■ Information Technology Engineers Examination

IT Passport Examination

(Level 1)

Syllabus

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

Version 6.3

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.

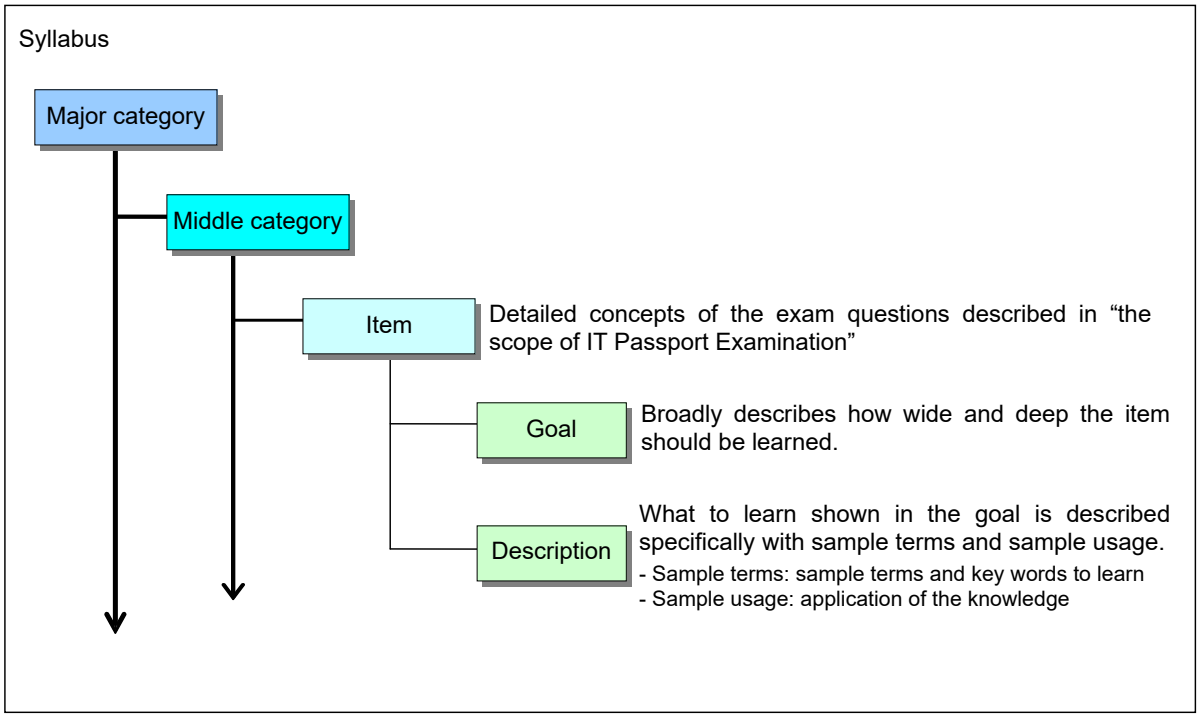

Figure 1 Configuration of the syllabus

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

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■ Revision history

[Ver. 6.3] December 2023

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

[Ver. 6.2] August 2023

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

[Ver. 6.1] August 2023

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

[Ver. 6.0] October 2021

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

[Ver. 5.0] September 2020

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

[Ver. 4.1] May 2020

➢ Page	➢ Change
➢ 25, 26	➢ Addition of sample terms and review and settlement of terms

[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

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STRATEGY

Major category 1: Corporate and Legal Affairs
Middle category 1: Corporate Activities

1. Management and organization theory

[Goal]

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

[Description]

- ✓ Understand the basic 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 purposes and the basic concepts of corporate activities
- the concepts on people, materials, money, and information, and the meaning and need for, the management and techniques for them in business management
- the concepts of corporate philosophy and mission, and the vision as the way the company wants to be

Sample terms: management principles (corporate philosophy), MVV (mission, vision, value), human capital management, purpose management, shareholders meeting, closing account, CSR (Corporate Social Responsibility), SRI (Socially Responsible Investment), disclosure, audit, green IT, carbon footprint, SDGs, stakeholder, corporate brand,

(2) Business management

- the basic concepts of business management

(a) What is business management?

- the purposes of business management

Sample terms: business objectives, financial management, asset management, human resource management, information management, PDCA (Plan, Do, Check, and Act), BCP (Business Continuity Plan), BCM (Business Continuity Management), risk assessment

(b) Human resources management

- the importance of human resources management in business management

Sample terms: coaching, mentoring, OJT, Off-JT, e-Learning, reskilling, adaptive learning, CDP (Career Development Program), mental health, HR Tech, MBO (Management By Objectives and self-control), HRM (Human Resource Management), retention, talent management, leadership, motivation, work engagement, work-life balance, DE&I (Diversity, Equity & Inclusion)

Sample usage: styles of leadership (contingency theory, shared leadership, servant leadership, etc.), initiatives for diverse work style, types of telework (telecommuting, mobile work, satellite office work, workcation) and management considerations (difficulties in labor management, etc.)

(3) Management organization

- the basic concepts of management organizations

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Sample terms hierarchical organization, divisional organization, functional organizations, matrix organization, project organization, company system, holding company, CxO (Chief x Officer (CEO (Chief Executive Officer), CIO (Chief Information Officer), etc.)

(4) Trends of IT utilization in society

・the overview of trends of IT utilization in society

(a) Advancement of IT and accompanying social changes

・the changes in society that the evolution of information technology is driving, such as sophistication of data analysis, and evolution of AI
・the relationship between human intellectual activities and the evolution of AI
・the changes in the way we view things from the perspective of human intellectual activities and the way we view things from the perspective of data

Sample terms increased processing power of computers, increase in diversity of data and the volume of data, evolution of AI

(b) Trends of IT utilization in business activities and social life

・the overview of trends of IT utilization in business activities and social life
・the usefulness of IT in solving various social issues arising from social changes (such as changes in supply, demand, and liquidity in the labor market, demographics, the global environment, energy issues, and education disparities)

Sample terms fourth Industrial Revolution, Society5.0, super smart society, data-driven society, digital transformation (DX), green transformation (GX), carbon neutral, National Strategic Special Zones (Super City Law), Basic Act on the Advancement of Public and Private Sector Data Utilization, Basic Act on Formation of a Digital Society

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2. Business analysis and data utilization

[Goal]

- Analyze familiar business tasks and understand and utilize typical techniques for solving problems by utilizing data.
- 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, data utilizations, OR (Operations Research) and IE (Industrial Engineering) techniques for analysis.

(5) Understanding business tasks

・the visual representations such as information collection and workflow to understand details of business tasks

Sample terms: questionnaire, interview (structured, semi-structured, unstructured), fieldwork

(6) Analysis of business operations and operational planning

・the typical methods for analyzing business operations, data visualization methods

(a) Business analysis methods

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

Sample terms: Pareto chart, ABC analysis, cause and effect diagram (fishbone diagram) , control chart, tree diagram chart, PERT (arrow diagram), critical path method, least squares method, regression analysis, correlation and causation, spurious correlation

Sample usage: business improvement using a Pareto chart or using regression analysis

(b) Data visualization with charts and graphs

・the explanations of data to others by selecting appropriate visualization methods according to the purpose

・not to be deceived by improperly created graphs and not to create such graphs

・the utilizations of tools (software packages) to analyze data and solve problems or improve efficiency

Sample terms: bar graph, line graph, scatter diagram, matrix diagram, box-and-wisker plot, heat map, radar chart, histogram, mosaic plot, cross tabulation table, contingency table, correlation coefficient matrix, scatter plot matrix, composite graph, dual axis graph, logic tree, concept map, CSV (Comma Separated Value), shapefile, co-occurrence keywords, chartjunk

Sample usage: graphical representation of data (charting), data analysis using charts and graphs, selection of tools according to the purpose of use, use of tools for organizing, searching, analyzing, processing, and representing data, example of excellent visualization (multidimensional visualization, relationship visualization, behavior and trajectory visualization, real-time visualization, text data visualization, etc.)

(7) Data utilization

・the business improvement and the problem solving by analyzing and utilizing data

(a) Data types and preprocessing

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・the purposes of collecting data, the types and characteristics of data to be collected
・the simple preprocessing for data utilization
・the creation and notation of machine-readable data

Sample terms survey data, experimental data, human behavior log data, machine operation log data, GIS data, quantitative data, qualitative data, primary data, secondary data, metadata, structured data, unstructured data, time series data, cross-sectional data

Sample usage sampling of data, name notation unification/name-based aggregation of data, handling outlier, abnormal value, and missing value of data, annotation, seasonal adjustment and moving average of data, natural language processing, image processing

(b) Utilization of statistical data in data analysis
・the importance of what we can tell from data, and of proper understanding what the data mean
・the importance of domain-specific knowledge (industry, specialty, etc.) related to the data being handled
・the importance of confirming the site whether the data occurred
・Reading and understanding documents and phenomena, and analyzing, discussing and expressing the relationships between them

Sample terms population, sampling (census, questionnaire survey, complete survey, simple random sampling, stratified sampling, multistage sampling), hypothesis testing, significance level, type I error, type II error, precision and bias, statistical biases (selection bias, information bias, etc.), cognitive bias

Sample usage differences in properties of each representative value, understanding without misled by exaggerated statistical information

(c) Data science, big data analysis
・background and implications of what is happening by reading and understanding the characteristics of data
・the importance of inductive reasoning in data science, and its advantages and disadvantages

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

Sample usage big data classification (open data, personal data, etc.) and utilization, points of attention and issues of when utilizing Big Data

(8) Decision making
・efficient decision making to solve problems

Sample terms decision tree, modeling (deterministic model, probabilistic model), data assimilation fin simulation, prediction, grouping, pattern discovery, optimization, inventory control, credit control, ordering method

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

(9) Problem-solving techniques
・basic techniques for solving problems

Sample terms brainstorming, brainwriting, affinity diagram

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3. Accounting and financial affairs

[Goal]

- Understand the basic 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

・terms and concepts

Sample terms: profit, gross profit, operating profit, break-even point, cost, variable cost, fixed cost, volume of sales, variable cost 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 basic financial statements and analysis taking advantage of financial indexes

(c) Other tax related

・overview of familiar taxes

Sample terms: consumption tax, corporation tax, Qualified Invoice Storage Method (Invoice System)

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4. Intellectual property rights

[Goal]

- Understand the basics 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

- copyrights arise from intellectual creations such as music, videos, cartoons, and computer programs and that acts of copying without permission and downloading them knowing that the content has been illegally uploaded are illegal
- rights also arise to people who transmit works by various means, such as singers and broadcasters, and it is illegal to transmit works to the public without permission
- exceptional use of copyrighted work is possible in educational institutes for educational purposes such as distance learning
- it is necessary to pay attention to the data used by AI for learning and the data generated by AI, respectively, from the viewpoint of copyright

(2) Laws on industrial property rights

- there are rights protected by registering an invention or a design
- unapproved use is illegal
- it is necessary to pay attention to the data used by AI for training and the data generated by AI respectively, from the viewpoint of industrial property rights

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 and shared data with limited access 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, volume license agreement, site license agreement, CAL (Client Access License), open source software, free software, public domain software, activation, subscription

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

(5) Other rights

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

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5. Laws on security

[Goal]

- Understand the overview of typical laws on security.

[Description]

- ✓ Understand that there is a law named the Basic Act on Cybersecurity, which defines the basic policies for cybersecurity in Japan and understand its overview.
- ✓ Understand that there is a law named the Act on the Prohibition of Unauthorized Computer Access (Laws related on prohibition of acts of unauthorized computer access, etc.) that can allow to punish even if no actual damage incurred.
- ✓ Understand the difference between general personal data, personal information, and personal data
- ✓ Understand the overview of various other laws related to information security.

(1) Basic Act on Cybersecurity

・the purpose and the basic concepts of Basic Act on Cybersecurity

(2) Laws related on prohibition of acts of unauthorized computer access, etc.

・what is defined as acts of unauthorized access and what should be done to prevent unauthorized access

・the basic concept of the Act on the Prohibition of Unauthorized Computer Access

(3) Act on the Protection of Personal Information (Laws related to personal information protection)

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

Sample terms: business operator handling personal information, Personal Information Protection Commission, individual identification code, special care-required personal information, anonymously processed information, opt-in, opt-out, provision to a third party, My Number Act (Act on the Use of Numbers to Identify a Specific Individual in Administrative Procedures)

(4) International trends in protection of personal data

・the overview of international trends in personal data protection

Sample terms: General Data Protection Regulation (GDPR), right to be forgotten (right to erasure), pseudonymization, anonymization

(5) Other laws on information security

・the overview of various laws on information security

Sample terms: Act on Regulation of Transmission of Specified Electronic Mail, crime on electromagnetic records of unauthorized commands (penalty on computer virus creation)

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6. Laws on labor and transaction

[Goal]

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

[Description]

✓ Understand the existence and overview of laws on labor and transaction in order to develop conditions related to working conditions and transactions and to promote work style reforms.

(1) Laws on labor

- the basic 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
- there are laws such as the Industrial Safety and Health Act and the Labor Measures Comprehensive Promotion Act (Power Harassment Prevention Act) for the purpose of improving workers' safety, mental and physical health, employment stability, and occupational life

(a) Labor Standards Act

- the act regulates the minimum requirements that must be observed in labor contracts, such as working hours, wages, etc.

Sample terms: Article 36 agreement, flexible working hours system, discretionary labor system, minimum wage

(b) Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved Working Conditions for Dispatched Workers (Act for Worker Dispatching Business)

- there are regulations that dispatch business owners must follow such as licenses required to dispatch workers

(c) Non-disclosure agreement

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

(d) Contract types

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

Sample terms: (quasi-)mandate contract, employment contract

(2) Laws on transaction

- Act against Delay in Payment of Subcontract Proceeds, etc. to Subcontractors is a law to prevent delays in payment of subcontract proceeds and protect the interests of subcontractors
- Payment Services Act and Financial Instruments and Exchange Act, etc. are laws for IT utilization in the financial sector
- Act against Unjustifiable Premiums and Misleading Representations is a law to regulate advertisements that deceive consumers with exaggerated expressions, etc., and stealth marketing that conceals the fact that it is an advertisement even though it is an advertisement

Sample terms: Act on Specified Commercial Transactions, Antimonopoly Act, Act on Improving Transparency and Fairness of Specified Digital Platforms, Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors, Payment Services Act, Financial Instruments and Exchange Act, Product Liability Act, Act against Unjustifiable Premiums and Misleading Representations

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7. Other laws, guidelines, and information ethics

[Goal]

- Understand the concept of norms for companies, etc., and regulate one's own actions.
- Understand the basic concept of information disclosure requests to government 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

Sample terms　Business and Human Rights, harassment

(2) Information ethics

・there are laws and regulations, social norms, morals, and ethics that must be observed when acting in a data-driven society

・it is necessary to pay attention to the data used by AI for training and data generated by AIfrom the viewpoints of of personal information protection, privacy, and confidentiality, respectively

Sample terms　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 (Request for Sender Information Disclosure, Request for transmission prevention measures, etc.), social media policy (social media guidelines), netiquette (Internet manners), fabrication, falsification, and theft of data, chain letter, fake news, hate speech, echo chamber, filter bubble, digital tattoo, harmful site access restrictions (filtering, parental control, etc.), fact check, ELSI : Ethical, Legal and Social Issues

(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

(5) Environment-related law

・there are various laws considering environment

Sample terms　Act on Waste Management and Public Cleansing, acts for recycling, GX (Green Transformatio) promotion act

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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.
- ✓ Understand that there are standards to follow and standards as guidelines.

(1) Standardization

・the need for and significance of standardization

Sample terms de facto standard, de jure standard, forum standard

(2) Examples of the standardization in IT

・the standardization of shapes of connectors, communication methods, code expressions, etc. and examples of their utilization in IT

Sample usage 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), ISO 9000 (Quality management systems), ISO 14000 (Environmental management systems), ISO 26000 (Guidance on social responsibility), ISO/IEC 27000 (Information security management systems) ISO 30414 (Guidelines for internal and external human capital reporting), JIS Q 31000 (Risk management), JIS Q 38500 (Governance of IT for the organization)

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

9. Business strategy techniques

[Goal]

- Understand the basic concepts about typical analysis methods of management information.

[Description]

- ✓ Understand the basic concepts of analysis methods of management information for establishing business strategy using methods for analyzing information about corporate activities.

(1) Analysis methods of management information

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

Sample terms: SWOT analysis, PPM (Product Portfolio Management), VARIO analysis, 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, homogenization strategy, bule ocean strategy, ecosystem, 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, ESG investment

10. Marketing

[Goal]

- Understand the basic concepts about marketing.

[Description]

- ✓ Learn the existence and purpose of marketing, and understand how to utilize the results of related data collection and data analysis for marketing.
- ✓ Understand the types and characteristics of typical marketing and pricing methods.
- ✓ Understand the concepts and effective use of web marketing.

(1) Basics of marketing

・the basic concepts and information utilization about marketing

Sample terms: marketing research, sales; product and purchase plan, advertisement, sales promotion, customer satisfaction, UX (User Experience), CX (Customer Experience), customer journey map, 4P, 4C, RFM (Recency: last purchase day, Frequency: purchase frequency, Monetary: cumulative purchase amount) analysis, Ansoff growth matrix, omnichannel, brand strategy, product life cycle, positioning

Sample usage: sales promotion dealing with customer analysis

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(2) Marketing techniques

・the types and characteristics of typical marketing methods

Sample terms segment marketing, direct marketing, cross-media marketing, in-bound marketing, location-based marketing, push strategy, pull strategy

(3) Web marketing

・the concept and effective use of the Internet and web advertising, and sales promotion

Sample terms Internet advertising, opt-in email advertising, banner advertising, listing advertising (search linked advertising), SEO (Search Engine Optimization), A/B testing, affiliate, recommendation, digital signage

(4) Price setting method

・the types and characteristics of typical price setting method

Sample terms skimming pricing, penetration pricing, dynamic pricing

11. Business strategy and goal/evaluation

[Goal]

➢ Understand typical information analysis techniques and goal setting techniques for business strategy planning.

[Description]

✓ Understand there are indicators and techniques for analyzing information and setting goals in business strategy planning.

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

・the basic reasoning based on information required for business strategy planning

・the basic information analysis techniques and terminology for goal setting and evaluation

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 basic information analysis techniques, goal setting by using goal setting frameworks (GROW model, KPI tree, SMART, etc.)

12. Business management system

[Goal]

➢ Understand the basic concepts of the business management system.

[Description]

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

(1) Business management system

・the basic terms and concepts about business management system

Sample terms CRM (Customer Relationship Management), value chain management, SECI (Socialization, Externalization, Combination, Internalization) model, 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)

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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
- technological development that leads to innovation is required
- 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, Devil River, Valley of Death, Darwinian Sea, hackathon, chasm, The Innovator's Dilemma, design thinking, persona method, PoC (Proof of Concept), PoV (Proof of Value), backcasting, Business Model Canvas, lean startup, API (Application Programming Interface) economy, VC (Venture Capital), CVC (Corporate Venture Capital)

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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.
- ✓ Understand the concepts of utilizing AI in various business fields

(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), ITS (Intelligent Transport Systems), ETC (electronic toll collection) system, IC card, RFID (IC tag), self-checkout, SFA (Sales Force Automation), traceability, smart grid, CDN (Content Delivery Network), digital twin, Cyber-Physical System (CPS)

Sample usage: business improvement using IC cards or RFID, utilization of blockchain (ensuring traceability, smart contract, etc.)

(2) Systems in government administration

・the characteristics of typical systems in government administratration

Sample terms: digital government, government cloud, Base Registry , Basic Resident Registeration Network System, e-Gov, electronic local government, electronic application, electronic procurement, electronic bidding, My Number, My Number Card, Mynaportal, emergency alert, J-Alert (national early warning system)

(3) Typical software packages

・the characteristics of typical software packages

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)

(4) Utilization of AI (Artificial Intelligence)

・the overview of principles and guidelines for AI utilization

・the areas and purposes of AI utilization, and the overview of considerations for AI utilization

(a) Principles and guidelines for AI utilization

・the overview of principles and guidelines related to AI utilization, such as the basic principles (Social Principles of Human-Centric AI) for better social implementation and sharing of AI

Sample terms: Social Principles of Human-Centric AI (Human-Centric Principle, Principles of Fairness, Accountability, and Transparency, etc.), AI Utilization Guidelines (AI Utilization Principles), Ethics guidelines for trustworthy AI, The Japanese Society for Artifical Intelligence Ethical Guidelines

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(b) Utilization areas and purpose of AI

- AI is used in various areas (production, consumption, cultural activities) such as R&D, procurement, manufacturing, logistics, sales, marketing, services, finance, infrastructure, public, healthcare, etc.
- the purposes of AI utilization include hypothesis verification, knowledge discovery, causal investigation, planning, decision support, activity alternative, etc.

Sample terms: artificial narrow intelligence, artificial general intelligence , recognition by AI, automation by AI, AI assistant, generative AI, multimodal AI, randomness

Sample usage: big data analysis by AI, prediction by supervised learning (sales prediction, morbidity prediction, deal prediction, defection prediction), grouping by unsupervised learning (customer segmentation, store clustering), control by reinforcement learning (automatic driving control of automobiles, vibration control of buildings), AI services combining multiple technologies, utilization of APIs provided by AI services, generative AI utilization (text correction and summarization, idea suggestion, scientific paper writing, programming, image generation, etc.)

(c) Points of consideration for utilizing AI

- understanding of the threats and negative cases when utilizing AI
- data collection methods and usage conditions used for AI learning, and output risks
- the possibility that incorrect information, biased information, old information, or malicious information (discriminatory expressions, etc.), and information whose learning sources are unknown are included in AI ouput
- the necessity of human involvement to AI output

Sample terms: XAI (Explainable AI), Human-in-the-Loop (HITL), bias due to AI user involvement, algorithm bias, reponsiblity of AI services, trolley problem, hallucination, deep fake, AI services opt-out policy

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 supporting design and manufacturing through automation, improving efficiency of 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

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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 basic concepts of electronic commerce

(a) Characteristics of electronic commerce

・the basic 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, freemium, catalog sales

(b) Classifications of electronic commerce

・the types of electronic commerce

Sample terms EC (electronic commerce or e-commerce), O2O (Online to Offline), OMO (Online Merges with Offline), EDI (Electronic Data Interchange), EFT (Electronic Fund Transfer), cashless payment (carrier billing by smartphone, contactless IC card payment, QR code payment, etc.), FinTech, crowdfunding, NFT (Non-Fungible Token)

(c) Using electronic commerce

・the specific examples of usage and methods of electronic commerce

Sample terms e-marketplace, online mall, electronic auction, Internet banking, Internet trading, escrow service, IC card/RFID application system, crowdsourcing, electronic money, crypto assets, Central Bank Digital Currency (CBDC)

(2) Points to note in electronic commerce

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

Sample terms account aggregation, eKYC (electronic Know Your Customer), AML/CFT (Anti-Money Laundering/Countering the Financing of Terrorism) solutions

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 basic characteristics and examples.

(1) Systems using IoT

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

Sample terms drone, AR glasses, MR glasses, VR goggles, smart glasses, smart speaker, connected car, automatic driving, autonomous driving level, CASE (Connected, Autonomous, Shared & Services, Electric), MaaS (Mobility as a Service), wireless charging system, robots (industrial, medical, nursing care, disaster response, etc.), effects brough about by IoT (monitoring, control, optimization,

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autonomy) cloud service, smart city, smart factory, smart agriculture, machine vision, HEMS (Home Energy Management System)

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 basic technologies used in them

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

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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)

19. Business process

[Goal]

- Understand the concepts of business improvement and problem solving.
- Understand the concepts of typical modeling in business models.
- Understand and utilize groupware and office tools effectively.
- 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 typical model notation

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

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(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)

Sample usage initiatives for telework, analysis of customer behavior and emotions by utilizing AI, automation of business processes by using AI

(b) System utilization for communication

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

Sample terms web conference, e-mail, electronic bulletin board, blog, chat, SMS (Short Message Service), SNS (Social Networking Service), sharing economy, lifelog, information bank, PDS (Personal Data Store)

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

・the solution business involves building a relationship of trust with customers, learning about their problems, proposing solutions, and providing support for problem solving

・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

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(Desktop as a Service), forms of cloud service delivery(public cloud, private cloud, hybrid cloud, multi-cloud, etc.), ASP (application service provider), outsourcing, hosting service, housing service, on-premises, managed service

21. System utilization promotion and evaluation

[Goal]

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

[Description]

- ✓ Understand that dissemination and awareness raising about information technology (IT) is necessary to make use of information systems in business activities and business execution.
- ✓ Promote to learn digital literacy required for utilization of information systems in business tasks, and make the most useof information systems in business tasks.
- ✓ Understand the importance of evaluating and verifying actual status of information system usage.

(1) Digital literacy

・the ability to understand and effectively use of digital technologies such as computers and application software to carry out business activities and business execution

(2) Dissemination and awareness raising

・the importance of dissemination and awareness raising activities such as education to utilize information systems

Sample terms gamification, digital divide

(3) Evaluation and verification of information system utilization

・the importance of evaluating and verifying the actual status of information system usage by return on investment analysis of information systems, user satisfaction surveys, etc.

・the significance of disposing and renewing legacy systems that have declined in safety and efficiency with the changing times

Sample terms cost-effectiveness analysis, maintenance cost, user satisfaction survey, system life cycle, disposal and renewal of legacy system

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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 basic flow of procurement.

[Description]

- ✓ Understand the basic 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

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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, Contract Guidelines on Utilization of AI and Data

(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

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Management

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

25. System development technology

[Goal]

- Understand the basic 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, 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, etc. required for the system and software

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

(b) Design

・there are system design, software design, etc., and the basic roles of each

Sample terms: functional design, detailed design

(c) Programming (includes up to unit testing)

・a program is created according to the design
・a unit test is performed to check 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) Integration and testing

・integration of unit-tested programs and check that the software or system worked as required
・there is a cycle of planning, implementation, and evaluation in a test
・it is necessary to evaluate performance against goals when conducting tests

Sample terms: integration test, black box test, performance test, load test, regression test

(e) Installation and acceptance

・the acquirer (outcourcer), with the assistance of the supplier (outsourcee), uses the system in its intended operating environment and checks if the system achieves its intended purpose
・if there are no problems in the acceptance test by the acquirer (outsourcer), the system are delivered
・education and training are provided to operators, users, and other interested parties

Sample terms: user manual, acceptance test, validation test, migration

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(f) Maintenance

・systems and software are modified, changed, and improved to ensure stable operation of the system and to respond to IT developments and changes in business strategies

(2) Estimate of software

・the basic 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

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

26. Development process and methods

[Goal]

- Understand the overview, 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 aims and characteristics of typical software development methods

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

(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, a lightweight method for rapid and adaptive software development

・basic terminology related to agile development

Sample terms: user story, XP (extreme programming), test driven development, pair programming, refactoring, retrospective, continuous integration (CI), scrum, scrum team (product owner, developer, scrum master), sprint, product backlog, sprint backlog

(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

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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 basic flow of the process in project management.

[Description]

✓ In order to promote a system development project smoothly, understand the overall basic 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 the project

(b) Project management process

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

Sample terms: project charter, project scope management, project communication management, project risk management, project manager, project member, stakeholder, 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

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

28. Service management

[Goal]

- Understand the significance, purpose, and concepts of 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 service management exists as a set of capabilities and processes that direct and manage organizational activities and resources for planning, designing, transitioning, delivering, and improving services, and understand its significance, purpose, and concepts.

(1) Service management

・Service management serves as a set of capabilities and processes that direct and control organizational activities and resources for planning, designing, transitioning, delivering, and improving services to deliver value.

Sample terms service

(2) ITIL

・ITIL (Information Technology Infrastructure Library) is a framework for service management.

(3) Service level agreement

・SLA (Service Level Agreement) serves as a document of agreement between the organization and the customer specifying the service and its agreed performance.

Sample terms SLA, SLO, SLI

29. Service management system

[Goal]

- Understand the overview of service management system and related items such as service desk.

[Description]

- ✓ Understand the overview of service management system.
- ✓ Understand the basic roles and overview of the service desk (help desk).

(1) Service management system overview

・the overview of the requirements for an organizatio regarding the service management system governing service management activities

Sample terms service management system, service requirements, service level management (SLM), demand management, service request management, incident management , problem management, configuration management, change management, release and deployment management, service availability management, service continuity management, service reporting, continual improvement, PDCA, service catalogue, escalation, transition of service, service acceptance criteria

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(2) Service desk (help desk)

・the service desk provides a single point of contact (SPOC) for service user inquires and performs service request management activities (recording and categorizing, prioritizing, fulfilling, closing, and recording response results, etc.).

Sample terms SPOC, FAQ, chatbot, AIOps

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 UPS (Uninterruptible power supply), private electric generator, 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

Sample terms Green IT (Green of IT)

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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 basic flow of system audit.

[Description]

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

(1) Audit

・the purpose and types of audits related to information systems

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

(2) System audit

・the purpose of system audit, and the basic flow of system audit

(a) Purpose of system audit

・the purpose of a system audit is to ensure that an independent, objective system auditor with high ethical standards verifies and evaluates if appropriate actions are being taken for risks associated with an information system (information system risks) so as to provide guarantees and advices and to support effective and efficient implementation as well as reforms of the management activities and business activities of the organization, and thus contribute to the achievement of objectives of the organization, and be accountable to the interested parties

Sample terms system auditor, system audit standards

(b) Flow of system audit

・a system audit performed based on the flow of formulating an audit plan, implementing the audit (preliminary audit, main audit, evaluation, and conclusion), and performing audit reporting and follow-up

Sample terms system audit plan, application of audit procedures based on risk approach, obtaining and evaluating audit evidence, preparation and retention of audit working paper, preparation and reporting of system audit report, follow-up of improvement proposal, typical techniques for system audits

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, etc. 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 an organization so that the company

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itself or the like can perform its business in a right and proper way and clarification of business processes, segregation 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 is a component of organizational governance, and is the activity of developing and implementing IT strategy and policies by the board of directors, etc.,to indicate the ideal state of IT utilization in the organization, based on the needs of stakeholders, in order to enhance the value of the organization and their trust in the organization.

(3) IT management

・IT management is the activity of establishing and operating a system to implement controls on the use of IT systems and report the results to management in order to achieve the goals of the IT strategy formulated based on the management policy and IT governance policy.

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Technology

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

33. Discrete mathematics

[Goal]

- Understand the basic concepts of radixes.
- Understands the basic concepts of sets.

[Description]

- ✓ In order to know basic theories about numeric values and data handled by computers, understand the basic 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 basic concepts and usage of sets, propositions, Venn diagrams, and truth tables

(3) Logical operations

・the concepts of logical operations, basic 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 basic concepts of probability and statistics.

[Description]

- ✓ Understand the basic concepts of probability and statistics, numerical calculation, numerical analysis, graph theory, queueing, and optimization problems necessary for collection, analysis, and processing of data.

(1) Probability and statistics

・the basic concepts of probability and statistics

(a) Overview of probability

・the concepts of permutation, combination, and probability

(b) Overview of statistics

・the concepts of basic statistics, such as frequency distribution table, histogram, and representative value

Sample terms mean, median, mode, standard deviation, deviation value, variance, correlation coefficient, explanatory variable, objective variable, estimation, hypothesis testing, regression analysis, correlation analysis

(2) Numerical calculation, numerical analysis, mathematical processing

・numerical calculations, numerical analysis and mathematical processing by correctly setting up

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data to be compared

Sample terms: data aggregation (sum, average), data sorting, ranking, linear algebra, vector, matrix, differentiation and integration of single-variable function, scale (nominal scale, ordinal scale, interval scale, proportional scale), error

Sample usage: comparison of data (comparison with the same conditions, comparison before and after processing), handling of errors in data

(3) Graph theory

- the basic concepts of graph theory, how to read graphs

Sample terms: node, edge, directed graph, undirected graph

(4) Queueing theory

- the basic concepts of queueing (but the theoretical contents, such as the M/M/1 queueing model, are not asked on the test)

(5) Optimization problem

- the basic concepts of optimization problem

35. Theory of information

[Goal]

- Understand the unit of information content.
- Understand the basic concepts of digitization of information.
- Understand the basic concepts of AI technologies.

[Description]

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

(1) Unit of information content

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

(2) Digitization

- the basic 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
- the characteristics of typical character codes

Sample terms: JIS code, Shift JIS code, Unicode

(4) Logical description

- able to express sentences in a natural language in a logical manner using symbols

Sample terms: predicate logic, deductive inference, inductive inference

(5) AI (Artificial Intelligence) technologies

- the basic concepts, mechanisms, foundation models, and characteristics of AI technologies (natural language processing, speech and image (still and moving images) recognition and

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synthesis, etc.)

Sample terms rule-based,feature, machine learning (supervised learning, unsupervised learning, reinforcement learning), neural network, backpropagation, activation function, overfitting, deep learning, pre-learning, fine-tuning, transfer learning, convolutional neural network (CNN), recurrent neural network (RNN), generative adversarial network (GAN), large-scale language model (LLM), prompt engineering

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

36. Data structure

[Goal]

- Understand the basic concepts of data structures.

[Description]

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

(1) Data and data structures

- the basic 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 and programming

[Goal]

- Understand the basic concepts of algorithms, how to express by a pseudo-programming language, etc., and purpose of programming.

[Description]

- ✓ Understand the basic concepts of algorithms in order to analyze and systemize business operations.
- ✓ Understand how to express simple algorithms using flow charts and a pseudo-programming language.
- ✓ Understand that programing is required to execute algorithms.

(1) Basic structures of algorithms

- basic structures of algorithms (sequence, selection, repetition)

(2) How to express algorithms

- as methods for expressing algorithms, there are flowcharts and pseudo-languages

Sample terms: expression, conditional expression, operator, assignment, comment, input/output (I/O), procedure, function, argument, return value, data type (integer type, real type, Boolean type, character type, etc.)

(3) Typical algorithms

- typical algorithms for searching, merging, sorting, etc.

Sample terms: algorithms for searching (linear search, binary search), algorithms for sorting (selection sort, bubble sort, quicksort)

(4) Programming

- programming is to describe an algorithm using a programming language
- programming allows computers to execute algorithms

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38. Programming languages

[Goal]

- Understand the types and characteristics of programming languages.

[Description]

- ✓ Understand to select an appropriate programming language according to the purpose of the program.
- ✓ Understand that there are coding standards, basic program structures, and libraries associated with programming using programming languages.

(1) Programming languages

- the types and characteristics of programming languages

Sample usage: C, Fortran, Java, C++, Python, JavaScript, R

(2) Cording standards and program structures

- the purpose and effects of cording standards
- using external libraries etc. allows for efficient programming

Sample usage: indentation, nesting depth, naming convention, module division, main routine, subroutine, library, API, web API, low code, no acode

39. Other languages

[Goal]

- Understand the types and basic usage of typical data description languages.

[Description]

- ✓ Understand the types and characteristics of data description languages that are widely used as means of expressing data to be handled with computers.
- ✓ Understand the simple usage (including writing) in using data description languages.

(1) Markup languages

- the characteristics and basic rules of markup languages which are typical data description languages

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

Sample usage: representation of web page in HTML, representation of data in XML

(2) Other languages

- the characteristics of typical data description languages used for exchanging data between programs written in different programming languages

Sample terms: JSON (JavaScript Object Notation)

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

40. Processor

[Goal]

- Understand the basic configuration and roles of computers.

[Description]

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

(1) Computer configuration

・a computer consists of five basic functions and that they work together

Sample terms: operation, control, storage, input, output

(2) Basic mechanism of aprocessor

・the basic mechanism, functions, and performance of a processor

Sample terms: operation, control, CPU, multi-core processor, GPU, GPGPU, 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) Types and characteristics of 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) , DDR3 SDRAM, DDR4 SDRAM, DDR5 SDRAM, DIMM, SO-DIMM

(2) Types and characteristics of 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 storage

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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 (Type-A/Type-B/Type-C, etc.), HDMI, DisplayPort, analog RGB, DVI, Bluetooth, IrDA, RFID, NFC

(2) IoT device

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

Sample terms: optical sensor, infrared sensor, magnetic sensor, acceleration sensor, gyro sensor, ultrasonic sensor, thermal sensor, humidity sensor, pressure sensor, smoke sensor, actuator (DC motor, hydraulic cylinder, pneumatic cylinder, etc.)

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)

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

43. System configuration

[Goal]

➢ Understand the basic 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 basic 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, virtualization (host type, hypervisor type, container type), VM (Virtual Machine), VDI (Virtual Desktop Infrastructure), web system, peer-to-peer, cluster, thin client, NAS, RAID, migration (live migration etc.)

(3) Utilization

・the characteristics of typical utilization

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

44. System evaluation indexes

[Goal]

➢ Understand the concepts of system performance, reliability, and economy.

[Description]

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

(1) System performance

・the concepts about system performance evaluation

Sample terms response time, benchmark

(2) System reliability

・the concepts about system reliability evaluation

(a) 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

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(b) Design of reliability

・the concepts of typical system configurations and reliable design to improve reliability

Sample terms dual system, duplex system, fail safe, fault tolerant, foolproof, cold standby, hot standby

(3) Economical efficiency of asystem

・the concepts about evaluation of economical efficiency of a system

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

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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) Necessity for OS

- an OS has control and management functions necessary to efficiently provide computer hardware and software resources for users and application software

(2) 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) Types of OS

- there are various types of operating systems, such as Windows, Mac OS, Chrome 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 basic concepts of backup.

[Description]

- ✓ From a viewpoint of utilizing a system in an office, understand the concepts of file management and how to use basic 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 basic file management mechanisms and file access methods
- basic operations, such as file sharing and setting access rights 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

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(2) Backup

・basic concepts, such as the necessity of backup, 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 basic operations for utilizing them in business tasks.

(1) Software packages

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

(2) Word processing software

・methods and characteristics of creating document files by using the basic functions of word processing software

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

(3) Spreadsheet software

・methods and characteristics of processing data by using the basic functions of spreadsheet software

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, using pivot data tables (pivot tables)

(4) Presentation software

・methods and characteristics of creating presentation materials by using the basic functions of presentation software

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

(5) Web browser

・methods and characteristics of searching and acquiring necessary information from web pages by using a web browser

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

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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 overview of open source software

(a) Characteristics of OSS

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

(b) Types of OSS

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

(c) License for OSS

・when using OSS, it is necessary to pay attention to the license that summarizes the license agreement for each OSS to be used

Sample terms GPL (GNU General Public License), copyleft

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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, mobile device (smartphone, tablet computer, wearable device, smart device, etc.)

(2) I/O device

・the types and characteristics of typical I/O devices

Sample terms: keyboard, pointing device (mouse, touch panel, joystick, pen tablet, etc.), image scanner, bar code reader, web camera, display (liquid crystal display, OLED (Organic Light Emitting Diode) display, head mounted display, etc.), projector, printer, 3D printer

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Major category 9: Technology element
Middle category 19: Information design

50. Information design

[Goal]

- Understand the concepts and techniques of information design.

[Description]

- ✓ Understand the concepts and techniques for conveying information accurately and improving operability depending on the purpose and situation of recipient.

(1) Concepts and methods of information design

- able to visualize and structure information, and organize relationships between components in an easy-to-understand manner
- understand the techniques for information design

Sample terms: principles of design (proximity, alignment, repetition, contrast), LATCH (Location, Alphabet, Time, Category, Hierarchy) principles, signifier, structured scenario method, UX design (User Experience design)

(2) Universal design

- The concepts of universal design aiming for comfortable use by as many people as possible, regardless of age, culture, disability, or ability difference.

Sample terms: accessibility, pictogram, infographics

51. Interface design

[Goal]

- Understand the characteristics of human interfaces.
- Understand the concepts of human interface design.

[Description]

- ✓ Understand the characteristics of human interfaces and the characteristics of each component of the typical interface, GUI.
- ✓ Understand that the interface, which is the point of contact between humans and systems, greatly influences ease of use and understanding, and understand the concept of desirable interfaces.

(1) Human interface

- the human interface is the interface between humans and systems and there are various techniques.

Sample terms: usability, gesture interface, multi-touch interface (tap, swipe, flick, pinch, long press, etc.), VUI (Voice User Interface)

(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, hover (rollover), tooltip

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(3) Screen design 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

(4) 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 web browsers

Sample terms CSS (Cascading Style Sheets), mobile first, responsive web design, redirect

(5) Human centered design

・Understand the concepts of human centered design to improve usability.

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Major category 9: Technology element
Middle category 20: Information and media

52. Multimedia technology

[Goal]

- Understand the mechanisms of characters, sounds and images, etc. on computers.
- Understand the characteristics of compression and decompression of information.

[Description]

- ✓ Understand that by multimedia technology which is necessary for utilizing of information and media, the information such as characters, sounds, and images, can be handled in computers in an integrated manner.
- ✓ Understand the characteristics of typical file formats, and information compression and decompression.

(1) Multimedia

・multimedia is the digitization of various forms of analog information, such as sounds and image (still image and video), as well as characters, and handles them in an integrated manner on computers.

Sample terms: web contents, hypermedia, encode, decode, streaming, DRM (Digital Rights Management), CPRM (Content Protection for Recordable Media), PDF (Portable Document Format), PDF (Portable Document Format)

(2) Sound processing

・the mechanism of digitization of sound data and the characteristics of typical sound file format

Sample terms: PCM (Pulse Code Modulation), MIDI, WAV, MP3, AAC

(3) Still image processing

・the basic mechanism of image representation in the computer and the characteristics of typical still image file format

Sample terms: raster data (bitmap data), vector data, JPEG, GIF, PNG, BMP, TIFF, EPS

(4) Moving image processing

・the basic mechanism of moving image representation in the computer and the characteristics of typical moving image file format

Sample terms: frame, frame rate, MPEG (Moving Picture Experts Group), H.264, H.265, AVI, MP4

(5) Compression and decompression of information

・ volumes of sound data, image data, and video data are large and the compuression/decompression methods are used according to the types of information and media

Sample terms: ZIP, compression ratio, lossless compression, lossy compression, run-length method, Huffman method

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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

・in computers, colors are represented by such as the three primary colors of light (RGB), the three primary colors of color (CMY), and CMYK

・colors are represented with hue, lightness, and saturation

Sample terms additive color mixing, subtractive color mixing

(b) Image quality

・pixels, resolution, and gradation

Sample terms dpi (dot per inch), ppi (pixels per inch)

(c) Graphics software

・the characteristics of painting (raster format) software and drawing (vector format) software

(2) Multimedia application

・the examples of typical application areas of multimedia technology

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

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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]

✓ Understand the significance, purpose, and concepts of a database, which is a collection of data such as numbers and character strings organized systematically, and a database management system, which is equipped with functions to store data structurally, maintain consistency, and extract it efficiently.

(1) Database

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

(2) Database management system

・the significance, purpose, and concepts of DBMS (Database Management System)

Sample terms RDBMS, NoSQL（Key-Value Store (KVS), document-oriented database, graph-oriented database）

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 basic process.

(1) Data analysis

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

Sample terms data combining, data cleansing

(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, foreign key, index

(3) Data normalization

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

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56. Data manipulation

[Goal]

- Understand the operations such as data extraction from databases.

[Description]

- ✓ Understand data manipulation required to utilize relational databases.

(1) Data manipulation

・the typical data manipulation methods for data in a relational database (the grammar of SQL is not asked on the test)

Sample usage the operations of insertion, update, selection, projection, and join for data in a relational database

57. Transaction processing

[Goal]

- Understand the transaction processing of database.

[Description]

- ✓ Understand that it is necessary to preserve the database by the concurrency control (exclusive control) and recovery functions, etc., in preparation of referencing and updating data by multiple users.

(1) Concurrency control (exclusive control)

・overview of the necessity and functions of concurrency control (exclusive control) , which is necessary to ensure consistency when multiple users access data at the same time.

Sample terms transaction, ACID characteristics, deadlock, two-phase commitment

(2) Failure recovery

・overview of the necessity and functionality of recovery functions required to recover data in the event of failure, etc.

Sample terms checkpoint, backward recovery (rollback), forward recovery (rollforward)

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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 overview 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, wired LAN, wireless LAN, WiMAX, VLAN, Wi-Fi 4/5/6/6E, Wi-Fi Direct, mesh Wi-Fi, WPS (Wi-Fi Protected Setup), 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 and IoT server, etc.

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

Sample usage: use of different communication methods for different applications, such as communication distance (short or long distance), speed (high or low speed), power consumption, etc.

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59. Communications protocol

[Goal]

- Understand the structure and characteristics of network architecture.
- 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) Typical network architecture

(a) OSI basic reference model

・the basic functions of each layer of the OSI reference model, which adopts 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

(b) TCP/IP hierarchical model

・Basic functions of each layer of the TCP/IP hierarchical model, which is a network architecture consisting of four layers, and is used as the standard in computer networks such as the Internet, and relationships among the layers.

Sample terms: network interface layer, internet layer, transport layer, application layer

(2) Communication protocol

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

・the characteristics of communication protocols used for IoT systems

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

60. Network application

[Goal]

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

[Description]

- ✓ Understand the basic 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) 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

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

(3) Communication service

・the overview of communication service

Sample terms carrier, MVNO (Mobile Virtual Network Operator), ISP (Internet Service Provider), packet communication, mobile communication, base station, AP (Access Point), platinum frequency bands, handover, roaming, MIMO, IP telephone, optical communication, carrier aggregation, tethering, SIM card, MNP (Mobile Number Portability), eSIM (embedded SIM), telematics

Sample usage concept of packet communication, differentiation of usage according to billing method by metered and flat rate systems

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Major category 9: Technology Element
Middle category 23: Security

61. Information security

[Goal]

- Understand the basics 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 basic ways of coping with them, and vulnerabilities.
- ✓ Understand typical of attack methods, and ways of coping with them.

(1) Concepts of information security

・the basic 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 basic ways of coping with them
・the vulnerability, which is a factor that may cause security incidents

(a) Types and the characteristics of human threats

・the types and characteristics of typical human threats

Sample terms: leakage, loss, damage, peep, eavesdropping, spoofing, cracking, social engineering, internal fraud, operational error, business e-mail compromise (BEC), double extortion, dark web

Sample usage: management of information based on information security policies

(b) Types and characteristics of technical threats

・the types and characteristics of typical technical threats

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

(c) Types and characteristics of physical threats

・the types and characteristics of typical physical threats

Sample terms: disaster, destruction, sabotage

(d) Vulnerabilities

・the overview 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

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(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 overview 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 (credential stuffing)
- ・cross-site scripting, cross-site request forgeries, clickjacking, drive by download, SQL injection, directory traversal, buffer overflow attack
- ・man-in-the-middle attack, MITB (man-in-the-browser) attack, third-party relay (open relay), IP spoofing, DNS cache poisoning, session hijacking
- ・DoS (Denial of Service) attack, DDoS attack, cryptojacking
- ・targeted attack (APT (Advanced Persistent Threat), water hole attack, interaction type attack, etc.), phishing, smishing, one-click fraud
- ・zero-day attack, exploitation of service and software functions
- ・prompt injection attack, adversarial examples
- ・preparation for an attack (footprinting, port scanning, etc.)

62. Information security management

[Goal]

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

[Description]

✓ Understand the necessity for risk management.

✓ Understand the purpose and the basic 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, risk communication, information

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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 organizations

・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, ISMAP (Information system Security Management and Assessment Program), J-CSIP (Initiative for Cyber Security Information sharing Partnership of Japan), Cyber Rescue and Advice Team against targeted attack of Japan (J-CRAT), SECURITY ACTION

(5) Various standards and guidelines

・standards for computer virus countermeasures, standards for computer unauthorized access countermeasures, System Management Standards, etc. are used as norms for information systems

Sample terms: Cybersecurity Management Guidelines, Information Security Guidelines for SMEs, Information Security Management Standards, Cyber Physical Security Framework, IoT Security Guidelines, PCI DSS

63. Information security measures and information security implementation technology

[Goal]

- Understand the basic 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 basic 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.

(1) Types of information security

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

(a) Human security measures

・the types of human security measures

・taking basic measures in familiar business tasks

Sample terms: information security awareness, information security training (training

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against targeted e-mail, etc.), 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) Technical security measures
- types of technical security measures
- taking basic measures in familiar business tasks

Sample terms: callback, access control, firewall, WAF (Web Application Firewall), IDS (Intrusion Detection System), IPS (Intrusion Prevention System), EDR (Endpoint Detection and Response), 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, secure boot, TPM (Trusted Platform Module)

Sample usage: measures against malware and malicious programs (introduction of anti-malware software, updating of malware definition files, etc.), ransomware countermeasures (data backup, 3-2-1 rule, WORM (Write Once Read Many) function, immutable backup), security settings in the Internet environment (anti-spam measures, URL filtering (web filtering), content filtering, MAC address filtering, parental control), security measures for cloud services, 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, anti-passback, interlock, clear desk/clear screen, security cable, remote backup

Sample usage: entrance access control using IC cards

(2) Encryption technology

- the basic mechanism of encryption technology required to maintain information security, encryption algorithm, the characteristics of encryption strength, etc.

Sample terms: encryption, decryption, symmetric key cryptography, public key cryptography, hybrid cryptography, hash function, disk encryption, file encryption

Sample usage: encryption of wireless LAN using WPA2

(3) Authentication technology

- the necessity of authentication and the overview of what kind of authentication technologies are used to prevent threats
- the overview of what each technology can prove

Sample term: digital signature (signing key, verification key), timestamp (time authentication), risk-based 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, passwordless authentication, EMV 3-D secure (3D secure

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2.0), SMS 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 (FRR), false acceptance rate (FAR)

(6) Public key infrastructure

・ the basic scheme and characteristics of the public key infrastructure

Sample term PKI (Public Key Infrastructure), digital certificate, root certificate, trust anchor (Root of Trust), server certificate, client certificate, CA (Certification Authority), CRL (Certificate Revocation List)

(7) Application software and IoT systems security

・ the types and characteristics of security measures for application software, IoT systems and IoT devices

Sample term security by design, privacy by design, measures against cross-site scripting, measures against SQL injection

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Information Technology Engineers Examination
－ IT Passport Examination (Level 1) －
Syllabus (Version 6.3)

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2023-12