NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: SOFTWARE ENGINEERING TECHNICIAN

LEVEL: NTA 4

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ABBREVIATIONS

CBET	Competency Based Education and Training
CSS	Cascading Style Sheets
DCL	Data Control Language
DDL	Data Definition Language
DIV	DIVision
DML	Data Manipulation Language
DQL	Data Query Language
HTML	Hypertext Markup Language
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
JDK	Java Development Kit
LVM	Logical volume management
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
RAM	Random Access Memory

RAID	Redundant Array of Independent Disks
RPM	Redhat Package Manager
SQL	Structured Query Language
TCP	Transmission Control Protocol
TET	Technical Education and Training
TPS	Transactions Per Second
TVET	Technical and Vocational Education and Training
UI	User Interface
UML	Unified Modelling Language
URL	Uniform Resource Locator
WEB	World Wide Web

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation**.**

Performance Criteria: Indicate expected end results or outcomes in the form of evaluative statements.

Skills: The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards: A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.

Task Analysis: The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.

Task: A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.

Underpinning Knowledge: Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.

Verification Process: The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to the demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET). The Software Engineering Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. On-the-job Software Engineers, and experienced Software Engineering Technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for

working in the occupation. A total of ... online surveys were completed by experts from the labour market across the country. Apart from the surveys aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR SOFTWARE ENGINEERING TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Software Engineering Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Software Engineering Technician may perform tasks in a number of key areas in the occupational standards, but not necessarily in all areas. For example, in AI software development, other individuals may be employed or designated to perform specific tasks.

The Software Engineering Technicians shall conduct computer software research, demand analysis, design, testing, maintenance, management and other tasks under the supervision of Software Engineers. Generally, the Software Engineering Technician performs the following responsibilities:

a) Operation of office software

b) Installation of the Linux operating system

c) Installation, update and deletion of Linux software

d) Building Web server environment in the Linux system

e) Writing Linux Shell script for automation

f) Design of responsive webpage layout

g) Use of CCS to beautify the webpage layout

h) Writing webpage interaction script using JavaScript

i) Use of CSS and JS frameworks for Web front-end development

j) Programming HTML5 page

k) Building small-scale local area network

l) Troubleshooting network faults

m) Design of database

n) Programming and optimizing SQL language

o) Developing dynamic website

p) Programming using the object-oriented concept

q) Programming and managing software development documents

r) Conducting function test, automation test and performance test of the website using testing tools or by coding

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR SOFTWARE ENGINEERING TECHNICIAN - NTA 4

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OFFICE INFORMATION PROCESSING	**DUTY NO.**	401
TASK TITLE	DOCUMENT WRITING, TYPESETTING AND MANAGING	**TASK NO.**	4011
PERFORMANCE CRITERIA	The person performing this task must be able to use office software to efficiently write, typeset and manage documents and design color matching of the documents in accordance with the actual working needs.		
RANGE STATEMENT	The task can be performed in offices under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Hardware requirements: Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Software environment: 1) Commonly-used operating systems such as Windows, Mac and Linux; 2) A variety of virtual machine environment; 3) Development tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Conduct basic operations on documents, including opening, copying, encrypting and transfering to PDF format; 2. Edit documents, including inputting, finding and replacing and setting paragraph format; 3. Insert, edit, and beautify pictures, graphics, charts, formulas, and WordArt; 4. Format text, charts, pictures and other objects to beautify documents; 5. Use styles, templates, mail merge and other functions to quickly complete document writing and format setting; 6. Typeset and print documents;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Create, open, save and encrypt documents; 1.2 Input text, formula and symbol, and search and replace text; 1.3 Insert editable pictures, charts, bar codes, watermarks, text boxes, WordArt and symbols; 1.4 Beautify the document by setting the format of text, paragraphs, charts and pictures; 1.5 Typeset and print documents.

7. Conduct collaborative editing of documents by multiple users.	**2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic operations of document processing software. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Creation of documents; 3.2 Editing and formatting of the text; 3.3 Typesetting of documents; 3.4 Sharing of documents; 3.5 Beautification of documents. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Document writing skills; 4.4 Time management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Various types of documents are wrote, typeset and managed according to the actual needs of the work.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Document security and confidentiality; 2. Document structure and organization.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OFFICE INFORMATION PROCESSING	**DUTY NO.**	401
TASK TITLE	INFORMATION COLLECTION, PROCESSING AND ANALYSING	**TASK NO.**	4012
PERFORMANCE CRITERIA	The person performing this task must be able to use office software to efficiently collect, process and analyse information according to the actual working needs.		
RANGE STATEMENT	The task can be performed in offices under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Hardware requirements: Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Software environment: 1) Commonly-used operating systems such as Windows, Mac and Linux; 2) A variety of virtual machine environment; 3) Development tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use spreadsheets to collect information and set the data format as necessary; 2. Merge and insert cells, rows and columns, and set corresponding formats; 3. Fill data quickly by means of flash filling and automatic sequence filling; 4. Use formulas and functions to deal with data in Excel spreadsheets; 5. Choose appropriate chart analysis and data display, and beautify to highlight the main content; 6. Use sorting, screening, classification and summary functions to process data; 7. Typeset and print the required information; 8. Conduct collaborative editing of	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Create, open, save and encrypt workbooks and worksheets; 1.2 Enter and flash fill data to the worksheet cells, and set the format; 1.3 Operate on rows and columns in the worksheet and set the format; 1.4 Use formulas and functions; 1.5 Process the data; 1.6 Use chart analysis to display data; 1.7 Typeset and print the workbook. **2.0 Principles** The person performing this task must be able to explain the following principles:

documents by multiple users.	2.1 Basic operations of spreadsheet software. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Data collection and management theory; 3.2 Using methods of formulas and functions; 3.3 Data input, and formatting; 3.4 Processing of the data; 3.5 Sharing of documents. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Data collection skills; 4.4 Time management skills; 4.5 Math Skills
DESCRIPTION OF THE END PRODUCT / SERVICE	The information is collected, managed and processed according to the actual working needs.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Data visualization; 2. Data security and privacy; 3. Data cleaning.

<table>
<tr><td>OCCUPATION</td><td>SOFTWARE ENGINEERING TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>OFFICE INFORMATION PROCESSING</td><td>DUTY NO.</td><td>401</td></tr>
<tr><td>TASK TITLE</td><td>REPORT DOCUMENT MAKING</td><td>TASK NO.</td><td>4013</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to make illustrated report documents that meet the working needs using office software according to the actual working needs.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in offices under the supervision of senior software engineering technicians or software engineers.
The tools and equipment to be used include:
1. Hardware requirements:
Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above;
2. Software environment:
1) Commonly-used operating systems such as Windows, Mac and Linux;
2) A variety of virtual machine environment;
3) Development tools and related frameworks.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Carry out basic operations on report documents, including creating, opening, saving and closing documents;
2. Edit slides, including creating, copying, deleting and moving slides;
3. Edit text using text boxes;
4. Edit graphics, pictures, charts, audio, video and other objects;
5. Insert hyperlinks and action buttons;
6. Edit slide master and notes master;
7. Set animation, including setting slide transition animation and adding custom animation to objects;
8. Set up different modes to show slides;
9. Export report documents in different formats;
10. Print and package report documents.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Create, open, save and close report documents;
1.2 Create, copy, delete and move slides;
1.3 Edit text using text boxes, pictures and other objects;
1.4 Set animation and check the animation effect through slide show;
1.5 Print and package documents.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Basic operation of slides.</td></tr>
</table>

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Making process of report documents; 3.2 Selection requirements of edit objects in slides; 3.3 Setting specifications of animation effects; 3.4 Slide show specifications; 3.5 Optimization theory of slide show effect. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Documentation skills; 4.4 Time management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Various types of reports and drafts are designed, typeset and managed according to the actual needs of the work.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Title and abstract writing; 2. Data analysis.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DOCUMENT AND USER MANAGEMENT	**DUTY NO.**	402
TASK TITLE	USE OF LINUX VIRTUAL MACHINE TO MANAGE DOCUMENTS AND USERS	**TASK NO.**	4021
PERFORMANCE CRITERIA	The person performing this task must be able to use Linux to manage documents and users according to the actual document operation requirements and operating system users, abiding by network security regulations and technical requirements.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Commonly-used operating systems such as Windows, Mac and Linux; 3. A variety of virtual machine environment; 4. Development tools and related frameworks.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose the right Linux command or develop appropriate solutions for the task; 2. Use Linux commands and graphical tools; 3. Create and manage directories; 4. Create and manage documents; 5. View and modify user and group configuration documents; 6. Create and manage users; 7. Create and manage groups; 8. Use the user account manager; 9. Manage software package.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Open Linux terminal or command line; 1.2 Create and manage directories and documents; 1.3 View and modify user and group configuration documents; 1.4 Create and manage users and groups; 1.5 Use the user account manager; 1.6 Manage software package. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Operating commands of Linux.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Opening methods of Linux terminal windows and command lines; 3.2 Linux document types and directory structure; 3.3 Commands to create, query and delete directories; 3.4 Commands to create, delete, move, copy, search and archive documents and to inquire and compare document contents; 3.5 Basic commands and other common commands of Linux; 3.6 Basic concepts and types of Linux users and groups; 3.7 Configuration documents of users and groups; 3.8 Operation procedures and Linux commands of creating users, modifying user passwords, suspending users, deleting users, and setting user configuration; 3.9 Operating procedures and Linux commands for user login and logout; 3.10 Operating procedures and Linux commands for creating groups, adding users to groups, and moving out users from groups; 3.11 Use of user account manager; 3.12 Common commands for managing accounts; 3.13 Linux Software Package Query, Installation, Upgrade, Uninstall and Verification; 3.14 Absolute path and relative path. **4.0 Essential Skills** 4.1 Problem handling skills; 4.2 Verbal expression skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Time management skills;

	4.6 Honest service skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Document and user management with Linux is conducted in accordance with the requirements of actual document operation and operating system users.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Data security; 2. Fault removal and maintenance.

<table>
<tr><td>OCCUPATION</td><td>SOFTWARE ENGINEERING TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>PERFORMANCE OF THE DOCUMENT PERMISSION AND PROCESS MANAGEMENT</td><td>DUTY NO.</td><td>402</td></tr>
<tr><td>TASK TITLE</td><td>USE OF LINUX VIRTUAL MACHINE TO MANAGE DOCUMENT PERMISSION AND PROCESS</td><td>TASK NO.</td><td>4022</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to master the content of documents and document permissions, the methods of permission modification of documents and directories, the modification of default and hidden permissions of documents and directories, and the usage of document access control lists, and be familiar with commonly-used process management commands.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers.
The tools and equipment to be used include:
1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above;
2. Commonly-used operating systems such as Windows, Mac and Linux;
3. A variety of virtual machine environment;
4. Developing tools and related frameworks.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Manage document permissions;
2. Modify permissions by using digital representation methods;
3. Modify permissions by using text representation methods;
4. Modify the default permissions and hidden permissions of documents and directories;
5. Set the hidden attributes of documents;
6. Set the special permissions of documents;
7. Use document access control lists;
8. Use process management commands to display and set processes.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Modify the permissions of documents and directories;
1.2 Use umask commands to set default permissions;
1.3 Set the hidden attributes of documents;
1.4 Set the special permission SUID, SGID, and SBIT of documents;
1.5 Use document access control lists;
1.6 Manage processes;
1.7 Use chmod to realize the digital and text representation to modify the permissions of documents and directories;</td></tr>
</table>

	1.8 Use chmod to realize the digital and text representation to modify the special permissions of documents and directories; 1.9 Use setfacl and getacl to manage access control lists of documents; 1.10 View system processes, query the process number, terminate processes, and set relevant priorities of processes. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Operating commands of Linux. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The understansding of the permission operating programs of directories and documents or Linux commands; 3.2 The modification of the permission operating programs of directories and documents or Linux commands; 3.3 The modification of the default permissions and hidden permissions of documents and directories; 3.4 The usage of access control lists of documents; 3.5 The usage of process management commands. **4.0 Essential Skills** 4.1 Problem handling skills; 4.2 Verbal expression skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Time management skills; 4.6 Honest service skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Document permission and process management with Linux is conducted in accordance with the requirements of actual document operation and

	operating system users.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Data security; 2. Fault removal and maintenance.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORMANCE OF LINUX DISK MANAGEMENT	**DUTY NO.**	402
TASK TITLE	DISK MANAGEMENT BY USING LINUX VIRTUAL MACHINE	**TASK NO.**	4023
PERFORMANCE CRITERIA	The person performing this task must be able to master the creation, mounting and inspection of basic disks and document systems; master the creation, management and maintenance of LVM logical volumes, and the creation and management of RAID volumes; be familiar with the mounting operation of commonly-used peripheral equipment.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Commonly-used operating systems such as Windows, Mac and Linux; 3. A variety of virtual machine environment; 4. Developing tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Manage basic disks; 2. Manage dynamic disks; 3. Mount peripheral equipment printers; 4. Use the disk management commands of fdisk; 5. Use other disk management commands; 6. Configure the RAID under the liunx OS; 7. Set different soft RAID modes; 8. Set the switch between different soft RAIDs; 9. Manage LVM logical volumes.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Manage basic disks and dynamic disks; 1.2 Use the disk management commands of fdisk; 1.3 Create LVM logical volumes; 1.4 Configure the RAID under the liunx OS; 1.5 Set different soft RAID modes. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Operating commands of Linux. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 The difference between basic disks and dynamic disks; 3.2 The classification of soft RAIDs; 3.3 The configuration of the disk definition of various RAIDs; 3.4 The configuration of RAID0, RAID1, RAID5/6, and RAID1+0 in the Linux environment. **4.0 Essential Skills** 4.1 Problem handling skills; 4.2 Verbal expression skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Time management skills; 4.6 Honest service skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Disk management with Linux is conducted in accordance with the requirements of actual document operation and operating system users.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Data security; 2. Fault removal and maintenance.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PROGRAM CODE WRITING	**DUTY NO.**	403
TASK TITLE	USAGE OF THE BASIC SYNTAX OF PROGRAMS	**TASK NO.**	4031
PERFORMANCE CRITERIA	The person performing this task must be able to write correct codes in accordance with the grammatical characteristics of different programming languages.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Programming devices Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above 2. Materials 1) Commonly-used operating systems such as Windows, Mac and Linux; 2) A variety of virtual machine environment; 3) Developing tools and related frameworks.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use keywords and identifiers; 2. Use basic types of data; 3. Use variables and constants; 4. Use operators; 5. Use code comments; 6. Use functions; 7. Follow the code specifications.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use keywords and identifiers; 1.2 Use basic types of data; 1.3 Use variables and constants; 1.4 Use operators; 1.5 Use code comments; 1.6 Use functions. **2.0 Principles** **The person performing this task must be able to explain the following principles:** 2.1 Principles of the writing basic syntax. **3.0 Theories** The person performing this task must be able to

	explain the following: 3.1 Naming rules of identifiers; 3.2 The creation and calling of functions; 3.3 Code writing specifications. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Time management skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The code writing with correct grammer is conducted in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The understanding of system business; 2. Specifications of code writing; 3. The realization of system functions.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PROGRAM CODE WRITING	**DUTY NO.**	403
TASK TITLE	PROGRAM FLOW DESIGN	**TASK NO.**	4032
PERFORMANCE CRITERIA	The person performing this task must be able to complete the program flow design in accordance with the requirements of system functions.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Programming devices Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Materials 1) Commonly-used operating systems such as Windows, Mac and Linux; 2) A variety of virtual machine environment; 3) Developing tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Design flowcharts; 2. Use single branch structures; 3. Use double branch structures; 4. Use multi-branch structures; 5. Use loops; 6. Use the break statement; 7. Use the continue statement; 8. Use the return statement.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Design flowcharts; 1.2 Use single branch structures; 1.3 Use double branch structures; 1.4 Use multi-branch structures; 1.5 Use loops; 1.6 Use the break statement; 1.7 Use the continue statement; 1.8 Use the return statement. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles for using branch and loop statements.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Methods of flowchart design; 3.2 The usage of branch statements and loop statements; 3.3 The functions of the break, continue, and return statements. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Time management skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The code writing with correct process is conducted in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The understanding of system business; 2. Specifications of code writing; 3. The realization of system functions.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PROGRAM CODE WRITING	**DUTY NO.**	403
TASK TITLE	PROGRAM DEBUGGING AND PROBLEM HANDLING	**TASK NO.**	4033
PERFORMANCE CRITERIA	The person performing this task must be able to debug programs and deal with problems in accordance with different developing tools.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Programming devices Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Materials 1) Commonly-used operating systems such as Windows, Mac and Linux; 2) A variety of virtual machine environment; 3) Developing tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Conduct program debugging; 2. Set breakpoints; 3. Step over; 4. Step in; 5. Step out; 6. Conduct the breakpoint rollback; 7. Move the breakpoint to the cursor; 8. Calculate expressions; 9. Recover the program; 10. Stop the program.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Set breakpoints; 1.2 Step over; 1.3 Step in; 1.4 Step out; 1.5 Conduct the breakpoint rollback; 1.6 Move the breakpoint to the cursor; 1.7 Calculate expressions; 1.8 Recover the program; 1.9 Stop the program. **2.0 Principles** **The person performing this task must be able to explain the following principles:** 2.1 Principles of program debugging.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Functions of program debugging; 3.2 Methods of program debugging; 3.3 Searching of debugging methods. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Time management skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Program debugging for solving problems is conducted in accordance with problems and situations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The understanding of system business; 2. Specifications of code writing; 3. The realization of system functions.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	STATIC PAGE CONSTRUCTION	**DUTY NO.**	404
TASK TITLE	PAGE CONTENT DESIGN USING HTML TAGS	**TASK NO.**	4041
PERFORMANCE CRITERIA	The person performing this task must be able to build the webpage structure and content in accordance with the page design requirements.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Hardware requirements: computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Commonly-used operating systems such as Windows, Mac and Linux; 3. Developing software, VScode, Google browser and other front-end development tools.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select the appropriate tools for front-end development; 2. Install and configure tools for front-end development; 3. Install and set commonly-used browsers; 4. Use browsers to inspect the page quality and page structure; 5. Build the site structure; 6. Select the appropriate HTML code to build the page structure; 7. Use HTML comments appropriately.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Install and configure the front-end developing tools such as VScode; 1.2 Use front-end developing tools to develop the page; 1.3 Install and set commonly-used browsers such as Google; 1.4 Use browsers to view the page; 1.5 Build the site structure; 1.6 Use developing tools to build webpages; 1.7 Use HTML comments; 1.8 Use HTML basic tags and attributes; 1.9 Use HTML image tags and attributes; 1.10 Use HTML table tags and attributes; 1.11 Use HTML hyperlink tags and attributes; 1.12 Use HTML forms and form element tags and attributes; 1.13 Use HTML list tags and attributes;

	1.14 Use HTML internal frameworks and attributes. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 HTML page structures; 2.2 HTML tag formats; 2.3 Formats of HTML tag attributes; 2.4 The selection of HTML tags and attributes; 2.5 The usage of HTML comments. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 HTML (Hypertext Markup Language); 3.2 World Wide Web (WWW); 3.3 The concept of webpages and websites; 3.4 W3C standards (World Wide Web Consortium); 3.5 Browsers and servers; 3.6 Uniform resource locators (URL); 3.7 Hypertext transfer protocol (HTTP); 3.8 Internet protocol (IP) address and domain names; 3.9 Webpage request mechanism; 3.10 Absolute path and relative path; 3.11 Static webpage and dynamic webpage; 3.12 HTML tags; 3.13 HTML tag attributes. **4.0 Essential Skills** 4.1 Problem analysis and problem solving skills; 4.2 Communication skills; 4.3 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The page structure and content construction are completed in accordance with customer demands.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

	1. Developing environment; 2. Version control; 3. Quality assurance of software.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	STATIC PAGE CONSTRUCTION	**DUTY NO.**	404
TASK TITLE	CSS STYLE USAGE IN PAGE DISPLAY CONTROL	**TASK NO.**	4042
PERFORMANCE CRITERIA	The person performing this task must be able to design CSS styles for web pages in accordance with the requirements of page design and HTML code structure and content.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Hardware requirements: computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Commonly-used operating systems such as Windows, Mac and Linux; 3. Developing software, VScode, Google browser and other front-end developing tools; 4. Other software, color picker, Photoshop, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use the VScode to develop CSS styles; 2. Use the Google Browser to inspect and debug CSS styles; 3. Use CSS styles; 4. Understand the principles of using CSS style lists; 5. Use the CSS style selector; 6. Use CSS styles to complete the display of page content; 7. Use other software to assist CSS style developing.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the VScode to develop CSS; 1.2 Use the Google Browser to inspect and debug CSS styles; 1.3 Use CSS styles; 1.4 Use the CSS selector to select page elements; 1.5 Use the font style attributes of CSS; 1.6 Use the text style attributes of CSS; 1.7 Use the background style attributes of CSS; 1.8 Use the list style attributes of CSS; 1.9 Use the container style attributes of CSS; 1.10 Use the display style attributes of CSS; 1.11 Use the pseudo-class style attributes of CSS; 1.12 Use the pseudo-element style attributes of CSS; 1.13 Use the elastic layout style attributes of CSS;

	1.14 Use the elastic layout style attributes of CSS; 1.15 Use the transition and animation style attributes of CSS. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The working principle of CSS; 2.2 The priority principle of CSS selectors; 2.3 The proximity principle of CSS style attributes; 2.4 The inheritance principle of CSS style attributes; 2.5 The principle of using CSS selectors; 2.6 The principle of using CSS comments; 2.7 The compatibility of the browser using CSS Style attributes. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 CSS cascading style sheets; 3.2 The development of CSS; 3.3 CSS linguistic features; 3.4 Advantages and disadvantages of CSS; 3.5 CSS grammatical rules; 3.6 The definition and function of CSS selectors; 3.7 Types of CSS selectors; 3.8 CSS style attributes and attribute values. **4.0 Essential Skills** 4.1 Problem analysis and problem solving skills; 4.2 Communication skills; 4.3 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The CSS style control of the page display is conducted.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The design requirements of styles; 2. The compatibility of browsers;

	3. Debugging tools.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	STATIC PAGE CONSTRUCTION	**DUTY NO.**	404
TASK TITLE	PAGE LAYOUT CONSTRUCTION USING DIV AND CSS	**TASK NO.**	4043
PERFORMANCE CRITERIA	The person performing this task must be able to use DIV and CSS for page layout according to the requirements of webpage design.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Hardware requirements: computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Commonly-used operating systems such as Windows, Mac and Linux; 3. Developing software, VScode, Google browser and other front-end developing tools; 4. Other software, color picker, Photoshop, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use VScode software to develop webpages; 2. Use Google Browser to view and debug the page layout; 3. Select commonly-used page layout of HTML tag elements; 4. Select commonly-used page layout of CSS style attributes; 5. Use DIV and CSS to set the layout of commonly-used pages.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use VScode software to develop webpages; 1.2 Use Google Browser to view and debug the page layout; 1.3 Use the floating style attributes of CSS; 1.4 Use the defloating function; 1.5 Use the location style attributes of CSS; 1.6 Use the elastic layout style attributes of CSS; 1.7 Use tables to set page layout. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Webpage design sequence to be followed; 2.2 The reusability of styles; 2.3 Floating and defloating; 2.4 DIV and CSS page layout of positioning

	methods; 2.5 Prudence on the usage of the ID selector; 2.6 The naming rules of the class selector and ID selector; 2.7 The CSS style writing sequence to be followed; 2.8 The reasonable usage of CSS layout; 2.9 The principle of elastic layout. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Types of commonly-used page layout; 3.2 Commonly-used elements in HTML page layout; 3.3 The location mechanism of CSS; 3.4 Normal flow; 3.5 Commonly-used floating layout; 3.6 The compatibility of CSS style attributes and solutions. **4.0 Essential Skills** 4.1 Skills of developing the page layout; 4.2 Problem analysis and problem solving skills; 4.3 Communication skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	DIV and CSS are used to complete the page layout in accordance with the requirements of page design.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The design requirements of styles; 2. The compatibility of browsers; 3. Debugging tools.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	NETWORK BASIS	**DUTY NO.**	405
TASK TITLE	EXPLANATION OF BASIC CONCEPTS OF COMPUTER NETWORK	**TASK NO.**	4051
PERFORMANCE CRITERIA	The person performing this task must be able to explain the basic concepts of computer network in accordance with the requirements.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Network equipment, network cables, optical fibers, optical modules, exchangers, routers, gateways, etc.; 3. Commonly-used operating systems such as Windows, Mac and Linux; 4. A variety of virtual machine environment; 5. Developing tools and related frameworks.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Select appropriate tools and equipment; 3. Explain the development history of computer network; 4. Explain the definition and composition of computer network; 5. Explain the types of computer network; 6. Explain the functions of computer network; 7. Explain the topological structure of computer network; 8. Explain the computational mode of the network.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Explain the development history of computer network; 1.2 Explain the definition and composition of computer network; 1.3 Explain the types of computer network; 1.4 Explain the function of computer network; 1.5 Explain the topological structure of computer network; 1.6 Explain the computing mode of network. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The basic concepts of computer network; 2.2 The development history of computer network;

	2.3 The definition and composition of computer network; 2.4 The types of computer network; 2.5 The function of computer network. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The types and topological structures of computer network; 3.2 Computing mode of computer network. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The basic concepts of computer network are explained in accordance with the requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The security and protection of computer network; 2. Network equipment and hardware.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	NETWORK BASIS	**DUTY NO.**	405
TASK TITLE	EXPLANATION OF BASIC MODELS IN COMPUTER NETWORK	**TASK NO.**	4052
PERFORMANCE CRITERIA	The person performing this task must be able to explain the OSI and TCP reference models in accordance with the requirements.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Network equipment, network cables, optical fibers, optical modules, exchangers, routers, gateways, etc.; 3. Commonly-used operating systems such as Windows, Mac and Linux; 4. A variety of virtual machine environment; 5. Developing tools and related frameworks.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Select appropriate tools and equipment for the task; 3. Explain the overview of computer architecture; 4. Explain the OSI reference model; 5. Explain the TCP/IP architecture; 6. Explain the visio network topological structure diagram.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Explain the overview of computer architecture; 1.2 Explain the OSI reference model; 1.3 Explain the TCP/IP architecture; 1.4 Explain the visio network topological structure diagram. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The basic model of computer network; 2.2 The concept of computer network architecture; 2.3 The concept of agreements. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 The functions of each layer of the reference model; 3.2 The TCP/IP architecture and function of each layer; 3.3 The distinctions and connections between the OSI reference model and TCP/IP reference model. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The OSI and TCP reference models are explained in accordance with the requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The security and protection of computer network; 2. Network equipment and hardware.

OCCUPATION	SOFTWARE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	NETWORK BASIS	**DUTY NO.**	405
TASK TITLE	UNDERSTANDING OF COMMONLY-USED PROTOCOLS OF THE TCP/IP REFERENCE MODEL	**TASK NO.**	4053
PERFORMANCE CRITERIA	The person performing this task must be able to explain the commonly-used protocols of the TCP/IP reference model in accordance with the requirements.		
RANGE STATEMENT	The task can be performed on a computer under the supervision of senior software engineering technicians or software engineers. The tools and equipment to be used include: 1. Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above; 2. Network equipment, network cables, optical fibers, optical modules, exchangers, routers, gateways, etc.; 3. Commonly-used operating systems such as Windows, Mac and Linux; 4. A variety of virtual machine environment; 5. Developing tools and related frameworks.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Select appropriate tools and equipment for the task; 3. Explain the internet protocol; 4. Explain the ICMP (Internet Control Message Protocol); 5. Explain the UDP (User Datagram Protocol); 6. Explain the TCP (Transmission Control Protocol); 7. Use wireshark to capture and analyze IP datagrams.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Explain the internet protocol; 1.2 Explain the ICMP (Internet Control Message Protocol); 1.3 Explain the UDP (User Datagram Protocol); 1.4 Explain the TCP (Transmission Control Protocol); 1.5 Use wireshark to capture and analyze IP datagrams. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Understanding of commonly-used protocols of the TCP/IP reference model.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 IP datagram; 3.2 IP address and addressing methods; 3.3 UDP (User Datagram Protocol); 3.4 TCP (Transmission Control Protocol); 3.5 IPv6; 3.6 Practical tools of TCP/IP. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The commonly-used protocols of the TCP/IP reference model are explained in accordance with the requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. The security and protection of computer network; 2. Network equipment and hardware.

TABLE 1: DACUM CHARTS FOR SOFTWARE ENGINEERING TECHNICIAN – NTA 4

DUTIES	TASKS	ENABLERS
1.0 Office information processing	1.1 Document writing, typesetting and managing. 1.2 Information collection, processing and analysing. 1.3 Report document making.	**General skills and knowledge** · Office software proficiency · Typesetting and color matching skills · Communication and report writing skills · Problem solving skills · Excellent interpersonal skills · Expression skills · Document management skills **Tools and equipment** · Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · A variety of virtual machine environment · Developing tools and related frameworks **Requirements for employees** · Teamwork spirit · Integrity · Time management
2.0 Operating system usage	2.1 Use of Linux virtual machine to manage documents and users. 2.2 Linux document permissions and process management. 2.3 Linux disk management.	**General skills and knowledge** · Linux document types and directory structure · Basic commands and other common commands of Linux · The management of Linux users and groups · Linux process management · Linux software package management

DUTIES	TASKS	ENABLERS
		· Linux disk management · Problem solving skills · Verbal expression skills · Teamwork skills **Tools and equipment** · Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · A variety of virtual machine environment · Developing tools and related frameworks **Requirements for employees** · Teamwork spirit · Integrity · Time management
3.0 Program code writing	3.1 Usage of the basic syntax of programs. 3.2 Program flow design. 3.3 Program debugging and problem handling.	**General skills and knowledge** · Basic knowledge of programming syntax · Program flow design skills · Program code specification skills · Program debugging and problem handling skills · Excellent interpersonal skills · Expression skills · Document management skills **Tools and equipment** · Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or

DUTIES	TASKS	ENABLERS
		above **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · A variety of virtual machine environment · Developing tools and related frameworks **Requirements for employees** · Teamwork spirit · Integrity · Time management
4.0 Static page construction	4.1 Page content design using HTML tags. 4.2 CSS style usage in page display control. 4.3 Page layout construction using DIV and CSS.	**General skills and knowledge** · Use of VScode and other front-end development tools · Inspection and debugging of pages using a browser · Typesetting and color matching skills · Communication and report writing skills · Problem solving skills · Excellent interpersonal skills · Expression skills · Document management skills **Tools and equipment** · Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · A variety of virtual machine environment · Developing tools and related

DUTIES	TASKS	ENABLERS
		frameworks **Requirements for employees** · Teamwork spirit · Integrity · Time management
· 5.0 Network basis	5.1 Explanation of basic concepts of computer network. 5.2 Explanation of basic models in computer network. 5.3 Understanding of commonly-used protocols of the TCP/IP reference model.	**General skills and knowledge** · Basic concepts of communication · Commonly-used terms of computer network · Functions of each layer of TCP/IP reference model · Making network cable and network cabling · LAN segment division · Basic configuration of network firewall · Problem solving skills · Excellent interpersonal skills · Expression skills **Tools and equipment** · Computers with CPU at I5 or higher level, RAM at 8GB or above and hard disk storage capacity of 500GB or above **Materials** · Commonly-used operating systems such as Windows, Mac and Linux · A variety of virtual machine environment · Developing tools and related frameworks **Requirements for employees** · Teamwork spirit · Integrity

DUTIES	TASKS	ENABLERS
		• Time management