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| **MINISTRY OF INFORMATION AND COMMUNICATIONS**No: 11 /2015/TT-BTTTT | **SOCIALIST REPUBLIC OF VIETNAM** **Independence – Freedom - Happiness***Hanoi, date 05 month 05 year 2015*  |

CIRCULAR

**Regulating Skill standard of professional information technology personnel**

*Pursuant to the law on Information Technology dated June 29th, 2006;*

*Pursuant to Decree No. 132/2013/NĐ-CP dated October 16th, 2013 of the Government regulating the functions, missions, authorities and organizational structure of the Ministry of Information Technology;*

*Pursuant to Decree No. 71/2007/NĐ-CP dated May 03rd, 2007 of the Government detailing and instructing the implementation of some provisions of the law on Information Technology on Information Technology industry;*

*At request of Director of the Department of Information Technology,*

*Minister of Information Technology promulgates a Circular regulating skill standard of professional information technology personnel.*

**Article 1. Scope of regulation**

This Circular regulates some kill standards of professional information technology personnel, including:

1. Database skill standard;

2. Network system skill standard;

3. System management skill standard;

4. Information security skill standard;

5. Software design and development skill standard.

**Article 2. Subjects of application**

1. This Circular is applicable to agencies, organizations, individuals directly participating or relating to assessing professional skill of professional information technology (IT) personnel in short-term training and improving professional skills.

2. Encourage organizations, individuals to apply this Circular in building educational programs, manuals; recruiting, using labor; learning, improving qualification and other activities relating to assessing professional skill of professional IT personnel.

**Article 3. Interpretation of terms**

In this document, these terms are construed as follows:

1. Training on IT includes: computer technology, information technology, communication technology, information system, management information system, computer science, computer technique, software technique, computing teaching, application computing, application mathematics, multi-media communication, communication and computer network.

2. Vocational training, college, university levels used in ranking skill standard defined at Article 4 this Circular are levels of knowledge defined at the law on Education and instructing documents for execution.

**Article 4. Regulating skill standard of professional IT personnel**

1. Skill standard of professional IT personnelis a system of requirements on knowledge and skills of IT that personnel in IT field obtain to implement one or a group of specific tasks. Some skill standards of professional IT personnel are as follows:

a) Database skill standard (DBSS Code): includes requirements on necessary knowledge and skills to implement tasks relating to comprehensive plan establishment, requirement determination, analysis, design, establishment, test, operational management to database system.

b) Network system skill standard (NWSS Code): includes requirements on necessary knowledge and skills to implement tasks relating to requirement determination, design, establishment, test, operation, maintenance, management and developing consultancy to network system.

c) System management skill standard (SMSS Code): includes requirements on necessary knowledge and skills to implement tasks relating to planning, operational management, human resources management, user management, resources management, fault and incident management, information security management, performance management, maintenance, assessment of system operation and user assistance.

d) Information security skill standard (SCSS Code): includes requirements on necessary knowledge and skills to implement tasks relating to organization’s information security policy, application of information security standards; system design, installation, test, operational management to information security system; analysis, review of information security policy.

đ) Software design and development skill standard (SDSS code): includes requirements on necessary knowledge and skills to implement tasks relating to determination, analysis of user’s requirements, systematization requirement determination, system development preparation, overall design, component design, detailed design, programming, software installation support and software test.

2. Requirements on knowledge and skills: Every skill standard of professional IT personnel has requirements on basic knowledge and professional knowledge, skills. In details:

a) Requirements on basic knowledge: Requirements on basic knowledge on IT to skill standards of professional IT personnel are defined at Appendix No.01 of this Circular with respective qualifications in every level defined at Clause 3 of this Article.

b) Requirements on professional knowledge and skills:

- Database skill standard: Requirements on professional knowledge and skills of Database skill standard are defined at Appendix No.02 of this Circular.

- Network system skill standard: Requirements on professional knowledge and skills of Network system skill standard are defined at Appendix No.03 of this Circular.

- System management skill standard: Requirements on professional knowledge and skills of System management skill standard are defined at Appendix No.04 of this Circular.

- Information security skill standard: Requirements on professional knowledge and skills of Information security skill standard are defined at Appendix No.05 of this Circular.

- Software design and development skill standard: Requirements on professional knowledge and skills of Software design and development skill standard are defined at Appendix No.06 of this Circular.

3. Classification of skill standards of professional IT personnel: every skill standard of professional IT personnel is divided into 4 grades in low-high order corresponding to grade 04 to grade 01. In details:

a) Grade 4:

- Meet requirements on basic knowledge of IT defined at Point a, Clause 02 of this Article at the level of secondary or graduating from IT major holding intermediate level or above.

- Meet requirements on professional knowledge of IT of grade 4 corresponding to every standard as defined at Point b, Clause 2 of this Article.

b) Grade 3:

- Meet requirements on basic knowledge of IT defined at Point a, Clause 02 of this Article at the level of college or graduating from IT major holding college level or above.

- Meet requirements on professional knowledge of IT of grade 3 corresponding to every standard as defined at Point b, Clause 2 of this Article.

c) Grade 2:

- Meet requirements on basic knowledge of IT defined at Point a, Clause 02 of this Article in college level or graduated IT major in college level or more.

- Meet requirements on professional knowledge of IT of grade 3 corresponding to every standard as defined at Point b, Clause 2 of this Article.

- Capable to manage a group of technicians from 10 persons and more in the field suitable to respective skill standard.

- Working experience in respective work in 6 or more consecutive years in grade 3.

d) Grade 1:

- Meet requirements on basic knowledge of IT defined at Point a, Clause 02 of this Article at the level of university or graduating from IT major holding university level or above.

- Meet requirements on professional knowledge of IT of grade 1 corresponding to every standard as defined at Point b, Clause 2 of this Article.

- Capable to manage a group of technicians from 50 persons and more in the field suitable to respective skill standard.

- Working experience in respective work in 3 or more consecutive years in grade 2.

**Article 5. Effectiveness**

This Circular takes effect on June 22nd, 2015.

**Article 6. Implementing organization**

1. Chief of Office, General Director of Department of Information Technology, Head of agencies, units under the Ministry of Information and Communications, Director of Department of Information Technology in cities, provinces under the central authority and related agencies, organizations, individuals bear responsibility for implementing this Circular.

2. Department of Information Technology (Ministry of Information and Communications) is responsible for consulting, instructing the implementation of this Circular; studying, proposing, altering, and updating Skill standards of professional IT personnel suitable to actual conditions.

3. During the performance, in case of any queries and difficulties, organizations, enterprises, individuals should promptly report to the Ministry of Information and Communications (Department of Information Technology) for consideration and resolution.

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| ***Archives:**** Prime Minister, Deputy Prime Ministers;
* Office of the Party Central Committee, Party Commissions;
* Office of the General Secretary;
* Office of the National Assembly;
* Office of the President;
* Ministries, Ministry-level agencies, Government agencies;
* Supreme people’s procuracy;
* Supreme people’s court;
* State Audit of Vietnam;
* Vietnam State Treasury;
* Central authority of bodies;
* People’s Committee of provinces, cities under central authority;
* IT unit of Ministries, Ministry-level agencies, Government agencies;
* Departments of Information & Communications of provinces, cities under central authority;
* Gazette, Government Portal;
* National Committee on IT application;
* Steering Committee on IT of the Party authority;
* Bureau of Legal Normative Documents Post-Review (Ministry of Justice);
* Ministry of Information and Communications: Minister and Deputy Ministers, agencies, units under the Ministry; the Ministry portal;
* Archives: Filing, IT (5).
 | **MINISTER****Nguyen Bac Son** |

**APPENDIX NO. 01**

**requirements on basic knowledge of IT**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of the Minister of Information and Communications)*

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| --- | --- | --- | --- | --- | --- |
| **1** | **Elementary theory** | 1.1 | Elementary theory | 1.1.1 | Discrete mathematics |
| 1.1.2 | Application mathematics |
| 1.1.3 | Theory on IT  |
| 1.1.4 | Theory on communications  |
| 1.1.5 | Theory on measurement and control  |
| 1.2 | Algorithms and programming | 1.2.1 | Data structure |
| 1.2.2 | Algorithms |
| 1.2.3 | Programming |
| 1.2.4 | Program languages |
| **2** | **Computer system** | 2.1 | Computer compositions | 2.1.1 | Micro-processing unit |
| 2.1.2 | Memory |
| 2.1.3 | Bus |
| 2.1.4 | Input/output interface |
| 2.1.5 | Input/output device |
| 2.2 | System compositions | 2.2.1 | System configuration |
| 2.2.2 | System evaluation values  |
| 2.3 | Software | 2.3.1 | Operating system |
| 2.3.2 | Intermediate software |
| 2.3.3 | File System |
| 2.3.4 | Development tools |
| 2.3.5 | Open source software  |
| 2.4 | Hardware | 2.4.1 | Hardware |
| **3** | **Technical composition** | 3.1 | User interface | 3.1.1 | User interface technology  |
| 3.1.2 | Interface design  |
| 3.2 | Multimedia | 3.2.1 | Multimedia technology  |
| 3.2.2 | Multimedia application |
| 3.3 | Database | 3.3.1 | Database system |
| 3.3.2 | Database design |
| 3.3.3 | Data operation |
| 3.3.4 | Transaction processing |
| 3.3.5 | Database application |
| 3.4 | Network | 3.4.1 | Network architecture |
| 3.4.2 | Data transmission and control |
| 3.4.3 | Signaling protocols |
| 3.4.4 | Network management |
| 3.4.5 | Network application |
| 3.5 | Security | 3.5.1 | Information security |
| 3.5.2 | Information security management  |
| 3.5.3 | Security technology evaluation |
| 3.5.4 | Information security measurement |
| 3.5.5 | Technology for security |
| **4** | **Developing technology** | 4.1 | **System developing technology** | 4.1.1 | Determination of system requirements  |
| 4.1.2 | Design of system architecture |
| 4.1.3 | Determination of software requirements |
| 4.1.4 | Design of software architecture and details  |
| 4.1.5 | Software programming and test  |
| 4.1.6 | Software integration and software quality test  |
| 4.1.7 | System integration and system quality test |
| 4.1.8 | Software installation |
| 4.1.9 | Software handover  |
| 4.1.10 | Software maintenance  |
| 4.2 | Software developing and managing techniques  | 4.2.1 | Developing procedures and methods  |
| 4.2.2 | Software licence management |
| 4.2.3 | Developing environment management  |
| 4.2.4 | Figuration and change management |

**APPENDIX NO. 02**

**Requirements on professional knowledge and skills of**

**Database skill standard**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of*

*the Minister of Information and Communications)*

| **Ref. code** | **Content/ Requirement** | **Requirement in grade** |
| --- | --- | --- |
|  | **Knowledge** | **Skills** | **4** | **3** | **2** | **1** |
| **DBSS 1** | **Module: Establishing comprehensive plan on database**  |  |  | **x** | **x** |
| DBSS 1.1 | Establishing a plan on database system |
| - Methods of information system evaluation. - Methods of problem analysis. - Database maintenance. | - Evaluating database use - Evaluating database maintenance - Operating and managing database - Comprehensive research on information and database system - Planning- Using planning tools - Explaining the plan to people relating to database - Evaluating requirements of database - Designing, establishing database in compliance with standards- Evaluating database volume and complexity  |
| DBSS 1.2 | Database standardization |
| - Data components- Code design- Data design - Data integrity | - Establishing rules on Database standardization- Designing code- Explaining code and data standardization to application developers - Identifying and processing if having various opinions.  |
| **DBSS 2** | **Module: Determining database requirements**  |  | **x** | **x**x | **x**x |
| DBSS 2.1 | Situation survey and mission analysis  |
| - User’s task details - Method of information collection - Methods of data analysis - Methods of problem analysis  | - Determining information source on user’s demand - Implementing techniques and orders of information collection - Determining required information - Analyzing answers from individuals and groups - Selecting, analyzing collected information and determining demands- Collecting and summarizing required information - Holding discussions on important issues and giving different solutions  |
| DBSS 2.2 | Determining the scope of job  |
| - System environment- Software, hardware, system architecture - Database development - Availability of system resources and date of project handover- Man-hour calculation - Technical limitations - Methods of risk analysis  | - Compiling documents on the scope of job meeting user’s requirements - Distinguishing project’s scope, range and complexity - Discussing with related people on successful criteria of database project - Calculating man-hour to every job item of database project- Surveying, analyzing and comparing market products to determine project’s applicability - Documenting on technical limitations - Comprehensive thinking |
| DBSS 2.3 | Determining preliminary requirements of database  |
| - System developing and operating environment - Database and job integration- System function and operation- Database design and operation - Data analysis- Determining system performance requirements - Organization’s information security policy - Data integrity guarantee - Data access control- Requirements on database system operation - Checking process- Items and notes included in document determining database requirements  | - Changing user’s requirements into database’s. - Identifying inconsistent requirements and giving solutions- Analyzing accuracy and consistence of information - Applying the technology efficiently meeting requirements - Finding out data distribution- Evaluating criteria evaluating performance - Proposing methods of performance guarantee- Changing user’s information security requirements into database’s. - Changing user’s operation requirements into database’s. - Describing important requirements clearly and accurately.- Selecting communications methods in line with checking requirements and efficiently speeding up the evaluating progress. - Considering contradictory ideas properly  |
| **DBSS 3** | **Module: Database analysis and design**  |  | **x** | **x** | **x** |
| DBSS 3.1 | Establishing conceptual-level data model  |
| - Method of model establishment - ERD - Entity Relationship Diagram and other database models - Operation rule - GUI - Graphic User Interface | - Analyzing information structure, subjects’ direction (Class chart) - Changing user’s requirements into conceptual-level data model - Determining entity’s characteristics - Confirming the consistence between operation process and data model - Adjusting the difference among some conceptual-level data models - Identifying and handling contradictory requirements - Compiling easy-to-read documents on conceptual-level data model for application developers and users  |
| DBSS 3.2 | Verifying conceptual-level data model  |
| - Organizational model - Operation process - Database  | - Seizing main interests of users- Explaining data model to application developers and users- Confirming the consistency between operation process and data model- Identifying and handling contradictory requirements- Explaining data model changes to related people for approval- Compiling easy-to-understand documents on conceptual-level data model to application developers and users |
| DBSS 3.3 | Designing logic-level data model  |
| - Relation database, relation data model - Build data sheet in relation database - Database operating efficiency - Awareness on a rule changing from ERD chart to SQL and NoSQL structure - Standardization - Limitations of integrity- GUI. | - Changing from ERD chart to relation data model - Implementing standardization- Specifying limitations of ERD data model - Analyzing subjects’ direction (Class chart); deciding types of data, indexes and deciding data excess and explaining reasons.  |
| DBSS 3.4 | Verifying logic-level data model |
| - Organization’s model.- Operation process.- Database. | - Verifying data on accuracy and suitability to project’s objective - Compiling easy-to-understand documents on data model to application developers  |
| **DBSS 4** | **Module: Database establishment and test**  |  | **x** | **x** | **x** |
| DBSS 4.1 | Selecting and installing Database Management System (DBMS) |
| - Methods of information collection from suppliers of DBMS solutions (suppliers) - Criteria of selection - Current environment and real-time installing environment - Database application- Database design and implementation - Database performance- Availability- Methods of system installation and assessment - Data and application test - Integrity and extended development  | - Identifying, consolidating and summarizing various requirements relating to DBMS - Identifying satisfaction or non-satisfaction of customer groups - Comparing various ideas - Assessing the information from suppliers - Sending requirements to suppliers - Discussing with suppliers - Collecting installation information from other organizations - Assessing the conformity to database project’s objective - Selecting DBMS on the basis of balancing between cost, function, performance, availability - Seizing contradictory ideas - Explaining process and reason of selection to related people  |
| DBSS 4.2 | Designing physical level database  |
| DBSS 4.2.1 | Confirming target physical environment  |
| - Target environment- Target DBMS  | - Assessing target performance  |
| DBSS 4.2.2 | Analyzing transaction |
| - Method of data flow analysis - Method of transaction analysis- Method of key sector analysis  | - Analyzing transactions and determining requirements of use.- Analyzing requirements from overall point of view  |
| DBSS 4.2.3 | Specific requirements on database  |
| - Organization’s data policy - Organization’s recovery backup policy - Database operational management - Database access performance  | - Preparing provisional data for requirement determination and reason explanation - Analyzing required information and consolidating into common requirements - Analyzing and thinking of the use of stable system - Determining database requirements in line with target - Identifying initial requirements of a database and developing specific system requirements - Identifying contradictory requirements and giving solutions  |
| DBSS 4.2.4 | Designing architecture |
| - Data life cycle (creating, distributing, processing, eliminating) - Demand of data process at user’s position - Distributed system and database - Server, workstation system- Advantages and disadvantages of distributed or concentrated database - Network architecture  | - Determining architecture and preparing document - Analyzing data and information flowchart - Changing user’s requirements into architectural design - Consolidating and summarizing various requirements - Determining technical matters and giving solutions - Explaining architectural selection process and reason to related people - Designing distributed data  |
| DBSS 4.2.5 | Changing into target DBMS  |
| - Target DBMS- Selecting types of data - Data compression - Data integrity - Physical record design - Methods of data flow calculation - Data locking | - Finding out logic-level data model - Considering system’s stability - Identifying target DBMS’s limitations - Calculating necessary storage space  |
| DBSS 4.2.6 | Designing performance  |
| - Target DBMS. - Access selection.- Method of standardization adjustment - Index selection - Storage space distribution  | - Finding out logic-level data model - Identifying target DBMS’s limitations  |
| DBSS 4.2.7 | Data’s physical distribution  |
| - Storage device configuration  | - Analyzing data access density - Designing distributed data area and distributed record area - Assessing the efficiency of database operation  |
| DBSS 4.2.8 | Information security design  |
| - Information security guarantee - Access control  | - Assessing the correlation between security requirement and access control - Proper decentralization  |
| DBSS 4.3 | Implementation |
| - Database determination via SQL- Method of data design - Data conversion | - Implementing or directing the implementation of database determination in line with target DBMS - Collecting original data and converting to target data - Inspecting data model, database compositions  |
| DBSS 4.4 | Test |
| - Method of database inspection - Use of inspection tools - Inspection procedures if detecting anomaly - Benchmark- Document storage and maintenance  | - Preparing data for test - Detecting anomaly - Cooperating with colleagues to give solutions for anomalous situations - Specifying database weaknesses and assessing impacts on users - Explaining to related people on database weaknesses significantly affecting on users - Preparing easy-to-understand, sufficient and accurate manuals  |
| **DBSS 5** | **Module: Database management, operation**  | **x** | **x** | **x** | **x** |
| DBSS 5.1 | Establishing a plan of database operation  |
| - Monitoring method - Monitoring tool- Hardware maintenance - Extra hardware installation - Backup recovery - System monitoring - Performance guarantee - Data integrity - Data and information security  | - Establishing system management policy on the basis of obtained budget - Explaining operational management policy to users - Understanding the importance of monitoring - Listing anomaly- Studying stable system operation - Proposing countermeasures to anomaly - Planning extra installation  |
| DBSS 5.2 | Database operation and maintenance  |
| - Method of monitoring data collection - Use of monitoring tools- Method of monitoring data analysis - Operating system.- Impacts upon software update - Database application- Standardization establishment  | - Analyzing monitoring data.- Describing analysis in details and with accuracy in the document - Implementing proper measures if detecting anomalous conditions - Determining proper time to update software - Establishing new application using rules - Monitoring standard conformity and improvement promotion - Preparing documents on standardization - Explaining the discrepancy against standardization subject to reduce performance and capacity of maintenance - Determining standards that are no longer suitable to actual situation and need eliminating |
| DBSS 5.3 | Database administration |
| DBSS 5.3.1 | Integrity maintenance |
| - Data model | - Identifying, detecting shortcomings on integrity - Implementing countermeasures to shortcomings on integrity  |
| DBSS 5.3.2 | Data’s physical structure maintenance  |
| - Database application  | - Analyzing query report- Analyzing user’s requirements, implementing solutions and assessing impacts  |
| DBSS 5.3.3 | Backup recovery management  |
| - System environment - Recovery backup  | - Explaining backup status to users  |
| DBSS 5.3.4 | Management of requirements on physical resources  |
| - Limitations of physical resources - Capacity of physical resources- Method of status measurement using physical resources - Database applications  | - Measuring the use of resources - Seizing trends of using physical resources accurately - Forecasting the extension of using resources - Assessing the necessity of resources upgrade - Determining anomalous use of resources  |
| DBSS 5.3.5 | Countermeasures to database audit  |
| - System audit - Procedure of database audit  | - Explaining system management, operation accurately to system auditors - Seizing auditing criteria and countermeasures to database audit  |
| DBSS 5.4 | Adjusting database performance  |
| - Performance design - Table design - Index design - Physical distribution- Storage device access - Performance improvement  | - Determining performance reduction reasons - Applying improvement experiences as a method of performance adjustment - Ensuring no generated negative impacts due to performance adjustment - Assessing the necessity of equipment addition  |
| DBSS 5.5 | User assistance |
| DBSS 5.5.1 | Providing database developing environment and user assistance  |
| - DBMS - Operating system - Database applications - Database development  | - Establishing or revising database developing standards and database applications - Providing favorable conditions to application developers  |
| DBSS 5.5.2 | Providing database using environment  |
| - User’s applications - User’s software use  | - Minimizing impacts on users due to data model change  |
| DBSS 5.5.3 | Establishing and implementing user training plan  |
| - Methods of user training promotion  | - Establishing a plan of user training and assistance in accordance with user’s ability of using software - Assessing user’s skills and detailing training results - Analyzing user’s training process - Analyzing user’s demand on training and giving solutions for satisfaction |
| DBSS 5.5.4 | Surveying additional requirements from users  |
| - Information collection on user’s requirements - Analysis of requirements  | - Changing user’s requirements into system’s technical requirements - Properly explaining user’s wrong requirements  |

**APPENDIX NO. 03**

**REQUIREMENTS ON PROFESSIONAL KNOWLEDGE AND SKILLS OF NETWORK SYSTEM SKILL STANDARDIZATION**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of the Minister of Information and Communications)*

| **Ref. code** | **Content/ Requirement** | **Requirement in grade** |
| --- | --- | --- |
|  | **Knowledge** | **Skills** | **4** | **3** | **2** | **1** |
| **NWSS1** | **Module: Determining requirements on network system**  |  |  | **x** | **x** |
| NWSS 1.1 | Analyzing user’s requirements on network use  |
| - Method, process and implementation of information collection - Determining targets and scope of survey- Network architecture, network topo, hardware and software - Network connection technology and network operational environment - Network design - System configuration - Application and middleware configuration - Technological limitations, hardware, software standardization and processing procedure - Risk analysis techniques  | - Determining key information sources on user’s demand - Determining necessary amount of collecting information - Analyzing feedbacks from individuals and groups - Selecting, collecting data relating to tasks and determining data demands - Arranging and summing up the information on demands - Analyzing and determining mutual dependence of information - Building detailed references regarding technological limitations - Holding free discussions and confirming queries - Working in groups  |
| NWSS 1.2 | Existing network analysis  |
| - Method of information collection - Network capacity measurement - Capacity analysis tools - System configuration - Network configuration - Application and middleware configuration  | - Measuring and assessing network capacity - Determining network congestion cases on the basis of System configuration - System analysis  |
| NWSS 1.3 | Determining scope of job  |
| - Network architecture, network topo, hardware and software - Network connection technology and operational environment - Available resources and completion time - Work volume - Technological limitations | - Building detailed documents on scope of job - Arranging requirements to meet targets - Forecasting developing results based on obtained experience and knowledge - Planning based on the capability of resources and limitations - Presenting visually required tasks in serial or parallel manner- Discussing on required criteria - Comprehensively considering various issues  |
| NWSS 1.4 | Determining requirements on network system  |
| - System and system’s integration - Network connection technology and operational environment - Network architecture, network topo, hardware and software - Requirements on performance- Network information security - System’s life cycle - Network reliability - Requirements on network operation - Method of audit  | - Reflecting organization’s requirements on information process in the form of requirements on system - Determining user’s expectations - Identifying inconsistence between requirements and giving solutions - Analyzing the information’s accuracy and consistence - Handling technological matters- Assessing system configuration - Making detailed references supporting requirements - Observing subjects from various point of views  |
| **NWSS 2** | **Module: Network system design**  |  |  | **x** | **x** |
| NWSS 2.1 | Surveying, assessing technologies and products to be applied  |
| - Method of information collection - Network architecture, network topo, hardware and software - Technological limitations, hardware, software standardization and processing procedure  | - Analyzing and determining mutual dependence of the information - Explaining technological information by proper tools - Making detailed references on technological limitations  |
| NWSS 2.2 | Designing network system  |
| NWSS 2.2.1 | Determining network architecture  |
| - Application’s system configuration- High class service in OIS model - Network connection technological standardization and processes - Tools and methods of network architecture design - Network architecture, network topo, hardware and software - Information diagram - Type of information and capacity - Throughput- Statistics of capacity and throughput load estimation  | - Differentiating between actual requirements and designed technology - Forecasting results based on past experience and existing knowledge - Analyzing trends by forecasting method - Analyzing technological information and explaining clearly and shortly |
| NWSS 2.2.2 | Information security methods  |
| - System security and potential security holes - Network security - Information security methods- Legal normative documents on Information security  | - Identifying and developing Information security policy - Assessing, amending criteria on Information security - Detecting matters on Information security in moral aspect - Determining types of risks  |
| NWSS 2.2.3 | Reliable measures  |
| - Reliability- Economic efficiency (balance among installation and operational, maintaining costs) - Information transmission services  | - Identifying the level of requirements of application’s reliable measures- Balancing between reliable measures and necessary costs  |
| NWSS 2.2.4 | Design scenario |
| - Network connection technological standardization and processes - Application’s system configuration - Network architecture, network topo, hardware and software - Network technology and installation of device’s functions - Solution’s integration and extension development  | - Recycling optimally existing hardware - Building block diagram and using spot tools - Forecasting results based on existing knowledge - Presenting complicated ideas, information - Assessing different plans and selecting one proper plan- Consolidating standardizations and processes into technical documents  |
| NWSS 2.3 | Planning operation for a new network system  |
| - Operation activity - Relevant parties and working groups - Conversion procedures - Organizational issues relating to information security  | - Presenting issues, requirements; putting questions and organizing, arranging questions - Determining information demands - Promoting the cooperation - Analyzing and summing up the information - Using project management software - Maintaining organizational processes based on organization’s rules.- Finding out user’s application and linking their demand with applications’ configuration - Conducting a visual analysis about the relationship between parts and the whole as well as processes and procedures  |
| NWSS 2.4 | Planning the implementation  |
| - Integration method and flow analysis tool - Implementation of plan and influences on users - Network and operational environment  | - Collecting and analyzing the information - Explaining technological information clearly - Explaining and summing up results - Analyzing the information, situations and planning within the scope of operation and finance - Planning operation, operational cooperation, plan implementation - Using project management tools and planning software - Estimating costs of design, construction, operation, and maintenance  |
| NWSS 2.5 | Design audit |
| - Design audit procedures - Network architecture, network topo, hardware and software - Network and operational environment  | - Communicating technological information to various users - Explaining technological information clearly - Listening to contributive criticisms - Explaining technological information clearly and using proper tools for explanation  |
| **NWSS 3** | **Module: Network system establishment and test**  | **x** | **x** | **x** | **x** |
| NWSS 3.1 | Implementing steps of preparation  |
| - System configuration - Software and procedure installation for configuration set-up - Relevant parties and working groups  | - Analyzing the information and situations - Considering risks - Preparing various plans - Building operational plans - Complying with proper procedures - Making detailed documents on operation process flow - Negotiating and cooperating until relevant parties’ approval for installation  |
| NWSS 3.2 | Network installation  |
| - Installing software and procedures for configuration - Data conversion issues and implementing procedures - Integration issues and implementing procedures - Hardware configuration- Network architecture, network topo, hardware and software  | - Building new applications- Presenting the information on installation to users - Considering ideas (word or writing) and giving appropriate feedbacks - Applying continuous improvement strategy and assisting tools - Dealing with inconsistence timely - Arranging many schedules and managing important landmarks, giving necessary adjustments - Illustrating impacts on performance and giving necessary adjustments  |
| NWSS 3.3 | Testing preparation |
| - Testing tools and procedures - Requirements on operation- Applications - Network environment - Fault impacts on system performance - Necessary budget and organizational structure - Network architecture, network topo, hardware and software | - Analyzing system - Communicating and understanding the information - Analyzing and building system structure - Determining testing devices - Linking faults with system function - Analyzing matters’ reasons and proposing acting program - Analyzing data - Assessing compatibility between operation situations with system structure - Discussing in providing necessary resources - Identifying system’s weaknesses and strengths  |
| NWSS 3.4 | Network test |
| - Method of test and procedures- Network architecture, network topo, hardware and software  | - Using tools of planning - Handling matters on process and procedure within responsibility - Critically analyzing details - Recording testing results- Considering proper manners to speed up the procedure - Controlling important landmarks- Encouraging and supporting group members and assigning responsibility to achieve group’s target  |
| NWSS 3.5 | Testing result analysis and assessment  |
| - Products and correlation in the testing environment - Continuous improvement process for testing implementation - Reporting procedures in the organization  | - Applying rules/principles of process/data and stating logic argument to arrive at conclusion - Explaining complicated ideas/information - Considering solutions in a creative way and building new approach plans/methods - Understanding and applying testing results into real situations |
| **NWSS 4** | **Module: Network system operation and maintenance**  | **x** | **x** | **x** | **x** |
| NWSS 4.1 | Implementing steps of preparation for users  |
| - Organization’s policy and procedure - Extension of procedures - Document preparation and storage - Information security tools - Operating system and network system - Network establishment for users | - Applying rules, procedures to accounts and making documents - Describing the content of maintenance procedures - Complying with rules, policies and procedures - Determining and handling matters - Receiving questions and determining the content of questions  |
| NWSS 4.2 | Establishing policies of maintenance, update and improvement  |
| - Operation systems - Network system life cycle - Network architecture, network topo, hardware and software - Dependence between operating system and system - Backup procedures  | - Determining user’s demand and expectations - Forecasting results based on existing knowledge - Proposing and implementing acting program - Explaining complicated ideas and information - Assessing system configuration and stability - Collecting the information on new products regularly  |
| NWSS 4.3 | Maintenance planning  |
| - Maintenance tools and procedures- Organization’s procedures of network system operation  | - Assessing impacts of technical faults - Making reference in detail and clearly - Agreement-directed negotiating- Forecasting results on technology - Understand and conveying the information to relevant parties persuasively and meeting targets  |
| NWSS 4.4 | Maintenance, update and improvement  |  |
| - Procedures of update - Reason of update - Data conversion matters and procedures as well as integration matters and procedure for settlement - Network architecture, network topo, hardware and software - Procedure of maintenance - Procedures and standards of making maintenance manual  | - Implementing improvement, amendment in line with technological development - Assessing system’s configuration, stability - Planning on implementing process - Complying with proper procedures - Finding out operation, system satisfaction - Finding out and assessing received data - Presenting the information clearly and accurately  |
| NWSS 4.5 | Data backup and recovery  |
| - Procedures of Data backup and recovery- Network architecture, network topo, hardware and software - Backup means - Regulations on electronic storage  | - Identifying matters in the system and assessing their importance- Implementing procedures - Making detailed reference in the basis of information and activities - Assessing impacts of activities  |
| NWSS 4.6 | Network system configuration management  |
| - Registry in database and database access - Organization’s procedures in purchase and investment control | - Using network composition control tools - Using registered database- Making detailed reference - Monitoring security and efficiency of resources - Cooperating with users relating to memory distribution - Monitoring network structure and using invested resources efficiently  |
| **NWSS 5** | **Module: Network system management**  | **x** | **x** | **x** | **x** |
| NWSS 5.1 | Network monitoring  |
| - Method of monitoring data collection - Use of monitoring tools- Operating system - Applications - Network architecture, network topo, hardware and software - LAN, WAN network and other network models - Organization’s information security policy and procedure - Documentation, storage of security policy tools  | - Analyzing monitoring data - Making documents with detailed analysis - Seizing trends on performance and discrepant diagnosis on performance - Using project management software - Analyzing system’s operation, impact and efficiency  |
| NWSS 5.2 | Incident analysis and recovery  |
| - Method of monitoring data - Operating system - Applications - Network architecture, network topo, hardware and software- LAN, WAN network and other network models- Network’s compositions and control device - Procedures for incident recovery  | - Implementing proper measures if any anomalous incidents arise- Explaining and assessing data - Handling incidents if having any trouble and stopping the system - Seizing trends on performance and discrepant diagnosis on performance - Making reports on incident monitoring and proposing fault process. |
| NWSS 5.3 | System performance analysis  |
| - Network architecture, network topo, hardware and software - Network capacity state - System’s feedback - System’s life cycle  | - Using measuring and monitoring tools - Analyzing the system - Using auditing tools- Analyzing and assessing data accuracy - Diagnosing limitations on performance - Seizing trends on performance and discrepant diagnosis on performance |
| NWSS 5.4 | Analyzing and dealing with information security violations  |
| - Network architecture, network topo, hardware and software - Monitoring procedures - Unauthorized access detecting tools - Countermeasures of information security violations - Information security holes and fault revisions - Computer Virus  | - Dealing properly at the violating time - Using monitoring tools and unauthorized access detecting tools - Using preventive tools - Collecting the information regularly  |
| **NWSS 6** | **Module: Network system assessment**  |  | **x** | **x** | **x** |
| NWSS 6.1 | Network system assessment |
| - Assessment, monitoring, reporting procedures and network system’s policy in the organization - Organization’s resources and resources’ limitations - Monitoring process/procedure in the system - Documenting standardizations and procedures for communication in internal organization  | - Analyzing and integrating the information - Using model and emulation tools - Assessing, adjusting the acting program - Determining points for improvement - Making easy-to-understand reports on system assessment  |
| NWSS 6.2 | Proposals on network system improvement  |
| - Network system’s life cycle - Network capacity forecast and network system requirements - Method of information collection - Technological limitations and hardware, software standardizations and processes  | - Proposing system amendments and improvements and analyzing targets, constraints - Collecting the information regularly on new products - Seizing trends of network system configuration from other organizations  |
| **NWSS 7** | **Module: Network system developing consultancy**  |  |  | **x** | **x** |
| NWSS 7.1 | Consulting on network system planning and analysis  |
| - Network system’s life cycle - Network system assessment- Network system developing forecast- Network system management  | - Seizing trends of network system configuration from other organizations - Summing up main points in free discussions - Working in groups - Making presentations  |
| NWSS 7.2 | Consulting on network system design and establishment  |
| - Network system design and establishment | - Seizing trends of network system configuration from other organizations- Summing up main points in free discussions - Working in groups - Making presentations |
| NWSS 7.3 | Consulting on network system operation and maintenance  |
| - Network system operation and management  | - Seizing trends of network system configuration from other organizations- Summing up main points in free discussions - Working in groups - Making a presentation. |

**APPENDIX NO. 04**

**Requirements on professional knowledge and skills of**

**IT SYSTEM MANAGEMENT skill standard**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of*

*the Minister of Information and Communications)*

| **Ref. code** | **Content/ Requirement** | **Requirement in grade** |
| --- | --- | --- |
|  | **Knowledge** | **Skills** | **4** | **3** | **2** | **1** |
| **SMSS 1** | **Module: System management planning**  |  |  | **x** | **x** |
| SMSS 1.1 | Determining system management requirements  |
| - Content and provisions relating to user’s job - Information collection - Methods of problem analysis - Future and current trends of types of operation, industry, operational fields from organization - Future and current trends of IT - System’s overall management operation - Human management  | - Finding out computerization strategy - Determining main sources of information on user’s demand - Implementing methods and procedures of information collection - Analyzing feedbacks from individuals and groups - Applying methods of job analysis to propose advance and improvement - Applying methods of problem analysis to deal with problems on system management - Making documents on results of analysis and explaining to users  |
| SMSS 1.2 | Determining system management services  |
| - User’s job - Use of system - System management - Risks in system operation - Current situation of organization and technology - Quantitative method of services’ content  | - Making documents about the scope of services to users - Negotiating with users about service content, levels and scope of responsibility - Determining scope and levels of service in line with current budget - Determining limitations of scope and levels from services provided  |
| SMSS 1.3 | Calculation on costs/benefits of services  |
| - Accounting - Costing accounting method - Factors for creating/changing costs to system management - Purchase expenses for organization and other costs. | - Analyzing factors of service establishment - Estimating investments on resources and operation cost - Explaining costs/benefits to users, adjusting (if necessary) for approval  |
| SMSS 1.4 | Establishing operational rules  |
| - Overall system management jobs- Standardization and procedures- Use of resources - Management of change  | - Providing forms, procedures and standardization of daily activities - Establishing documents on rules completely, accurately and clearly- Detecting a difference between rules and actual situation, deciding improvement methods - Explaining rules for approval - Receive criticism  |
| SMSS 1.5 | Establishing system management plan  |
| - System overall management - Plan preparation - System operation- System maintenance  | - Preparing short and long-term plan - Explaining plan to users clearly - Considering system operation management in overall opinion  |
| **SMSS 2** | **Module: System management**  |  | **x** | **x** | **x** |
| SMSS 2.1 | System operation  |
| - Scheduling - System operation - Establishing manuals - Data on service level assessment and data collection method - Collected data analysis and assessment  | - Creating user’s consent on suitability of operational schedule - Considering jobs’ order and arranging jobs efficiently - Considering levels of difficulty in jobs, staff’s qualification and estimating operational time - Making reports to the leaders on analysis results, assessing current situation and system’s operational problems  |
| SMSS 2.2 | User management  |
| - Policy and purpose of User management - Management of registration - Management of information security and privacy  | - Determining items monitored by system and those by users - Checking inconsistence between registered information and user’s usage - Explaining the necessity of contents which need to be monitored by users - Making reports to the leaders on analysis results, assessing current situation and user management problems  |
| SMSS 2.3 | Operational management  |
| - Organization’s operational fields - Operational rules - Fault management and fault recovery - Binding conditions and points in need of review for planning preparation - Personnel management - Contract with external staff  | - Evaluating job volume and required numbers of staffs- Determining jobs in line with scope of IT application - Checking whether the operation is accurately, timely implemented in its authority or not - Analyzing operational results and proposing the improvement of system operation methods - Operating and building team-work rules for the highest efficiency  |
| SMSS 2.4 | Management of expenses  |
| - Methods of budget determination - Methods of information collection on actual expenses - Initial and operational expenses- Hiring and lease - Methods on additional expenses - Contract and contract liquidation - Methods of analysis on the difference between budget and actual consumption  | - Dividing items of expenses in capital sources and types of expenses - Considering purchase properly by comparing between purchasing and outsourcing - Determining suitability between budget and actual consumption - Analyzing the difference between budget and actual consumption and making reports of analysis to the leader  |
| SMSS 2.5 | Human management  |
| - Labor Code - Laws on sexual equality in labor recruitment and use - Laws on health and labor safety - Education and training - External contract - Management of missions  | - Calculating necessary man-hours- Calculating labor quality - Establishing missions properly - Managing job state and staff’s health - Supporting in improving staff’s qualification - Adjusting and negotiating among organizations for staff circulation - Adjusting and negotiating with external contractors for staff arrangement  |
| SMSS 2.6 | Management of distributed sites |
|  | - System management problems at distributed sites - System configuration and compositions of distributed sites - User’s job at distributed sites - Technologies on distributed system  | - Seizing requirements on system operation management at distributed sites - Building management system at distributed sites on the basis of system management plan - Seizing problems on operation management of distributed system and considering solutions - Building training plans at distributed sites  |
| SMSS 2.7 | Use of operational management system  |
| - Common jobs in system operation - Operational management system - Requirements for systematization - Available software packages in operational management  | - Seizing problems on operational management of system and proposing improvements - Quantifying impacts of application of operational management system - Determining adaptability of packages to organization’s jobs - Proposing solutions to problems relating to distributed system management  |
| SMSS 2.8 | Standardization |
| - Jobs relating to system operation- Procedures of standardization - Management of standards  | - Establishing common and fixed forms for jobs - Building documents on operation and standardization for users instruction - Building standards on job volume and explaining these standards to users - Capability of explaining to users the necessity of complying with standards - Seizing current situation of jobs prone to IT application and determining suitability following the standards  |
| **SMSS 3** | **Module: Management of resources**  | **x** | **x** | **x** | **x** |
| SMSS 3.1 | Management of hardware and network resources |
| - Hardware and network - Overview on hardware and network configuration, components of hardware and network configuration - Contact information equipment and communication service - Register management - Asset management - Configuration management - Change management - Hardware maintenance - Network management and maintenance - Procedures of network inspection  | - Compiling the registration of management - Managing hardware assets and network components properly - Managing current hardware and network assets to maintain using values - Determining range of influence to the operation relating to the change of hardware and network configuration- Comparing economic efficiency among various ownership forms (purchasing, hiring and leasing) - Managing current network assets to maintain using values - Evaluating the integrity of communication systems, network components, equipment and software in operational point of view - Comparing economic efficiency of different contact information systems |
| SMSS 3.2 | Software management  |
| - Software - Software configuration - Software configuration components- Register management - Configuration management - Change management.- Software’s life cycle - Software copyright contract - Support of software supplier - Copyright - Library management tools - Document management tools  | - Compiling the registration of management and managing software assets properly - Evaluating integration of every package of component software with the organization in operational point of view - Determining range of influence to the operation relating to the change of hardware configuration- Comparing differences on requirements of intellectual protection due to difference in development form (self-development, development in commitment and software purchase)  |
| SMSS 3.3 | Data management  |
| - Organization’s data- Organization’s data security policy. - Information resource management - Data’s life cycle - Data management - DBMS - Database management - Catalog- Dictionary/data catalog- Data standardization- Data control procedures  | - Determining the importance of data- Evaluating the integration of security, data management tools, data analysis tools in the operational point of view - Explaining figures and cooperating with controllers  |
| SMSS 3.4 | Equipage management  |
| - Organization’s buildings and auxiliary equipage - Computer operation equipage - Communication equipage - Laws on security methods to facilities and equipage - Forms of facility and equipage ownership (purchase, lease and hiring) - Damaging insurance - Standards and methods of information security  | - Determining the importance of equipage - Seizing remarks in equipage management - Seizing shortcomings of equipage management procedure and implementing necessary countermeasures - Comparing economic efficiency of different ownership forms (purchase, lease and hiring) - Seizing shortcomings of buildings where equipment, equipage are installed at distributed sites and implementing necessary countermeasures |
| **SMSS 4** | **Module: Management of faults and incidents**  |  | **x** | **x** | **x** |
| SMSS 4.1 | Fault monitoring  |
| - Monitored-to-be contents- Monitoring system - System faults and individual characteristics - Fault detecting methods - Fault situations in the past  | - Building fault detecting methods from initial period - Building monitoring form in monitoring activity - Distinguishing signs of faults - Determining whether signs of faults lead to the appearance of faults or not - Determining serious levels of occurred faults - Determining the influence of faults on organization’s operation  |
| SMSS 4.2 | Determining fault causes  |
| - Types of system faults and characteristics of faults - Methods in analyzing fault’s factors - Fault cases in the past  | - Establishing and implementing training plan to isolate faults in initial period and inspecting causes - Appointing proper staffs to inspect causes in fault characteristics and others’ cooperation - Localizing range of influence of faults - Determining fault state and resetting system properly  |
| SMSS 4.3 | System process, recovery  |
| - Data recovery procedure - Network recovery procedure - Hardware and software recovery - Types of faults and classification of faults - Evaluation of precautionary measures for fault recurrence  | - Building recovery methods with little influence on users - Giving various recovery methods and choosing the optimal methods - Choosing proper staffs to follow up recovery job - Building and implementing training plans on recovery - Describing faults in specification accurately and effectively - Analyzing fault causes sufficiently and implementing acts against recurrence- Forecasting possible faults in organizational environment - Evaluating actual result of precautions against fault recurrence  |
| **SMSS 5** | **Module: System information security management**  |  | **x** | **x** | **x** |
| SMSS 5.1 | Establishing management system and information security policy |
| - Information security requirements - Precautious plans to sudden cases - Potential risks - Information security management tools - Database - Network- Physical, technical and managerial information security methods- Laws on information security - Infringed information security cases - Information security technology and using cases - Technical expenses on information security methods  | - Determining capacity of information security loss in the organization- Finding out organization’s information security policyandinformation security methods established in the organization - Evaluating risks - Calculating expenses/benefit rate for information security methods - Building physical, technical and managerial information security plans and implementing plans  |
| SMSS 5.2 | Monitoring information security infringement and state analysis |
| - Types of information security infringement and characteristics of every type - Techniques of information security infringement - Information security infringement cases in the past - Implementation of methods against information security infringement - Information system supervision- Information security software  | - Distinguishing signs of information security infringement - Determining signs likely to cause information security infringement - Determining serious levels of information security infringement - Determining range of influence of information security infringement on organization’s operation departments  |
| SMSS 5.3 | Inspecting information security levels  |
| - Information security software - List of information security level inspection  | - Seizing the importance of information security inspection- Seizing content of items in a list of information security inspection and approved criteria - Determining efficiency of information security inspection  |
| **SMSS 6** | **Module: System performance management**  |  | **x** | **x** | **x** |
| SMSS 6.1 | Evaluating system performance |
| SMSS 6.1.1 | Establishing criteria of performance evaluation  |
| - Performance monitoring model- Hardware performance specification - Performance evaluation methods - System configuration- Network  | - Combining new or current performance evaluation models to establish performance evaluation model in organization’s characteristics- Establishing a target value corresponding to service levels in every performance evaluation index - Choosing information collection method in line with every performance evaluation index - Determining bottleneck point by analyzing performance data  |
| SMSS 6.1.2 | Analyzing and evaluating performance  |
| - Information used as performance evaluation index of hardware, software, network and such information collection methods; standard values - Information used as overall performance evaluation index, standard values and collection methods - Performance measurement tools - Statistics  | - Determining improvement methods when evaluating result is lower than target value - Choosing performance measurement tools in line with organization’s requirement  |
| SMSS 6.2 | Managing system capacity  |
| - Limit of resources - Relationship between resources and performance - System capacity - System operation at limit power/efficiency - Changes in user’s operation environment  | - Consulting proper use of system resources - Estimating system load, forecasting limit capacity, performance accurately and preventing resulting problems - Analyzing causes reducing performance from various opinions - Proposing equipment addition and system innovation properly, considering expenses/benefit rate - Forecasting changes of system use state from changes of user’s operation environment  |
| **SMSS 7** | **Module: System maintenance**  | **x** | **x** | **x** | **x** |
| SMSS 7.1 | Planning system maintenance |
| SMSS 7.1.1 | Collecting requirements on system maintenance  |
| - Software and hardware maintenance - Facility and equipage maintenance  | - Choosing information sources on maintenance demands - Arranging maintenance demands - Analyzing maintenance demands - Establishing priority level of maintenance demands  |
| SMSS 7.1.2 | Planning system maintenance |  |
| - Maintenance - Organizations in charge of maintenance - Software and hardware maintenance - Contract of software maintenance - Improvement plan of software suppliers - Management of software change - Network maintenance - Facility and equipage  | - Implementing maintenance plan meeting user’s demand - Distinguishing range of influence from maintenance to users  |
| SMSS 7.2 | Implementing system maintenance  |
| - System maintenance process- Management of software change - Software maintenance - Software distribution - Maintenance contract  | - Reducing range of influence from maintenance to user’s job - Deciding methods of improvement preventing resulting problems in maintenance process - Examining the influence of software improvement - Negotiating with software suppliers - Negotiating with external contractors for software development - Determining necessity of maintenance - Implementing maintenance plan  |
| **SMSS 8** | **Module: New system construction and system migration** |  | **x** | **x** | **x** |
| SMSS 8.1 | Building a plan of system development  |
| - System development - System maintenance- System test - System migration  | - Proposing the improvement in system development process in system operation management opinion - Building a plan of system operation and obtaining the approval - Evaluating implementation of system operation management - Negotiating and adjusting with relevant people on system development  |
| SMSS 8.2 | Designing system operation methods  |
|  | - Computer architecture - System management - Issues relating to actual operation management at the organization - Trends of operation management technologies - Operation management tools in the market  | - Determining solutions on operation management in line with organization’s reality - Evaluating integration of operation management methods |
| SMSS 8.3 | Operation test and system migration  |
|  | - Testing tools - System operation  | - Choosing items likely to be applied in system migration test - Choosing testing tools in system migration process - Forecasting jobs upon system migration - Determining suitability of System operation and restoring backup system  |
| SMSS 8.4 | System migration  |
|  | - Old and new systems - Migration tools - Data migration - Issues relating to migration in the past  | - Reducing influences relating to System migration to users - Explaining System migration plan to relevant people and adjusting according to different ideas - Determining whether system migration is continued in migration process or not  |
| SMSS 8.5 | Managing development environment  |
|  | - System configuration - System development - Development environment and user’s characteristics  | - Keeping system state without any change from current system - Keeping system state without influence on others - Keeping system state with faults but likely to be handled if occurred in new system - Adjusting resources in system development progress - Negotiating and adjusting development environment according to users  |
| **SMSS 9** | **Module: Evaluating system operation**  |  |  | **x** | **x** |
| SMSS 9.1 | Determining target and items of evaluation |
| - Operation management - Information system resources - System’s life cycle  | - Evaluating operation target in system design period - Evaluating operation system, performance, power in system design period - Evaluating function, efficiency, reliability in system migration period- Evaluating system’s overall efficiency in system operation period  |
| SMSS 9.2 | Establishing items, criteria of evaluation and implementation of evaluation  |
| - System operation management - Resources of information system - Methods of evaluation - Reference value of evaluating indexes  | - Determining rationalization of criteria - Analyzing factors in the case evaluating result is lower than target.  |
| SMSS 9.3 | Proposing system improvement  |
| - Evaluation of improvement | - Explaining improvement proposal to relevant people - Distinguishing actual causes of operation and deciding solutions - Seizing opponent proposals - Dealing with common problems  |
| **SMSS 10** | **Module: User assistance**  | **x** | **x** | **x** | **x** |
| SMSS 10.1 | User assistance |
| - User’s job- User’s technical level - Relationship between violations of rules and faults - Information collection methods - Technical information and documents relating to user’s demand  | - Determining resulting problems in system operation management due to violations of rules - Building and communicating rules - Identifying and analyzing user’s demand and giving solutions to meet user’s demand - Describing training content accurately and simply to users - Determining user’s capacity necessary to be trained and putting training target properly - Preparing training content and environment - Instructing and consulting users in levels of understanding and technique  |
| SMSS 10.2 | Assisting users if having any new demand  |
| - Service’s range - System environment and component factors - Using procedure of resources - Inspection of user’s satisfaction levels  | - Distinguishing user’s requirements and respective priority- Finding out issues on system operation management technology- Determining methods to improve user’s satisfaction levels in operation’s point of view  |

**APPENDIX NO. 05**

**Requirements on professional knowledge and skills of**

**INFORMATION SECURITY skill standard**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of*

*the Minister of Information and Communications)*

| **Ref. code**  | **Content/ Requirement**  | **Requirement in grade**  |
| --- | --- | --- |
|  | **Knowledge** | **Skills**  | **4** | **3** | **2** | **1** |
| **SCSS 1** | **Module: Information security policy construction**  |  |  | **x** | **x** |
| SCSS 1.1 | Evaluating information and data resources  |
| - Technique, procedure and implementation of information collection - Legal normative documents and regulations - Organization’s information resources - Organization’s network structure and information systems - Information resources evaluating and measuring techniques - Documentation method | - Establishing survey targets and scope - Seizing detailed information on organization’s information resources - Analyzing internal information resource flow - Analyzing information resources properly - Presenting to managers, information security directors and planners - Exchanging and agreeing information resources in need of evaluation  |
| SCSS 1.2 | Identifying threats  |
| - Technique, procedure and implementation of information collection - Incidents relating to information resources - Evaluation of risks - Technology, operation of general systems and network - Network architecture and system, hardware, software - Network attacking techniques  | - Establishing survey targets and scope - Seizing the information of incidents from general systems - Collecting the information continuously - Identifying threats  |
| SCSS 1.3 | Determining risks  |
| - Types of risks and causes, including personnel factor - Information resources - Organization’s network architecture and system - Network architecture and system, hardware, software  | - Seizing detailed information on risks to organization’s information resources and causes - Classifying information resources and risks properly  |
| SCSS 1.4 | Classifying methods and evaluating situation  |
| - Methods of risk prevention - Network architecture and system, hardware and software - Technique, procedure and implementation of information collection  | - Seizing details on risks to organization’s information resources and causes - Classifying risks and methods of risk prevention properly - Establishing targets and scope of evaluation - Analyzing results of evaluation  |
| SCSS 1.5 | Evaluating risks  |
| - Previous data about risk probability - Overview about risk probability and statistics - Calculating expenses on information security methods  | - Calculating and evaluating damages due to loss of information resource (loss of asset value, expenses of cause investigation and recovery and others expenses) - Seizing the information of incidents from general information system - Collecting the information continuously  |
| SCSS 1.6 | Building information security policy  |
| - Information security policy - Method of scheduling - Method of information security policy establishment  | - Building a policy to a procedure from information resource evaluation to risk evaluation - Describing information security policy in operation language - Presenting to managers, directors in information security and planners  |
| **SCSS 2** | **Module: Establishment of information security criteria**  |  |  | **x** | **x** |
| SCSS 2.1 | Establishing information security regulations in operation activities  |
| - Information security policy - Information security standards - Relevant laws and legal normative documents - Labor contract - Career rules - Security regulations in information exchange - Protection of privacy - Crisis management - Understanding of secret information leak - Secret information management procedure - Information security incidents - External training services relating to information security - Press release - Establishment situation and standard update - Document change and management procedures  | - Establishing information security criteria - Presenting to managers, directors in information security and planners - Agreeing established criteria in the organization - Collecting information security incidents continuously - Applying criteria flexibly |
| SCSS 2.2 | Establishing information security regulations to information system  |
| - Information security policy - Information security standards - Services, trends, crime and incidents on the Internet - Internet linking technology and information security tools - Network topo - Fire wall - Installation and operation of servers and remote access servers.- System of software copyrights relating to applications - Secret information leak - Encoding technology, digital signature and electronic conformation - Network, hardware and software - Computer virus and antivirus software - Crisis management - Incident detection - Information security inspection - Career rules - System management and operation - System development procedures - Outsourcing contracts - Press release  | - Establishing information security criteria - Presenting to managers, directors in information security and planners - Agreeing established criteria in the organization - Collecting the information of trends and services on the Internet continuously - Collecting information security incidents continuously - Analyzing methods from incident cases  |
| **SCSS 3** | **Module: Information security system design**  |  | **x** | **x** | **x** |
| SCSS 3.1 | Controlling authentication and access permissions  |
| - Crypto technology - Authentication technology - Biometric technical mechanism - Digital signature technology - Operating systems - Network, hardware, software and database - Overview of encode - Hash algorithms  | - Establishing system requirements relating to authentication and access permissions on the basis of information security criteria - Establishing systems of authentication and access permissions, keeping a proper relationship between them - Integrating information security technologies including authentication, encode and digital signature technologies into a unique system in unified opinion - Proposing a system of authentication and access permissions in combination of biometric, digital signature technologies and others  |
| SCSS 3.2 | Controlling physical-level information security  |
| - Wiretapping from telecommunication cable - Network topo - Network hardware and software - Information security products  | - Establishing requirements on a system relating to information security of devices on information security - Applying physical-level information security methods in line with information asset evaluation after risk analysis - Integrating a system towards important information resources separated physical level - Discussing and persuading member organizations to implement physical-level information security  |
| SCSS 3.3 | Controlling logic-level information security  |
| - Network architecture - Network topo - Data filtering principles - Basic knowledge of TCP/IP - Routing - Network design  | - Establishing requirements on a system relating to logic-level information security of devices on information security based on information security criteria - Applying information security technology for system design - Reading network design - Establishing requirements on network design from requirements on information security system design  |
| SCSS 3.4 | Ensuring liability of data on the Internet  |
| - Fire wall - Network architecture - Network services - Routing technology - TCP protocol - Internet attack - Preventive device of unauthorized access - Database  | - Establishing requirements on a system relating to data unification based on information security criteria - Applying information security technology for system design - Controlling capacity in line with system’s importance on the basis of risk analysis - Collecting the information on network services supplied by Vietnam Computer Emergency Rescue Centre (VNCERT) and suppliers to put into a system |
| SCSS 3.5 | Protecting data security  |
|  | - Encoding technology- Operation of crypto systems- Management of cryptographic keys  | - Establishing system requirements relating to keeping data confidentiality based on information security criteria - Applying information security technology for system design - Determining encoded data - Establishing a system of management to cryptographic keys  |
| SCSS 3.6 | Establishing procedures of information security system operation  |
| - Document management - Storage means - Backup tools - Secret information leak - Information security inspection - Protection of privacy - Cooperative method in investigation of information security incidents  | - Establishing system requirements relating to backup based on information security criteria - Establishing full backup procedures - Determining scope of data to detect information security incidents - Determining methods of backup data storage and information security supervision - Establishing information security procedures based on information security standards - Agreeing established processes and procedures in the organization  |
| SCSS 3.7 | Communicating users and planning user training  |
| - Risks of information resources - Internal penalties and rules - New sectors in general information security  | - Persuading managers about the importance of regular training on information security for staffs - Establishing training plans including the convenience to users  |
| **SCSS 4** | **Module: Information security system test and establishment**  |  | **x** | **x** | **x** |
| SCSS 4.1 | Selecting and introducing information security products  |
| - Organization’s network configuration - Functions of information security products - Standards of information technology – security techniques – evaluation criteria of information technology security - TCVN 8709-3:2011 ISO/IEC 15408.  | - Selecting information security products to establish information security system- Selecting information security products with efficiency, proper expenses  |
| SCSS 4.2 | Establishing information security system |
| - Functions of information security products - Computer system architecture - Network system architecture - Software development- Operating system-level processing of computer and network systems  | - Clarifying requirements on information security function - Auditing whether established system meets requirements on information security function or not  |
| SCSS 4.3 | Auditing implementation of information security  |
| - Information security holes - Information security recommendations - Information security auditing tools or information security holes - Computer system and network architecture - Network attack - Test attack procedures - Audit of operating systems and opening gates - Penetration Test models, Penetration Test steps  | - Collecting the information on information security and information security holes continuously - Implementing network attacks - Building reliability in the organization  |
| **SCSS 5** | **Module: Operation management of information security system** | **x** | **x** | **x** | **x** |
| SCSS 5.1 | Implementing procedures of information security operation |
| - Procedures of information security implementation - Exceptions to procedures of information security implementation - Standards of information security management in ISO/IEC 27000 standard  | - Requesting users to tightly comply with and not skip information security procedures - Detecting techniques of procedure disability and information security |
| SCSS 5.2 | Monitoring and recording system’s activities  |
| - Procedures of information security implementation - Information security monitoring tools  | - Finding and forecasting attacks on the basis of operational diary - Detecting information security holes and violations through information security monitoring tools (including control to supervisors) - Dealing with information security violations timely  |
| SCSS 5.3 | System maintenance  |
| - Information security holes  | - Selecting the information and mending faults if necessary to network  |
| SCSS 5.4 | Training users  |
| - Objective and subjective incidents in information security - Risks to information resources - Internal penalties and rules  | - Explaining information security incidents understandably - Persuading users - Presenting - Communicating with managers from departments  |
| SCSS 5.5 | Training information security staffs  |
| - External information security services - Objective and subjective incidents in information security - Network attacks  | - Helping learners seize new technical information on information security - Analyzing causes of objective and subjective incidents in information security - Instructing learners in applying learned techniques into operation management of information security - Practicing knowledge on network attacks, processing of network incidents  |
| **SCSS 6** | **Module: Information security analysis**  | **x** | **x** | **x** | **x** |
| SCSS 6.1 | Detecting incidents  |
| - Network attacks - Access detecting techniques - System access records - Other automatic tools or system for detecting unauthorized access - External monitoring services  | - Monitoring continuously - Detecting or forecasting serious attacks from normal records - Warning violators on information security cleverly  |
| SCSS 6.2 | Initially dealing with incidents  |
| - Allocation of responsibilities and internal communication organization models - Announcement of incidents - Information security policy - Results of analysis and importance of information resources - Computer and network systems - System operation  | - Initially dealing with incidents normally - Determining priority of settlement on the basis of the importance of information resources - Reporting incident situation accurately without misunderstandings with presumptions - Implementing timely settlement, contacting with VNCERT and other units  |
| SCSS 6.3 | Analyzing incidents  |
| - Network attacks - Network and computer systems - Objective and subjective information security incidents - Analysis of monitored information security data - Monitoring procedure to causes of incidents  | - Investing and analyzing network attacks - Reporting causes of incidents, contacting with VNCERT and other units and making objective analysis of incidents - Documenting incidents particularly  |
| SCSS 6.4 | Recovery after incidents  |
| - Information security holes, recommendations and fault-mending information - Organization’s system configuration - Recovery and backup procedures  | - Evaluating the urgency of incidents, determining and implementing recovery in the shortest time - Recording and reporting actual situations correctly  |
| SCSS 6.5 | Implementing precautions of incident recurrence  |
| - Information security holes, recommendations and fault-mending information - Organization’s system establishment method  | - Selecting and implementing proper methods after examining causes of incidents - Recording and reporting actual situations correctly  |
| SCSS 6.6 | Evaluating information security levels  |
| - Information security holes, recommendations and fault-mending information - Information security auditing contents. - Information security auditing services - Network attacks - Schedule of information security evaluation  | - Applying timely acts to deal with information security holes - Implementing information security methods continuously - Building the reliability in the organization - Using various attack tools  |
| **SCSS 7** | **Module: Checking information security contents**  |  | **x** | **x** | **x** |
| SCSS 7.1 | Collecting and evaluating technical information  |
| - Objective and subjective information security incidents - Information security technology - Organization’s network and system configuration - Supplier’s information  | - Collecting the information on information security technology - Selecting the information on holes and information security technology relating to organization’s network system  |
| SCSS 7.2 | Classifying and analyzing operational issues  |
| - Technique, procedure and implementation of information collection - Organization’s network and system configuration - Organization’s network and system operation  | - Establishing survey targets and scope - Analyzing network and system operation policy as well as operational criteria on the basis of survey results - Reviewing information security policies according to analyzed issues - Reporting to the leadership on management activities to be implemented corresponding to analyzed issues  |
| SCSS 7.3 | Classifying and analyzing technical issues  |
|  | - Information security - Organization’s network and system configuration  | - Classifying the information on information security - Analyzing information security policies and criteria of implementation on the basis of classified technical information - Reviewing information security policies corresponding to classified issues - Reporting to the leadership on management activities to be implemented corresponding to analyzed issues  |
| SCSS 7.4 | Classifying and analyzing new risks  |
|  | - Objective and subjective information security incidents - Information security technology - Organization’s network and system configuration  | - Collecting and classifying the information on objective and subjective information security incidents - Determining causes of information security incidents from actual cases and analyzing countermeasures - Analyzing information security policies and criteria of implementation on the basis of classified technical information - Reviewing information security policies corresponding to classified issues  |
| SCSS 7.5 | Updating information security policies |
| - Information security policy revising procedures - Information security policy - Method of information security policy establishment and information security criteria  | - Periodically reviewing information security policies thoroughly  |

**APPENDIX NO. 06**

**Requirements on professional knowledge and skills of**

**SOFTWARE DEVELOPMENT AND DESIGN skill standard**

*(Attached to Circular No. 11 /2015/TT-BTTTT dated May 5th, 2015 of*

*the Minister of Information and Communications)*

| **Ref. code** | **Content/ Requirement** | **Requirement in grade** |
| --- | --- | --- |
|  | **Knowledge**  | **Skills** | **4** | **3** | **2** | **1** |
| **SDSS 1** | **Module: Analysis of user’s requirements and determination of systematization requirement**  |  | **x** | **x** | **x** |
| SDSS 1.1 | Collecting analyzing the information for determining user’s requirements  |
| - User’s job content and scope - Information collection methods - Methods of analysis  | - Determining main information sources on user’s requirements- Applying techniques and order of information collection - Determining data volume to be collected - Analyzing feedbacks from individuals and collectives - Selecting, receiving collected data and determining demands -Arranging and summing up data on user’s requirements - Making a favorable environment so that everyone can exchange important issues and proposing solutions - Collecting and presenting data on expenses  |
| SDSS 1.2 | Determining scope of job  |
| - System environment - System architecture, hardware and software- Availability of resources and time-limit of project handover - Man-hour calculation - Technical limitations - Risk analyzing techniques  | - Documenting scope of user’s requirements clearly - Negotiating with ordering people on criteria to be obtained to a project of systematization - Forecasting man-hours to every items of job in a project of systematization - Forecasting completion progress of system development - Surveying, analyzing, comparing products in the market and determining capacity of application to the system - Building documents in technical constraints - Thinking without succession and generality  |
| SDSS 1.3 | Determining systemization requirement  |
| - Systemization and integration of system - System’s operation and functions - Development capacity and procedure  | - Transferring user’s requirements into system’s - Detecting contradictory requirements and presenting solutions - Analyzing correctness and consistence of data - Applying technologies meeting requirements effectively  |
| SDSS 1.4 | Determining information security requirements  |
| - Information security risks - Organization’s information security policies - Network information security - Data’s integrity - Security methods (access control, encode, authentication, fire wall) and information security tools | - Analyzing data importance - Determining types of risks - Transferring user’s information security requirements into system’s - Applying technologies meeting requirements on information security effectively  |
| SDSS 1.5 | Determining operation requirement  |
| - System operation requirements - Countermeasures of system faults - Maintenance tools  | - Transferring user’s operation requirements into system’s  |
| SDSS 1.6 | Determining maintenance requirement  |
| - System maintenance  | - Determining items requested maintenance by users  |
| SDSS 1.7 | Establishing performance evaluating criteria  |
| - System requirements - Determination of System’s performance requirement  | - Evaluating performance evaluating criteria - Determining satisfaction of performance evaluating criteria - Proposing necessary items for performance guarantee  |
| SDSS 1.8 | Determining test requirement  |
| - Test method - Test tools  | - Determining test items in accordance with user’s requirement - Auditing the implementation of system requirements - Dealing with problems upon test  |
| SDSS 1.9 | Preparing and checking documents of requirement determination  |
| - Checking procedure - Operation environment and system development - Notes and items to be included into documents of requirement determination | - Describing important items clearly - Selecting proper exchange method to check requirement determination and boost checking progress effectively- Evaluating inconsistent ideas properly  |
| **SDSS 2** | **Module: Preparation of system development**  |  | **x** | **x** | **x** |
| SDSS 2.1 | Determining cycle models to the development |
| - Software cycle models  | - Determining scope, range, complexity of a project - Selecting software cycle models in integration with a project  |
| SDSS 2.2 | Preparing development environment  |
| - Hardware and software (tools, languages, intermediary softwares)  | - Selecting optimal hardware and software to a project (tools, languages, intermediary softwares)  |
| SDSS 2.3 | Preparing plans of development procedure  |
| - Preparing documents of project plans - Risk management - Staff’s working dynamics  | - Making optimal plans, reviewing scope, complexity and resources for development - Presenting project targets - Arranging personnel efficiently - Seizing staff’s skills - Raising staff’s spirit - Studying risk precautions  |
| **SDSS 3** | **Module: System design (external design)**  |  |  | **x** | **x** |
| SDSS 3.1 | Selecting system architecture  |
| - Survey techniques and order - Technology and definition of system design - System trade-off- System architecture, software and hardware - Systematization standards  | - Building detailed documents on system architecture - Evaluating systematization planning methods and explaining them to relevant people - Determining system’s core requirements to system architecture - Implementing technical selection including effectiveness of expenses- Explaining system complexity and analyzing user’s ideas - Collecting, connecting and understanding data  |
| SDSS 3.2 | Designing functional specification and interference to subsystems  |
| - Overall system - System’s classification structure  | - Analyzing and establishing system’s consistence - Separating system into subsystems - Evaluating validation of subsystems interferences - Establishing subsystems optimally - Analyzing system configuration and stability  |
| SDSS 3.3 | Designing information security  |
| - Design of information security requirements - Information security policies  | - Applying information security technologies in system design  |
| SDSS 3.4 | Determining data and job models  |
| - Methodology of job model development - Methodology of data model development - Modulation techniques - Operation limitations  | - Developing data and job models in line with model developing techniques - Evaluating data - Creating modulation modules - Evaluating consistence between operation and system - Analyzing system architecture and structure  |
| SDSS 3.5 | Preparing and checking manuals (manual’s outline)  |
| - Document checking procedure- User’s job - System operation - User graphical interface design  | - Building manuals and items to be described - Selecting proper exchange method to check manuals and method of implementation - Proposing methods of user graphical interface construction as requested - Arranging operational requirements (documents and movements) upon user’s job systematization  |
| SDSS 3.6 | Designing system test specification  |
| - Test specification design - Test tools - System requirements  | - Designing test specification in line with systematization definition - Preparing system test plan - Analyzing problems’ causes and presenting acting program  |
| SDSS 3.7 | Preparing and checking system design documents  |
| - System specification in documents - Design and checking order and method of implementation - Developing procedure - Operational environment  | - Supporting users without engineers in seizing system specification properly - Explaining technical information relating to job’s efficiency - Selecting an exchange method suitable to the system design check and efficiently implementing a check - Evaluating contradictory ideas properly  |
| **SDSS 4** | **Module: Component design (internal design)**  |  | **x** | **x** | **x** |
| SDSS 4.1 | Designing software component  |
| - Software design techniques - Possible applied foundations - Architectural design - Subject-oriented design techniques - Standardization - System configuration  | - Finding out system specification and dividing subsystems into components - Designing interface among components consistently - Ensuring quality as required- Implementing specification such as extension, reliability and flexibility  |
| SDSS 4.2 | Designing physical-level database  |
| - Transferring logic data model into physical one - Standardization, non-standardization, relation theory and data modeling tools - Storage devices’ capacity calculation and clustering | - Implementing jobs relating to database operation and construction - Finding out structure of logic model and transferring it into real data structure - Explaining relationship between data models and database - Applying steps of database establishment  |
| SDSS 4.3 | Designing and testing prototype |
| - Methodology of prototype design - Construction of prototype and testing methods - Testing tools  | - Analyzing important points - Integrating opinions on software and applying them for system improvement - Evaluating system model performance on the basis of testing results - Proposing improvement plans - Being aware of software’s limitations  |
| SDSS 4.4 | Designing component testing specification  |
| - Design of testing specification- Testing tools - Component specification and interface among components  | - Designing testing specification in correspondence with definition of software’s component design - Preparing component testing plans - Analyzing problems’ causes and presenting acting program  |
| SDSS 4.5 | Checking software’s component design  |
| - Documentation of software’s component specification - Design checking order and implementation - Developing procedure - Operational environment | - Selecting proper exchange method in line with component design check and implementing a check efficiently - Explaining component design logically and clearly - Evaluating contradictory ideas - Proposing other measures - Proposing optimal plans on the basis of overall research  |
| **SDSS 5** | **Module: Detailed design (program design)**  |  | **x** | **x** | **x** |
| SDSS 5.1 | Implementing detail software design  |
| - Detail software design - Writing techniques for explaining program logically and properly - Computer-Aided Software Engineering- Programming languages  | - Designing software’s component specification consistently - Classifying issues to be considered and preparing respective detail specification - Selecting optimal design technique - Selecting optimal developing environment to system  |
| SDSS 5.2 | Checking detail design  |
| - Detail design documents - Design checking order and implementation - Developing procedure - Program implementing environment - Operational environment  | - Selecting proper exchange method and implementing detail design check - Explaining logicality of detail design - Evaluating opponent ideas - Finding out program developing situation and specifying problems  |
| SDSS 5.3 | Designing unit testing specification  |
| - Designing unit testing specification - Testing tools - Production procedure - Operational environment- Programming languages - Testing environment  | - Planning unit test - Making a test, report of faults and software system quality - Establishing testing environment  |
| SDSS 5.4 | Preparing and checking manuals (final version)  |
| - Documentation of manuals and issues to be described - Checking procedure - User’s job - System operation - User graphic interface design (GUI) and implementation  | - Selecting proper exchange method to check user manuals and efficiently implementing a check - Presenting User graphic interface design (GUI) through detail design and acquiring understanding from participants in a checking process - Arranging operational requirements systematically  |
| **SDSS 6** | **Module: Program construction**  | **x** | **x** | **x** | **x** |
| SDSS 6.1 | Coding |
| - Methodology of coding’s development- SQL programming - Program quality (example: convenience in decoding, maintenance, efficiency). - Programming languages in line with application development - Recycle of existing components  | - Determining programming manuals clearly and considering detail specifications - Summing up processing information- Creating various source codes to complex issues to compare, evaluate - Finding out architecture and classification in the system  - Ensuring software quality as required - Building program structure with extension, flexibility and reliability |
| SDSS 6.2 | Checking peer-review code  |
| - Technique and order of peer-review code  | - Selecting a group for checking properly - Selecting proper exchange method and implementing a check - Comparing programming methods based on various program techniques- Explaining issues with logicality and complex issues - Emulating source code and analyzing results - Evaluating opponent ideas properly  |
| SDSS 6.3 | Checking unit  |
| - Unit checking procedure - Recurrent testing procedure - Fault analyzing method and fault revising procedure  | - Determining, handling and modifying errors and faults - Auditing, analyzing state and proposing solutions  |
| SDSS 6.4 | Testing component  |
| - Component testing procedure - Recurrent testing procedure - Fault analyzing method and fault revising procedure - Check of system’s accuracy  | - Determining, handling and modifying errors and faults - Auditing, analyzing state and proposing solutions - Checking software’s accuracy  |
| SDSS 6.5 | Testing system  |
| - System testing procedure - Recurrent testing procedure - Fault analyzing method and fault revising procedure - Check of software’s accuracy | - Determining, handling and modifying errors and faults - Auditing, analyzing state and proposing solutions - Finding out system’s classification and structure - Classifying results and processes systematically and documenting as detail proving documents  |
| SDSS 6.6 | Testing systematization requirement  |
| - Testing procedure of systematization requirement - Recurrent testing procedure - Fault analyzing method and fault revising procedure  | - Determining, handling and modifying errors and faults - Auditing, analyzing state and proposing solutions - Finding out system’s classification and structure - Classifying results and processes systematically and documenting as detail proving documents - Preparing various methods and negotiating with users if user’s requirements are not satisfied due to system or technical errors  |
| SDSS 6.7 | Updating documents  |
| - Service manual establishment - System document establishment - Document updating procedure- System operation | - Explaining changes in service manual and causes - Reflecting changes in system design or in implementation at system documents  |
| SDSS 6.8 | Preparing software handover  |
| - Software configuration for handover - Procedures of handover preparation - Product handover for operation and maintenance periods  | - Organizing, arranging softwares, data, documents relating to handover samples - Explaining issues in respect of software handover  |
| **SDSS 7** | **Module: Support in software installation**  | **x** | **x** | **x** | **x** |
| SDSS 7.1 | Installing software  |
| - User’s current system - Software installation - Operation implemented parallel to current system  | - Planning software installation with the least impact on user’s current environment - Supporting users from initial operation period  |
| SDSS 7.2 | Supporting user’s approved test  |
| - Understanding of system testing results and systematization-required testing results  | - Implementing assisting jobs supporting user’s approval test  |
| SDSS 7.3 | Training, coaching and supporting users  |
| - User’s software operation  | - Planning training, coach and support in line with user’s qualification - Training, coaching and supporting users  |
| **SDSS 8** | **Module: General testing activities**  | **x** | **x** | **x** | **x** |
| SDSS 8.1 | Preparing testing plans  |
| - Software quality guarantee - Software’s reliability  - Testing schedule - Organization of testing systems - Testing techniques - Testing data preparation and design - Evaluation method of testing results - Documents of testing results - Testing environment preparation - Testing means and tools  | - Planning quality guarantee in system development process - Preparing testing schedule properly- Evaluating personnel and resources to be tested - Selecting testing method in line with the project - Studying automation of testing procedure- Determining testing ending and starting conditions  |
| SDSS 8.2 | Preparing testing procedure  |
| - Methodology of test  | - Monitoring testing procedure |
| SDSS 8.3 | Implementing a test  |
| - Testing procedure - Methodology of test - Recurrent testing process - Fault analysis and amendment - Report of testing result  | - Evaluating testing results- Determining, handling, and modifying errors and faults - Auditing, analyzing state and proposing solutions - Classifying processes, results systematically and documenting- Evaluating performance - Evaluating usability- Evaluating testing procedures |
| SDSS 8.4 | Recording testing results and approval  |
|  - Records of testing results | - Evaluating automatic testing tools - Evaluating completeness of test - Studying plans of testing procedure improvement |