innovation, product innovation, open innovation, valley of death, Darwinian sea, hackathon, chasm, The Innovator's Dilemma, design thinking, The Business Model Canvas, lean startup, API (Application Programming Interface) economy

Major category 2: Business strategy
Middle category 5: Business industry

14. Business system

[Goal]

➢ Understand the characteristics of typical systems in various business fields.

[Description]

✓ In order to understand how the system is utilized in various business fields, understand the characteristics and concepts of the typical systems that are used in business fields, such as distribution and finance.

(1) Systems in typical business fields

・the characteristics of systems in typical business fields

Sample terms: distribution information system, financial information system, POS (point of sales) system, GPS (global positioning system) application system, GIS (Geographic Information System), ETC (electronic toll collection) system, IC card, RFID (IC tag), SFA (Sales Force Automation), traceability, smart grid, CDN (Content Delivery Network), Crowdfunding

Sample usage: business improvement using IC cards or RFID

(2) Software packages in typical business systems

・the characteristics of the software packages in typical business systems

Sample terms: software package for each job role (accounting, marketing support, sales management software), software package for each industry (software packages for finance, medical services, production, transportation), DTP (DeskTop Publishing)

(3) AI (Artificial Intelligence)

・the fundamental concepts of artificial intelligence

Sample terms: neural network, deep learning, machine learning

Sample usage: Utilization of AI in society and familiar business

(4) Systems in other fields

・there are typical administrative systems such as an electronic application and notification system

Sample terms: electronic bidding, Social Security and Tax Number

15. Engineering system

[Goal]

➢ Understand the characteristics of typical systems in the engineering field.

[Description]

✓ Understand the characteristics and concepts of typical engineering systems to understand the system usage situation in the engineering field.

(1) IT utilization in the engineering field

・the significance of IT utilization in the engineering field, such as “the support of design and production by automation” and “the promotion of efficiency in production management and inventory control”

(2) Typical engineering systems

・the characteristics of typical engineering systems, such as CAD (Computer Aided Design)

Sample terms concurrent engineering, simulation, sensing technology, production method, JIT (Just In Time), FMS (Flexible Manufacturing System), MRP (Material Requirements Planning), lean manufacturing, just-in-time system

16. e-business

[Goal]

➢ Understand electronic commerce and the characteristics of typical systems.

[Description]

✓ The characteristics, including risks, to understand familiar electronic commerce using a network.

(1) Electronic commerce

・the fundamental concepts of electronic commerce

(a) The characteristics of electronic commerce

・the fundamental characteristics, including that, in product sales by electronic commerce, the cost for stores or salesclerks can be reduced and a business can be started with little investment

Sample terms long tail, catalog sales

(b) The classifications of electronic commerce

・the types of electronic commerce

Sample terms EC (electronic commerce or e-commerce), B2B (business to business), B2C (business to consumer), C2C (consumer to consumer), O2O (Online to Offline), EDI (Electronic Data Interchange), FinTech

(c) Using electronic commerce

・the specific examples of usage and method of electronic commerce

Sample terms electronic marketplace, online mall, electronic auction, Internet advertising, Internet banking, electronic money, Internet trading, SEO (Search Engine Optimization), affiliate, escrow service, opt-in mail advertisement, banner advertisement, recommendation, digital signage, virtual currency

(2) Points to note in electronic commerce

・risks in electric commerce and the need of security measures, and the fundamental points to note.

17. IoT systems and Embedded systems

[Goal]

➢ Understand the concepts of systems using IoT or embedded systems, and typical examples.

[Description]

✓ In order to understand systems using IoT or embedded systems utilized in familiar appliances and devices, understand its fundamental characteristics and examples.

(1) Systems using IoT

・the examples of typical systems using IoT, and the names of the fundamental technologies and devices used in these in accordance with advancement of technology in recent years

Sample terms drone, connected car, automatic driving, wireless charging, robot, cloud service, smart factory, Industry 4.0

Sample usage utilization methods of industrial drones and robots, collection and utilization methods for energy, utilization methods in various industry (finance, agriculture, medical services, logistics, etc.)

(2) Examples of embedded systems

・the examples of familiar embedded systems (devices), and the name of the fundamental technologies used in them

Sample terms robotics, firmware, industrial robots, cell phone, mobile device

Major category 3: System strategy
Middle category 6: System strategy

18. Information systems strategy

[Goal]

- Understand the significance and purpose of information system strategies and the concepts of strategic goals.

[Description]

- ✓ Understand the significance and purpose of information system strategies planned to realize business strategies and the concepts of strategic goals.

(1) Information systems strategy

・ an information system is developed to achieve the business strategy and enterprise strategy of a company

Sample term enterprise search

(2) Strategic goals

・business strategy and enterprise strategy are established as a specific goal through business environment analysis and a SWOT analysis

Sample terms EA (Enterprise Architecture), SoR (Systems of Record), SoE (Systems of Engagement), back-end, front-end

19. Business process

[Goal]

- Understand the concepts of business improvement and problem solving.
- Understand the concepts of typical modeling in business models.
- Understand the effective utilization of groupware and office tools, and practice it.
- Understand the purpose and concepts of increasing operational efficiency by using computers and networks.

[Description]

- ✓ Understand the concepts of modeling the business process and considering its improvement plan so that you can participate in a study of computerization of your assigned business tasks.
- ✓ Utilize computers and networks effectively to improve business and facilitate communication.

(1) Business process

・the concepts of typical modeling necessary to analyze and understand the present business process for business improvement and problem solving

(a) Modeling

・The concepts of modeling which represent the business scheme and business process visually

(b) Typical modeling techniques

・the concepts of the typical modeling methods

Sample terms E-R diagram (Entity Relationship Diagram), DFD (Data Flow Diagram), BPMN (Business Process Modeling Notation)

(c) Analysis of business processes

・typical techniques and systems about modeling of business processes

Sample terms BPR (Business Process Reengineering), BPM (Business Process Management), workflow

(2) Business improvement and problem solving

・the efficiency of business tasks can be increased by efficiently utilizing IT, such as computers and networks, for familiar business tasks including white collar ones

・the ability to analyze business processes, make business improvement, and solve problems

・finding problems and correcting them by understanding the business processes through workflows and E-R diagrams and reading business data represented in tables and graphs

Sample terms RPA (Robotic Process Automation)

(3) Effective use of IT

・various methods for business improvement and operational efficiency by utilizing IT

(a) Operational efficiency by computerization

・characteristics and advantages of various methods of computerization, such as the installation of commercial software packages, installation of groupware and office tools, development and installation of individual information systems, and network construction

Sample terms BYOD (Bring Your Own Device), IoT (Internet of Things), M2M (Machine to Machine), teleworking

(b) System utilization for communication

・how to use specific tools for smooth communication required for business improvement or effective business

Sample terms video conference, e-mail, electronic bulletin board, blog, chat, SNS (Social Networking Service), sharing economy

Sample usage utilization of e-mail for business tasks, upload of shared files

20. Solution business

[Goal]

➢ Understand the concepts of solutions through typical services.

[Description]

✓ In order to understand the concepts of solutions, learn the offering methods and sample usage of typical solutions.

(1) What is a solution

・to build a trusting relationship with customers, learn about customer problems, propose problem solutions, and support the problem solving in the solution business

・the process of solution offering in computerization

(2) The forms of solutions

・the solutions for computerization include various approaches such as in-house development, introduction of software packages, and utilization of services provided by other companies

Sample terms SI (System Integration), cloud computing, SaaS (software as a service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service), DaaS (Desktop as a Service), ASP (application service provider), outsourcing, hosting service, housing service, on-premises, PoC (Proof of Concept)

21. System utilization promotion and evaluation

[Goal]

- Understand the significance and purpose of promotion activities of system utilization.

[Description]

- ✓ In order to take advantage of information systems in business management, understand that the dissemination and enlightenment of information technology.
- ✓ Learn information literacy skills required for utilization of data in business tasks, and make the most use of data in assigned business tasks.

(1) Information literacy

・to search, organize, analyze, and transmit information for performing business tasks by taking advantage of information technology such as computers and application software

Sample terms digital transformation

(2) Utilization of Data

・Analyzing data accumulated through information systems, improving business, and solving problems in assigned business tasks

Sample terms BI (Business Intelligence) tool, data warehouse, data mining, big data, text mining, data science, data scientist

Sample usage classifications and utilization methods of big data (open data, personal data), points of attention and issues in utilizing big data

(3) Dissemination and education

・the significance of education and the dissemination of information technology through educational activities and programs to make use of information systems

Sample terms gamification, digital divide, accessibility

Major category 3: System strategy
Middle category 7: System planning

22. Computerization planning

[Goal]

- Understand the purpose of computerization planning.

[Description]

- ✓ Understand the purpose and process of computerization planning so that you can participate in a study of computerization of your assigned business tasks.

(1) Computerization planning

・ to make computerization initiatives and basic computerization policies based on an information systems strategy through target business task analysis with respect to computerization planning, and to clarify the whole image of computerization, such as the order of each system development, approximate cost, and effect

Sample terms: schedule, organization, risk analysis, cost effectiveness, scope, planning process

23. Requirements definition

[Goal]

- Understand the purpose of the operational requirements definition based on the analysis of current state.

[Description]

- ✓ Understand the purpose of operational requirements definition, so that you can participate in a study of computerization of your assigned business tasks.
- ✓ Understand how to proceed the analysis of assigned business tasks, identification and organization of data, and utilize it

(1) Operational requirements definition

・operational requirements definition defines the functions and requirements that the system must provide in consideration of the business strategy, system strategy, and needs of users.

Sample usage: surveys of user requirements, analysis of surveys, analysis of the current business tasks, definition of operational requirements, definition of functional and non-functional requirements, agreement of requirements

24. Procurement planning and implementation

[Goal]

- Understand the fundamental flow of procurement.

[Description]

- ✓ Understand the fundamental flow of procurement so that you can participate in a study of computerization of your assigned business tasks.

(1) Procurement flow

・the fundamental flow of procurement contains creation and distribution of a request for information (RFI) and a request for proposal (RFP), creation of selection criteria, acquisition of proposals and estimates from the vendors, comparative evaluation of the proposals, selection of suppliers, conclusion of contracts, and acceptance and inspection.

Sample terms green procurement

(2) Request for information

・the request for information expressly describes the purpose of computerization and the outline of the business operations for vendors, and requests them to supply information in order to collect the information about the means that can be considered and technology trends before creating the request for proposal

(3) Request for proposal

・a request for proposal is a document for specifying the outline of the system to introduce, items requested for the proposal, procurement conditions, and requesting the submission of proposals from vendors

(4) Proposal

・a proposal is a document that a vendor creates to describe system configurations and development methods based on the RFP and to propose to the requestor

(5) Estimate

・an estimate is a document that shows the cost concerning development, operation, and maintenance of the system and it is important to select suppliers and check the details of the order

Management

Major category 4: Development technology
Middle category 8: System development technology

25. System development technology

[Goal]

- Understand the fundamental flow of the process of system development.
- Understand the concepts of the estimate in system development.

[Description]

✓ In order to understand processes through which systems are developed, learn the flow of processes, such as requirements definition, system design, programming, and testing, and understand the concepts of an estimate and review.

(1) System development process

・types of processes in system development

(a) System requirements definition and software requirements definition

・the system requirements and the software requirements are defined to clarify the functions, performance, and details required for the system and software

Sample terms: functional requirement, non-functional requirement, joint review, user review, quality characteristics (functionality, efficiency, usability, reliability, etc.)

(b) System design and software design

・systems architecture design, software architecture design, and software detailed design, and the fundamental role of each of them

Sample terms: external design, internal design

(c) Programming

・a program is created according to the system design

・a unit test is performed to verify whether there are any errors (bugs) in each program created

Sample terms: coding, white box test, debug, code review

Sample usage: creation and analysis of test data

(d) Testing

・programs are consolidated after the unit tests are completed and verified whether the software or system works as specified

・it is necessary to learn that there is a cycle of planning, implementation, and evaluation in a test, and to evaluate the gap between target and achievement in testing

Sample terms: integration test, system test, operational test, black box test, regression test

(e) Software acceptance

・software is delivered after the ordering company checks whether the software works normally by using it under the same conditions as actual operation and finds it satisfactory

・training of system users is provided

Sample terms: user manual, acceptance test, migration

(f) Software maintenance

・in software maintenance, the software is corrected and modified in order to support the stable operation of the system, progress of information technology, and change of business strategy

(2) Estimate of software

・the fundamental concepts in estimating the person hours required for development and development period based on the software development scale and development environment

Sample terms FP (Function Point) method, analogous estimating method, relative estimation

Major category 4: Development technology
Middle category 9: Software development management techniques

26. Development process and methods

[Goal]

➢ Understand the outline, significance, and purpose of the typical development methods.

[Description]

✓ In order to perform software development efficiently, understand the methods and concepts about software development.

(1) Major software development methods

・the characteristics of the typical software development methods

Sample terms: structured method, object orientation, use case, UML, DevOps

(2) Major software development models

・the characteristics of the typical software development models

Sample terms: waterfall model, spiral model, prototyping model, RAD (Rapid Application Development), reverse engineering

(3) Agile

・the characteristics of Agile that is a lightweight development method to develop software agilely and adaptively.

・the fundamental terms about agile development

Sample terms: XP (extreme programming), test driven development, pair programming, refactoring, scrum

(4) Framework for development process

・the characteristics of a typical framework for development process

(a) Common frame

・the basic concepts of SLCP (Software Life Cycle Process) as a common frame where each working item is defined and standardized for software development and proper transaction

(b) Capability maturity model

・for evaluation and improvement of the development and maintenance processes, the basic concepts of CMMI (Capability Maturity Model Integration) where a process maturity of a system development organization is modeled and the maturity is defined in five levels

Major category 5: Project management
Middle category 10: Project management

27. Project management

[Goal]

- Understand the significance, purpose, and concepts of project management.
- Understand the fundamental flow of the process in project management.

[Description]

✓ In order to promote a system development project smoothly, understand the overall fundamental knowledge of project management.

(1) Project management

・what project management is and what processes are included

(a) What is a project?

・the significance and characteristics of a project

(b) Process in project management

・it is a flow that starts up a project, promotes it based on the plan, controls progress, cost, quality, and human resources through various reviews and achieves the goal

Sample terms: project charter, project manager, project member, stakeholder, project scope management, project communication management, project risk management, WBS (Work Breakdown Structure), arrow diagram, Gantt chart, countermeasures against risks (avoid, mitigate, accept, transfer)

Sample usage: optimum allocation of human resources in business tasks, schedule management of a project, how to report the progress of business tasks

Major category 6: Service management
Middle category 11: Service management

28. Service management

[Goal]
- Understand the significance, purpose, and concepts of IT service management.

[Description]
- ✓ Understand that the activities for operating an information system stably and efficiently and maintaining or improving the quality of service to users are required.
- ✓ Learn that IT service management exists as the method of operations management for that purpose, and understand its significance, purpose, and concepts.

(1) IT service management
- IT service management is the method of the operations management to increase efficiency of IT operation and enhance the quality of services including availability by regarding the business tasks of IT department as IT service and organizing them

(2) ITIL
- there is a concept of ITIL (Information Technology Infrastructure Library) as a framework of IT service management

(3) Service level agreement
- an SLA (Service Level Agreement) is concluded in order to stipulate the quality and scope of service to offer and to perform operations management based on the agreement with the service receiver

(4) Service level management
- in order to achieve the service level that is agreed between the service receiver and provider, there is SLM (Service Level Management) that aims at maintaining and improving service level through the PDCA cycle.

Sample terms availability management (management of service availability, etc.)

29. Service support

[Goal]
- Understand related items, such as service desk, in service support.

[Description]
- ✓ In order to understand IT service operation, learn the fundamental role of the service desk (help desk) in the core of service support, and the fundamental configuration of the management functions (roles) included in service support.

(1) Service support
- what kinds of roles and functions service support consists of as a series of activities about daily operations

Sample terms incident management (fault management), problem management, configuration management, change management, release management, version control

(2) Service desk (help desk)

・a service desk offers a single window to the inquiries from the users of the system, records and manages the inquiries, hands over the inquiries to appropriate departments, and records call-handling results

Sample terms　escalation, FAQ, chatbot
Sample usage　service desk operation methods that utilize AI

30. Facility management

[Goal]

➢ Understand the concepts about system environment maintenance.

[Description]

✓ Understand that there is facility management as a concept for a company or the like to maintain system environment at the best state.

(1) System environment maintenance

・the necessity for the system environment maintenance that maintains the system environment of computers, networks, facilities, and equipment

Sample terms　green IT (green of IT), UPS (Uninterruptible power supply), private electric generator, security wire, surge protection

(2) Facility management

・in order to improve resources, such as a building and equipment at their optimum state, there is a concept of facility management

Major category 6: Service management
Middle category 12: System audit

31. System audit

[Goal]
- Understand the significance, purpose, concepts, and target of system audit.
- Understand the fundamental flow of the process in system audit.

[Description]
- ✓ Understand the purpose and main types of audits in a company or the like.
- ✓ Understand the significance, purpose, and fundamental flow about the system audit performed for an information system.

(1) Audit

・the purpose and types of audits

Sample terms accounting audit, operations audit, information security audit, system audit

(2) System audit

・the purpose of system audit, and the fundamental flow of the process in system audit

(a) Purpose of system audit

・the purpose of system audit is to investigate the information system from a broad viewpoint and to judge whether the system contributes to management, independently of audited departments

(b) Process flow in system audit

・the process of system audit includes various activities such as overall check of an information system, evaluation, explanation of the result to the management, advice and check for improvement, and follow-up

Sample terms system auditor, system audit standards, system audit planning, preliminary audit, main audit, audit evidence, system audit report

32. Internal control

[Goal]
- Understand the purpose and concepts of internal control and IT governance in a company or the like.

[Description]
- ✓ Learn that internal control and IT governance are provided to realize sound management of a company or the like, and understand the purpose and concepts.

(1) Internal control

・internal control is the mechanism of building and running the organization so that the company itself or the like can perform its business in a right and proper way

・clarification of business processes, separation of job duties, creation of enforcement rules, and establishment of a check system are necessary for its realization

Sample terms Monitoring, reputation risk

(2) IT governance

・IT governance establishes an information systems strategy and controls its implementation, and it is required for a company or the like to enhance its competitive power

Technology

Major category 7: Basic theory
Middle category 13: Basic theory

33. Discrete mathematics

[Goal]
- ➢ Understand the fundamental concepts of radixes.
- ➢ Understands the fundamental concepts of sets.

[Description]
- ✓ In order to know fundamental theories about numeric values and data handled by computers, understand the fundamental concepts of the representation and operation of binary numbers, sets, and logical operations.

(1) Numbers and representation
- the concepts of the representation of binary numbers, method of radix conversion, and addition and subtraction of binary numbers, as well as the range of numbers that can be represented

(2) Sets
- the fundamental concepts and usage of sets, propositions, Venn diagrams, and truth tables

(3) Logical operations
- the concepts of logical operations, fundamental operations, and the usage of truth tables

Sample usage conditional search using AND, OR, NOT, and XOR (exclusive OR)

34. Applied mathematics

[Goal]
- ➢ Understand the fundamental concepts of probability and statistics.

[Description]
- ✓ Understand the fundamental concepts of probability, statistics, and queueing theory required for collection, analysis, and processing of data.

(1) Probability and statistics
- the fundamental concepts of probability and statistics

(a) The outline of probability
- the concepts of permutation, combination, and probability

(b) The outline of statistics
- the concepts of fundamental statistics, such as frequency table, histogram, and average

(2) Queueing theory
- the basic concepts of a queue, but the theoretical contents, such as the M/M/1 model, are not asked on the test

35. Theory of information

[Goal]

- Understand the unit of information content.
- Understand the fundamental concepts of digitization of information.

[Description]

- ✓ In order to know fundamental theories about numeric values and data handled by computers, understand how to express information content, the concept of digitization, and representation of characters.

(1) The unit of information content

- the information content such as a bit and a byte and the method of expressing prefixes (K, M, G, T, m, μ, n, p, etc.)

(2) Digitization

- the fundamental concepts of digitization (A/D conversion), such as quantization, sampling, and encoding, as well as the characteristics of analog and digital

(3) Representation of characters

- characters are represented numerically inside a computer

Major category 7: Basic theory
Middle category 14: Algorithm and programming

36. Data structure

[Goal]

➢ Understand the fundamental concepts of data structures.

[Description]

✓ Understand the fundamental concepts of data and data structures so that you can perform analysis and arrangement of business data.

(1) Data and data structures

・the fundamental concepts of data structures, such as the types of variables and fields, arrays, records, and files

Sample terms List, queue, stack, tree structure, binary tree

37. Algorithm

[Goal]

➢ Understand the fundamental concepts and expressions of algorithms and flowcharts.

[Description]

✓ Understand the fundamental concepts and expressions of algorithms and flowcharts so that you can analyze operations and perform computerization.

✓ Understand creation of simple algorithms and flowcharts

(1) Flowchart

・the symbols and the expressions of procedures in flowcharts

・how to create flowcharts

(2) The basic structure of an algorithm

・control structures such as sequence, selection, and iteration (or repetition)

(3) Fundamental algorithms

・ fundamental algorithms such as the total, search, merge, and sort

・how to create fundamental algorithms

38. Programming and programming languages

[Goal]

➢ Understand the role of programming languages and programming.

[Description]

✓ Understand that programming is performed using programming languages in the system development.

(1) Programming and programming languages

・ programming is to describe an algorithm using a programming language

・ an algorithm can be executed in computers by programming

Sample usage programming-like descriptions in script languages

39. Other languages

[Goal]

- Understand the types and fundamental usage of typical markup languages.

[Description]

- ✓ Understand the types and characteristics of the typical markup languages widely used as means of expression in computers.
- ✓ Understand the simple usage (including writing) in using markup languages.

(1) Markup languages

・the characteristics and the fundamental rules in describing typical markup languages

Sample terms: HTML (HyperText Markup Language), XML (Extensible Markup Language), tags, SGML

Sample usage: representation in HTML

Major category 8: Computer system
Middle category 15: Computer component

40. Processor

[Goal]

- Understand the fundamental configuration and roles of computers.

[Description]

- ✓ Understand the fundamental components composing computers, and the concepts of the mechanism, functions, and performance of the processor, which is the core of the computer system.

(1) The configuration of a computer

・a computer consists of five fundamental functions and they are integrated

Sample terms operation, control, storage, input, output

(2) The fundamental mechanism of a processor

・the concepts of the fundamental mechanism, functions, and performance of a processor

Sample terms operation, control, CPU, multi-core processor, GPU, clock frequency

41. Memory

[Goal]

- Understand the types and characteristics of memory.
- Understand the types and characteristics of storage media.

[Description]

- ✓ Learn that there are various types of computer memory, which have various roles, and understand the types and characteristics of storage media and the concepts of storage hierarchy.

(1) Memory

・the characteristics such as differences of memory capacity and access speed by types of memory

Sample terms RAM, ROM, volatile memory, nonvolatile memory (flash memory)

(2) Storage media

・The characteristics that vary with the types of storage media, such as storage capacity, portability, usage, and purpose

Sample terms HDD, SSD, CD (CD-ROM, CD-R), DVD (DVD-ROM, DVD-RAM, DVD-R), Blu-ray disc, USB memory, SD card

(3) Storage hierarchy

・the concepts of storage hierarchy

Sample terms cache memory, main memory, auxiliary memory

42. Input/output devices

[Goal]

- Understand the types and characteristics of input/output interfaces.

[Description]

- ✓ In order to utilize familiar information devices including IoT systems, understand the types and characteristics of input/output interfaces. In addition, understand that device drivers are required to utilize them.

(1) Input/output interfaces

・the types of input/output interfaces (wired interface and wireless interface) as well as the characteristics of data transfer methods (serial and parallel)

Sample terms: analog, digital, USB, IEEE 1394, PCMCIA, HDMI, analog RGB, DVI, Bluetooth, IrDA, RFID, NFC (Near Field Communication)

(2) IoT device

・role, components, and characteristics of IoT devices in IoT systems

Sample terms: sensor, actuator

Sample usage: collection and analysis methods of data in IoT systems, mechanism and measurement methods of various sensors, utilization methods for familiar IT device

(3) Device drivers

・the functions of device drivers and PnP (Plug and Play)

Major category 8: Computer system
Middle category 16: System component

43. System configuration

[Goal]

➢ Understand the fundamental characteristics of system configurations.

[Description]

✓ Learn that there are various configuration methods in terms of the processing modes and the utilization in system configurations. Understand the examples of typical systems and the fundamental characteristics of the client/server system, one of the distributed processing systems.

(1) Processing modes

・The characteristics of typical processing modes

Sample terms: centralized processing, distributed processing, parallel processing, replication

(2) System configurations

・the characteristics of typical system configurations

Sample terms: dual system, duplex system, client/server system, Web system, peer-to-peer, cluster, thin client, NAS, RAID

(3) Utilization

・the characteristics of typical utilization

Sample terms: interactive processing, real-time processing, batch processing, virtualization

44. System evaluation indexes

[Goal]

➢ Understand the concepts of the performance, reliability, and economical efficiency of a system.

[Description]

✓ Understand the evaluation indexes for measuring the performance, reliability, and economical efficiency of a system.

(1) System performance

・the concepts about the evaluation of system performance

Sample terms: response time, benchmark

(2) System reliability

・the concepts about the evaluation of system reliability

(a) The indexes showing system reliability

・the concepts of typical indexes for indicating reliability

Sample terms: availability, failure rate, MTBF (Mean Time Between Failure), MTTR (Mean Time To Repair)

Sample usage: study of the availability improvement plan

(b) The design of reliability

・the concepts of the typical system configurations and reliable design for improvement in reliability

Sample terms: dual system, duplex system, fail safe, fault tolerant, foolproof

(3) Economical efficiency of a system

・the concepts about evaluation of economical efficiency of a system

Sample terms initial cost, operational cost, TCO (Total Cost of Ownership)

Major category 8: Computer system
Middle category 17: Software

45. Operating system

[Goal]

- Understand the necessity, functions, and types of OSs (Operating Systems).

[Description]

- ✓ Understands OSs in terms of management and utilization of computer systems, and understand the characteristics of each of the typical types.

(1) The necessity for OS

- an OS has control and management functions so that it can provide hardware and software resources in a computer for users or application software efficiently

(2) The functions of OS

- the functions, such as user management (profiles and accounts), file management, input/output management, and resource management

Sample usage: management of registration and deletion of user IDs, management of the access privilege of each user, virtual storage

(3) The types of OSs

- there are various types of operating systems, such as Windows, Mac OS, UNIX, Linux, iOS, and Android
- the problems in exchange of data between different types of operating systems

46. File system

[Goal]

- Understand the concepts of file management.
- Understand the fundamental concepts of backup.

[Description]

- ✓ From a viewpoint of utilizing a system in an office, understand the concepts of file management and how to use fundamental functions.
- ✓ Understand the concepts, such as the necessity for backup and generation management, in preparation for damage of the files by operational errors and system failures.

(1) File management

- the fundamental mechanism of file management and the access method to files
- perform fundamental handling, such as file sharing and configuring access privileges, in familiar business tasks

Sample terms: root directory, current directory, file extension, fragmentation

Sample usage: directory management, file sharing, setup of access privileges, specification of an absolute path and a relative path

(2) Backup

・fundamental concepts, such as the necessity, acquisition method, acquisition procedure, and generation management for backups

Sample terms archive

47. Office tools

[Goal]

➢ Understand the characteristics and basic operations of software packages, such as office tools.

[Description]

✓ Understand the characteristics of software packages, such as word processing software and spreadsheet software, and understand the fundamental operations for utilizing them in business tasks.

(1) Software packages

・the characteristics of software packages, such as word processing software and spreadsheet software

・the necessity of installing software packages

(2) Word processing software

・how to utilize word processing software and the characteristics

Sample usage creation of documents and tables, embedding of charts and graphs, effective use of clipboard

(3) Spreadsheet software

・how to process data by using the basic functions in spreadsheet software and the characteristics

Sample usage cell reference, substitution in cells; specification methods of the four arithmetic operations; utilization of typical functions; selection, addition, deletion, insertion, sorting of data; search, creation of graphs

(4) Presentation software

・how to utilize presentation software and the characteristics

Sample usage creation of slides, selection of fonts, creation of figures, embedding of images

(5) WWW browser (Web browser)

・how to search for and acquire necessary information from Web pages by using a Web browser and the characteristics

Sample usage utilization of search sites, information retrieval with conditions (AND, OR, NOT)

48. Open source software

[Goal]

➢ Understand the characteristics of OSS (Open Source Software).

[Description]

✓ Understand the characteristics, utilization purpose, and considerations in usage of OSS.

(1) Open source software

・the outline of open source software

(a) The characteristics of OSS

・there are the characteristics in OSS, such as disclosure of source codes, prohibition of limit of redistribution, and the principle of no warranty

(b) The types of OSS

・OSS includes various software such as operating systems, communication software, office software, database management systems, and application software.

Major category 8: Computer system
Middle category 18: Hardware

49. Hardware (computer and I/O device)

[Goal]

- Understand the types and characteristics of computers.
- Understand the types and characteristics of I/O devices.

[Description]

- ✓ Understand the types and characteristics about typical hardware, such as computers including PCs and I/O devices including a keyboard, a mouse, a display, and a printer, which make up an information system.

(1) Computer

・the types and characteristics of typical computers

Sample terms: PC, server, general purpose computer, personal digital assistant, tablet terminal, wearable device, smart device

(2) I/O device

・the types and characteristics of typical I/O devices

Sample terms: keyboard, mouse, tablet, image scanner, touch panel, bar code reader, display, printer, projector, Web camera, 3D printer

Major category 9: Technology element
Middle category 19: Human interface

50. Human interface technology

[Goal]

➢ Understand the characteristics of human interfaces.

[Description]

✓ Understand the characteristics of human interfaces and the characteristics of each component of GUI, which is the typical human interface.

(1) Human interface

・a human interface is an interface between users and systems used in various situations

(2) GUI

・the characteristics of GUI (Graphical User Interface), such as the visual display using various graphics and the intuitive operations by a pointing device and other devices

Sample terms window, icon, radio button, check box, list box, help function, menu bar, pull-down menu, pop-up menu, thumbnail

51. Interface design

[Goal]

➢ Understand the concepts of interface design.

[Description]

✓ Understand that the interface used as the contact point between users and systems has a great effect on ease of use and understanding a lot, and understand the concepts of desirable interfaces.

(1) Screen and form design

・the concepts of designing the screens and forms in software

(a) Screen design

・the concepts of design of screens with good operability, such as smooth input flow, establishing the rules in using colors, and displaying the operation guide

(b) Form design

・the concepts of an appropriate form design, such as placing relevant items nearby, including only minimum necessary information, and deciding the rules to unify forms

(2) Web design

・the viewpoint of usability (ease of use) is required in Web design, such as giving uniformity to the color tone and design in the whole site by using style sheets, and supporting a variety of WWW browsers

Sample terms CSS (Cascading Style Sheets)

(3) Universal design

・the concepts of universal design, which enables as many people as possible to use comfortably irrespective of age, culture, and handicaps or ability differences

Sample terms Web accessibility

Major category 9: Technology element
Middle category 20: Multimedia

52. Multimedia technology

[Goal]

- Understand the types and characteristics of encodings of sounds and images.
- Understand the characteristics of compression and decompression of information.

[Description]

- ✓ Understand that information, including characters, sounds, and images, can be handled in computers in an integrated manner by means of multimedia technology.
- ✓ Understand the characteristics of typical file formats for multimedia, and information compression and decompression.

(1) Multimedia

- multimedia digitizes (encodes) the various forms of analog information, such as sound and image (static image and video), as well as text, and handles them in an integrated manner on computers

Sample terms: Web contents, hypermedia, streaming, DRM (Digital Rights Management), CPRM (Content Protection for Recordable Media), HTML5

(2) File formats for multimedia

- the characteristics of the main file formats used in sound processing, static image processing, and video processing

Sample terms: MP3 (MPEG Audio Layer-3), MIDI (Musical Instrument Digital Interface), JPEG (Joint Photographic Experts Group), GIF (Graphics Interchange Format), PNG (Portable Network Graphics), MPEG (Moving Picture Experts Group), PDF (Portable Document Format)

(3) Compression and decompression of information

- The compression/decompression methods are used for large sound, image, and video data according to the types of media
- the purpose of compression includes the reduction of data storage and network load

Sample terms: ZIP, LZH, compression ratio, lossless compression, lossy compression

53. Multimedia application

[Goal]

- Understand the purpose and characteristics of multimedia application.

[Description]

- ✓ Understand the characteristics of graphics processing as a technique for representation and understand that there are various application areas of multimedia technology.

(1) Graphics processing

- the characteristics of colors, image quality, and drawing tools in graphics processing

(a) Representation of colors
- colors are represented by the additive primaries (RGB) and the subtractive primaries (CMY) in computers
- colors are represented with hue, lightness, and saturation

(b) Image quality
- pixels, resolution, and gray scale

(c) Graphics software
- the characteristics of painting software and drawing software

(2) Multimedia application
- the examples of typical application areas of multimedia technology

Sample terms CG (Computer Graphics), VR (Virtual Reality), AR (Augmented Reality), 3D, simulator, game, 4K／8K

Major category 9: Technology element
Middle category 21: Database

54. Database architecture

[Goal]

➢ Understand the significance, purpose, and concepts of database and DBMS (Database Management System).

[Description]

✓ Note that a database is an important means for representing business tasks in terms of information (data), and that a database management system stores data structurally, maintains consistency, and is equipped with the functions for extracting it efficiently. In addition, understand the significance, purpose, and concepts of database.

(1) Database

・the purpose and characteristics of database and the concepts of the database model

・the analysis method of big data

(2) Database management system

・the significance, purpose, and concepts of a DBMS (Database Management System) from a viewpoint of usage in familiar business tasks

Sample terms RDBMS, NoSQL

55. Database design

[Goal]

➢ Understand the concepts of analysis and design for data.

[Description]

✓ Understand the necessity of analysis and design for data and its fundamental process.

(1) Data analysis

・the necessity of checking up and organizing the data used in business tasks.

(2) Data design

・organizing and representing the data and the relations of data

Sample terms E-R diagram, code design, field (item), record, file, table, primary key, external key, index

Sample usage arrangement and optimization of business data

(3) Data normalization

・the necessity of data normalization (the details of normalization are not asked on the test)

56. Data manipulation

[Goal]

➢ Understand the operations such as data extraction.

[Description]

✓ Understand data manipulation required to utilize relational databases.

(1) Data manipulation

・the typical data manipulation methods about a table (the grammar of SQL is not asked on the test)

Sample usage selection, insertion, update, projection, and joint operations using business data

57. Transaction processing

[Goal]

➢ Understand the processing methods of database.

[Description]

✓ Understand that it is necessary to maintain the consistency of a database under the exclusive control and recovery functions, in preparation of inquiring and updating data by multiple users.

(1) The functions of a database management system

・the necessity and outline of the function of the exclusive control and the recovery functions required to achieve information sharing and data integrity

Major category 9: Technology element
Middle category 22: Network

58. Network architecture

[Goal]

- Understand the classification of LAN and WAN regarding networks.
- Understand the roles of the connecting devices for building a network.
- Understand the configurations and communication methods regarding IoT networks

[Description]

- ✓ Recognize that a network is an indispensable infrastructure for activities in a corporate or the like, and understand the outline of the roles of LAN, WAN, and typical network components.
- ✓ Understand the configuration of familiar in-company LAN.

(1) Network configuration

・the network in a familiar workplace consists of LAN and WAN, and the meaning of each

(2) Network component

・the architecture of typical networks, such as Ethernet, and the role of the lines and the connecting devices that make up a network

Sample terms: network interface card, cable, hub, router, switch, communication line, transmission path, wireless LAN, Wi-Fi, default gateway, proxy, MAC address, ESSID (Extended Service Set Identifier), mobile communication standard (LTE, 5G etc.), transmission speed (bps: bits per second) , SDN (Software-Defined Networking) , beacon

(3) IoT Network component

・the configurations and communication methods of IoT networks to connect IoT devices

Sample terms: LPWA (Low Power Wide Area) , edge computing, BLE (Bluetooth Low Energy) , IoT Area Network

Sample usage: proper use of High-speed network (5G .etc) and low-speed network (LPWA .etc) depending on the purpose

59. Communications protocol

[Goal]

- Understand the necessity for communication protocols.
- Understand the roles of the typical familiar protocols.

[Description]

- ✓ Understand that a communication protocol is required to communicate between different system environments.
- ✓ Understand the roles of the typical protocols used on the Internet.

(1) Communication protocol

・it is necessary to perform transmission in accordance with common rules to deliver information between the sender and the receiver

・the characteristics of communication protocols used for IoT systems

Sample terms TCP/IP, HTTP, HTTPS, SMTP, POP, FTP, NTP (Network Time Protocol), DHCP, port number

60. Network application

[Goal]

- Understand the fundamental mechanism of the Internet and the characteristics of the services.
- Understand the characteristics of communication services and transmission speed.

[Description]

- ✓ Understand the fundamental mechanism of the Internet as well as the characteristics of services on the Internet, such as e-mail.
- ✓ Understand the characteristics of communication services that provide means of communications such as the Internet.

(1) The mechanism of the Internet

・the computer connected to the Internet is managed by a unique IP address and domain name

Sample terms IP address (IPv6, IPv4, global, private), domain name, DNS, URL

(2) Internet service

・the characteristics of various services used on the Internet, such as e-mail, Web, and file transfer, and the key points to consider about their utilization

Sample terms broadcast mail, mailing list, mailbox, cc, bcc, cookie, MIME, RSS, online storage

(3) Communication service

・the outline of communication service

Sample terms carrier, MVNO (Mobile Virtual Network Operator), ISP (Internet Service Provider), packet communication, mobile communication, IP telephone, optical communication, carrier aggregation, dithering, SIM card, telematics

Sample usage the concepts of packet communication, the concepts of charging by the metered rate system and flat rate system

Major category 9: Technology element
Middle category 23: Security

61. Information security

[Goal]

- Understand the fundamentals of information security from the viewpoint of safe activities in a network society.

[Description]

- ✓ Understand that information security is required to collect and utilize information safely.
- ✓ Understand the types of threats, the fundamental ways of coping with them, and vulnerabilities.
- ✓ Understand typical of attack methods, and ways of coping with them.

(1) The concepts of information security

・the fundamental concepts and the purpose of information security

Sample terms cyberspace, cyberattack

(2) Information assets

・there are customer information, sales information, intellectual property related information, and personnel information as typical types of information assets in a company

(3) Threat and vulnerability

・the types of typical threats to information security, and the fundamental ways of coping with them

・the vulnerability, which is a factor that may cause security incidents

(a) The types and the characteristics of human threats

・the types and characteristics of typical human threats

Sample terms leakage, loss, damage, peep, spoofing, cracking, social engineering, internal fraud, operational error

Sample usage management of information based on information security policies

(b) The types and characteristics of technical threats

・the types and characteristics of typical technical threats

Sample terms malware (computer virus, bot, spyware, ransomware), worm, Trojan horse, RAT, micro virus, Gumblar, key logger, backdoor, file sharing software, SPAM

(c) The types and characteristics of physical threats

・the types and characteristics of typical physical threats

Sample terms disaster, destruction, sabotage

(d) Vulnerabilities

・the outline of vulnerabilities, such as defects in information security in information systems, inadequate arrangement of conduct codes in an organization, and incomplete compliance with the codes among employees

Sample terms bug, security hole, human vulnerability, shadow IT

(e) Fraud mechanism

・the factors that cause fraud, and the concepts of developing the environment to prevent the occurrence of information security accidents and incidents due to internal fraud

Sample terms fraud triangle (opportunity, motivation, rationalization)

(4) Attack methods

・the outline of illegal acts and methods against information systems, organizations, and individuals from outside, and their countermeasures

Sample terms dictionary attack, brute force attack, password list-based attack, cross-site scripting, drive by download, SQL injection, cache poisoning, DoS (Denial of Service) attack, DDoS attack, targeted attack (water hole attack, interaction type attack, etc.), phishing (one-click fraud, etc.), zero-day attack, exploitation of service and software functions

62. Information security management

[Goal]

➢ Understand the fundamental concepts about risk management and information security management, and fundamentals of information security countermeasures.

[Description]

✓ Understandthe necessity for risk management.

✓ Understand the purpose and the fundamental concepts of information security management, as well as protection of personal information.

✓ Understand typical information security organizations and associated systems, inside and outside of the organization

(1) Risk management

・risk management is performed in a flow of the identification, analysis, evaluation, and response of a risk

・maintenance of manuals and preparations such as education and training are needed to cope with an incident or accident

Sample terms risk assessment process (risk identification, risk analysis, risk assessment), risk treatments (risk avoidance, risk sharing, risk transfer, risk diversification, risk retention)

(2) Information security management

・the necessity for information security management, and the concepts of ISMS (Information Security Management System)

Sample terms information security policy, elements of information security (confidentiality, integrity, availability, authenticity, accountability, non-repudiation, reliability) information security risk, information security incident, continual improvement (PDCA, etc.)

(3) Protection of personal information

・the necessity for protection of personal information and the purpose of measures, such as relevant laws and the Privacy Mark System

Sample terms privacy policy (personal information protection policy), security measures, cyber insurance

(4) Information Security Organization

・the roles and associated systems of information security organizations, which accept reports of

damage caused by unauthorized access, make suggestions to avoid a repetition of problems, and carry out educational activities associated with information security

Sample terms: information security committee, CSIRT, SOC (Security Operation Center), unauthorized computer access report system, computer virus report system, report system for vulnerability-related information for software and systems, J-CSIP (Initiative for Cyber Security Information sharing Partnership of Japan), Cyber Rescue and Advice Team against targeted attack of Japan (J-CRAT)

63. Information security measures and information security implementation technology

[Goal]

- Understand the fundamental concepts of information security and necessary measures in the organization.
- Understand necessary efforts to ensure information security in IoT systems.

[Description]

- ✓ To take necessary measures appropriately against various threats to information security, understand and take fundamental measures in terms of human, technical, and physical securities.
- ✓ Understand the roles of technologies, such as encryption, authentication, and public key infrastructure required to maintain information security.
- ✓ Understand the items recommended in various guidelines to ensure information security for IoT systems.

(1) The types of information security measures

・the fundamental concepts of human, technical, and physical securities as measures for information security

(a) The types of human security measures

・the types of human security measures

・taking fundamental measures in familiar business tasks

Sample terms: information security awareness, surveillance, Guidelines for the Prevention of Internal Improprieties in Organizations, access privilege

Sample usage: the education and training about information security; observance of information security policies, internal rules, and manuals; access controls such as setup of an access privilege

(b) The types of technical security measures

・the types of technical security measures

・taking fundamental measures in familiar business tasks

Sample terms: content filtering, callback, access control, firewall, DLP (Data Loss Prevention), quarantine network, DMZ (demilitarized zone), SSL/TLS (Secure Sockets Layer/Transport Layer Security), VPN (Virtual Private Network), MDM (Mobile Device Management), digital watermark, digital forensics, penetration test, blockchain, tamper resistant

Sample usage: installation of antivirus software, the update of virus definition files, security setup of an e-mail and a web browser, vulnerability management (OS updating, application of security patches, etc)

(c) The types of physical security measures
- the types of physical security measures.
- taking action according to the rules in the organization

Sample terms: surveillance camera, locking management, entrance access control, clear desk/clear screen, security cable, remote backup
Sample usage: entrance access control using IC cards

(2) Encryption technology
- the fundamental mechanism of encryption technology required to maintain information security and the characteristics of encryption strength

Sample terms: common key cryptography, public key cryptography, hybrid cryptography, encryption, decryption, disk encryption, file encryption
Sample usage: encryption of wireless LAN using WPA2

(3) Authentication technology
- the necessity of authentication and the outline of what kind of authentication technologies are used to prevent threats
- the outline of what each technology can prove

Sample term: digital signature (signing key, verification key), timestamp (time authentication)

(4) User authentication
- the types and characteristics of technologies used for user authentication

Sample term: Login (User ID, password), access control, IC card, one-time password, multi-factor authentication, single sign-on

(5) Biometric authentication
- the types and characteristics of biometric authentication technologies used for user authentication

Sample term: vein authentication, iris authentication, voice authentication, face authentication, retina authentication, false rejection rate, false acceptance rate

(6) Public key infrastructure
- the fundamental scheme and characteristics of the public key infrastructure

Sample term: PKI (Public Key Infrastructure), digital certificate

(7) Security of IoT Systems
- there are various guidelines formulated for the design and development of IoT systems and IoT devices

Sample term: IoT Security Guideline, IoT Security Guide for Consumer

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－ IT Passport Examination (Level 1) －
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