THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

OCCUPATIONAL STANDARDS

OCCUPATION: BIG-DATA TECHNICIAN

LEVEL: NTA EVEL 5

FEBRUARY 2024

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ABBREVIATIONS

CBET	Competency Based Education and Training
DSS	Decision Support System
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
IT	Information Technology
ITIL	Information Technology Infrastructure Library
HDMI	High-Definition Multimedia Interface
NACTVET	National Council for Technical and Vocational Education and Training
NIST	National Institute of Standards and Technology
NMS	Network Management Station
NOS	National Occupational Standards
OS	Occupational Standards
PCI	Peripheral Component Interconnect
SQL	Structured Query Language
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
USB	Universal Serial Bus

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, with a high level of human development. 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 and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job 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 application across all public and private institutions.

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

For the purpose of TET delivery, Tanzania has 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. Therefore, it is quite pertinent

for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

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.

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 process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026)*. NACTVET 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 team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplace, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0 THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR BIG-DATA TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by Big-Data Technicians. 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. Big-Data Technicians may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Big-Data Technician shall design, deploy and maintain the server cluster architecture under the supervision of engineers. They also ensure smooth, stable and safe network connection, monitor and maintain daily cluster operation, repair and replace server hardware equipment, inspect and maintain network equipment, and collect, store and clean data. Generally, the Big-Data Technician performs the following responsibilities:

a) Design and implementation of network systems

b) Installation and configuration of network hardware and software

c) Network performance monitoring

d) Network security maintenance

e) Elimination of network problems

f) Recording of network configuration and procedures

g) Data entry

h) Database security

i) Database troubleshooting

j) Daily maintenance and upgrade of database

k) Installation, configuration, and maintenance of operating systems, servers, and system software

l) Management of user accounts, permissions, and access controls

m) Maintenance of system security by implementing security policies, firewalls and intrusion detection systems

n) Management and maintenance of large-scale data processing infrastructure and systems

o) Development and maintenance scripts for data processing and automation

p) Execution of backup and disaster recovery procedures to ensure data availability

q) Cooperation with data scientists and engineers to optimize data processing and storage

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 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 BIG-DATA TECHNICIAN – NTA LEVEL 5

<table>
<tr><td>OCCUPATION</td><td>BIG-DATA TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>CARRY OUT NETWORKING DESIGN AND DEPLOYMENT</td><td>DUTY NO.</td><td>501</td></tr>
<tr><td>TASK TITLE</td><td>PLAN AND PREPARE NETWORK AND NETWORK LAYOUT SITE</td><td>TASK NO.</td><td>5011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to create network diagrams, determine network hardware and software requirements, conduct site survey, and plan cable wiring, plumbing installation, wall socket installation, and network rack installation.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed on the network layout site under the supervision of senior technicians or big data engineers.
The tools and equipment to be used include:
1. Cable tester;
2. Crimping tools;
3. Wire stripper;
4. Cable tie;
5. Labelling machine;
6. Network analyser;
7. Electric drill/Electric saw;
8. Ladder;
9. Measuring tape;
10. Screwdriver.
11. Safety gear</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. Collect requirements;
2. Conduct on-site investigation;
3. Design the network;
4. Select equipment;
5. Conduct cabling;
6. Install network devices;
7. Configure network devices;
8. Test equipment status;
9. Record the installation process;
10. Clean equipment, tools and sites;
11. Store tools and equipment safely;
12. Train and support.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Design the network;
1.2 Select equipment;
1.3 Conduct cabling;
1.4 Install network devices;
1.5 Configure network devices;
1.6 Test equipment status.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Specifications for requirements collection;</td></tr>
</table>

13. Observe health, occupational and environmental safety, rules and regulations	2.2 Standards for recording installation processes; 2.3 Standard operation of network cabling; 2.4 Safety operation specifications of circuit; 2.5 Safety operation specifications for operating tools; 2.6 Safety operation specifications for work at heights. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Standards and functions of each network configuration parameter; 3.2 Differentiation of the running state of network devices; 3.3 Troubleshooting in the process of network operation; 3.4 Necessary conditions and precautions of the construction site. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Network diagrams are prepared, network hardware and software requirements are determined, site survey conducted, and cable wiring, plumbing installation, wall socket installation, and network rack installation properly planned in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Waste disposal methods.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT NETWORKING DESIGN AND DEPLOYMENT	**DUTY NO.**	501
TASK TITLE	CONDUCT INSTALLATION OF NETWORK HARDWARE AND CONFIGURATION OF NETWORK SOFTWARE	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to assemble and install network devices, lay network cables and install network interface cards on computers and other equipment, and configure network operating systems, network services, firewalls and network applications.		
RANGE STATEMENT	The task can be performed on the network layout site under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Network cabling tools; 2. Network switches and router; 3. Network interface card; 4. Network monitoring tools; 5. Server hardware and software; 6. Configuration tools; 7. Security tools; 8. Electric tools; 9. Test equipment. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Evaluate the physical environment; 2. Install and configure network hardware components; 3. Order necessary hardware components; 4. Verify whether the power supply works normally and whether the equipment is receiving power; 5. Install and manage network cables; 6. Configure network hardware components; 7. Test hardware components to ensure their normal operation; 8. Plan software; 9. Evaluate customer demands;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Install and configure network hardware components; 1.2 Order necessary hardware components; 1.3 Install and manage network cables; 1.4 Configure network hardware components; 1.5 Install software; 1.6 Record the installation process of hardware. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Operation specifications for the installation and configuration of network hardware components; 2.2 Operation specifications for the installation and management of network cables;

10. Perform pre-installation tasks; 11. Install software; 12. Conduct configuration to ensure its normal operation; 13. Conduct testing to ensure its normal operation; 14. Record the installation process of software. 15. Observe health, occupational and environmental safety, rules and regulations	2.3 Specifications for the configuration of network hardware components; 2.4 Standards for the installation of software; 2.5 Standard operation of network cabling. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Network topology; 3.2 Network protocol; 3.3 Knowledge related to network security; 3.4 Usage of operating systems; 3.5 Knowledge related to network management; 3.6 Procedures of logging. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Network devices and cables are assembled and installed, in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating tools; 2. Safety operation of work at heights; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT NETWORKING DESIGN AND DEPLOYMENT	**DUTY NO.**	501
TASK TITLE	CARRY OUT TESTING, TROUBLESHOOTING, MAINTENANCE AND UPGRADING OF NETWORK SYSTEMS	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to understand industry standards, be familiar with safety standards such as ISO/IEC 27001, NIST and PCI DSS, follow test standards to ensure proper operation of network components, be familiar with maintenance standards such as ITIL to ensure efficient and effective operation of network systems, and follow upgrade standards to ensure that network systems are regularly updated with the latest hardware and software updates.		
RANGE STATEMENT	The task can be performed on the network layout site under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Cable tester; 2. Network analyser; 3. Protocol analyser; 4. Network scanner; 5. Oscilloscope; 6. Spectrum analyser; 7. Network management system (NMS); 8. Firmware and software tools; 9. Power meter. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine the cause of the problem; 2. Verify connectivity; 3. Check the network configuration; 4. Check the network hardware; 5. Test network services; 6. Update firmware or software or replace faulty hardware to solve the problem; 7. Perform regular network maintenance; 8. Perform backup and recovery; 9. Monitor network security; 10. Record network changes;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Test network performance; 1.2 Implement safety measures; 1.3 Plan network system upgrades; 1.4 Perform network system upgrades; 1.5 Test the network system upgrades. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Specifications of recording network system upgrades;

11. Plan upgrades; 12. Test upgrades; 13. Perform and verify upgrades; 14. Record and upgrade logs. 15. Observe health, occupational and environmental safety, rules and regulations	2.2 Standard operation of network cabling; 2.3 Performance standards for routine maintenance. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of determining the causes of network problems; 3.2 Precautions for upgrading records; 3.3 Planning procedures for upgrades; 3.4 Backup methods of network data; 3.5 Design of network topology. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Testing, troubleshooting, maintaining and upgrading of network systems are completed.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of operating tools; 2. Safety operation of work at heights; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM DATABASE DESIGN AND APPLICATION	**DUTY NO.**	502
TASK TITLE	CARRY OUT INSTALLATION AND CONFIGURATION OF DATABASES TO ENSURE THEIR SECURITY	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to configure database software to meet the specific requirements of the organization, set up user accounts and permissions, and take charge of implementing and maintaining database security measures to protect the organization's data.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Database Management System (DBMS); 2. Database management tools; 3. Backup and recovery tools; 4. Firewall; 5. Intrusion detection system; 6. Security scanning tools; 7. Monitoring tools; 8. Command line interface; 9. Hardware such as servers, storage devices and backup devices. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Evaluate database requirements; 2. Select appropriate database software; 3. Install the database software; 4. Configure databases; 5. Test databases; 6. Define security policies and procedures; 7. Set up user accounts and permissions; 8. Implement access control; 9. Monitor databases against security bugs; 10. Apply and update security patches; 11. Provide user training.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select appropriate database software; 1.2 Install the database software; 1.3 Set up user accounts and permissions; 1.4 Implement access control; 1.5 Test upgrades. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Configuration standards of databases; 2.2 Testing standards of databases; 2.3 Principles of database design. **3.0 Theories**

12. Observe health, occupational and environmental safety, rules and regulations	The person performing this task must be able to explain the following: 3.1 Operation methods of database management system; 3.2 Database backup and recovery; 3.3 Knowledge related to database maintenance; 3.4 Scalability of databases; 3.5 Knowledge related to SQL. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database installation and configuration are completed, and database security is protected in accordance with technical requirements and the manufacturer's requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM DATABASE DESIGN AND APPLICATION	**DUTY NO.**	502
TASK TITLE	CARRY OUT DATABASE TROUBLESHOOTING, LIBRARY BACK UP, AND DATA RECOVERY	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to undertake database troubleshooting, backup and recovery in accordance with technical requirements and manufacturer's manual.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Database Management System (DBMS); 2. Database management tools; 3. Backup and recovery tools; 4. Firewall; 5. Intrusion detection system; 6. Security scanning tools; 7. Monitoring tools; 8. Command line interface; 9. Hardware such as servers, storage devices and backup devices. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify database faults correctly; 2. Collect information; 3. Analyse data; 4. Formulate solutions; 5. Test solutions; 6. Determine backup requirements; 7. Select the backup method; 8. Create backup plans; 9. Test backups; 10. Make recovery plans; 11. Perform recovery. 12. Observe health, occupational and environmental safety, rules and regulations	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect and analyse information; 1.2 Develop and test solutions; 1.3 Select and create backup plans; 1.4 Test schemes and plans; 1.5 Recover databases. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Set standards for solutions; 2.2 Determine backup requirements; 2.3 Select the basis for backup; 2.4 Principles of database design. **3.0 Theories**

	The person performing this task must be able to explain the following: 3.1 Methods of correctly identifying database faults; 3.2 Procedures of recovery plan formulation; 3.3 Operation methods of database management system; 3.4 Knowledge related to SQL; 3.5 Database backup and recovery; 3.6 Knowledge related to database maintenance; 3.7 Scalability of databases. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database troubleshooting, backup and recovery are completed in accordance with technical requirements and manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM DATABASE DESIGN AND APPLICATION	**DUTY NO.**	502
TASK TITLE	CONDUCT DESIGN, OPERATION, AND OPTIMIZATION OF DATABASE TABLES.	**TASK NO.**	5023
PERFORMANCE CRITERIA	The database operator must be able to ensure that the database runs efficiently and stores data in a way that supports the needs of the application or system that will use it.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Database Management System (DBMS); 2. Database management tools; 3. Backup and recovery tools; 4. Firewall; 5. Intrusion detection system; 6. Security scanning tools; 7. Monitoring tools; 8 Command line interface; 9. Hardware such as servers, storage devices and backup devices. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Understand the requirements; 2. Design database schemas; 3. Create and modify tables; 4. Insert and update data; 5. Manage database indexes; 6. Manage database security; 7. Monitor database performance. 8. Identify performance problems; 9. Optimize query performance; 10. Optimize database schemas; 11. Implement backup and recovery; 12. Implement database replication. 13. Observe health, occupational and environmental safety, rules and regulations	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Design and operate database schemas; 1.2 Create and modify tables; 1.3 Manage, monitor and update the databases; 1.4 Implement database replication, backup and recovery. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of database design. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operation methods of database management system; 3.2 Knowledge related to SQL;

	3.3 Methods of database backup and recovery; 3.4 Database security; 3.5 Knowledge related to database maintenance; 3.6 Scalability of databases. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database table design and operation and database optimization are completed in accordance with technical requirements and manufacturer's manual requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MANAGEMENT AND MAINTENANCE OF SYSTEMS	**DUTY NO.**	503
TASK TITLE	CONDUCT INSTALLATION AND CONFIGURATION OF SOFTWARE AND HARDWARE	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to follow the best practices and supplier guidelines for installation and configuration, ensure security and compliance, diagnose and resolve issues quickly and accurately, maintain accurate documentation, communicate effectively with team members and stakeholders, thoroughly test installation and configuration, and comply with company policies and standards.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Operating system installation medium; 2. Network monitoring tools; 3. System backup and recovery tools; 4. Command line utilities; 5. Remote access tools; 6. Hardware diagnostic tools; 7. Configuration management tools; 8. Virtualization software. 9. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check the system requirements of the software to be installed; 2. Install necessary operating system updates or patches; 3. Configure software settings; 4. Test software; 5. Record installation and configuration steps; 6. Check the hardware requirements of the system, including compatibility with existing hardware and software; 7. Conduct physical installation of hardware components according to manufacturer's instructions;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Operate system update or patching; 1.2 Configure of software and setting of hardware; 1.3 Test software and hardware; 1.4 Analyse the problems of software and hardware; 1.5 Take corresponding measures a quarantined problem **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Use specifications of tools and software; 2.2 Identification and isolation standards of system problems; 2.3 Configuration standards of software and hardware settings;

8. Configure hardware settings; 9. Test hardware; 10. Determine the symptoms of the problem; 11. Use diagnostic tools and techniques to quarantine problems; 12. Plan to solve the problem; 13. Implement the solution; 14. Record the steps of troubleshooting and problem solving. 15. Observe health, occupational and environmental safety, rules and regulations	2.4 Testing standards for software and hardware. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating methods of different operating systems; 3.2 System architectures of different operating systems; 3.3 Software installation methods of different operating systems; 3.4 Hardware configuration methods of different operating systems. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Software and hardware installation and configuration are securely completed in accordance with industry standards and user requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MANAGEMENT AND MAINTENANCE OF SYSTEMS	**DUTY NO.**	503
TASK TITLE	MANAGE USER ACCOUNTS, ACCESS AND SAFETY	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to manage user accounts, assign roles and permissions, and enforce password policies, configure and administer firewalls, intrusion detection and prevention systems, and antivirus software. He/she shall also communicate regularly with users and stakeholders on security policies and procedures.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Operating system installation medium; 2. Network monitoring tools; 3. System backup and recovery tools; 4. Command line utilities; 5. Remote access tools; 6. Hardware diagnostic tools; 7. Configuration management tools; 8. Virtualization software. 9. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Create new user accounts; 2. Assign appropriate access levels; 3. Modify user account settings; 4. Disable or delete user accounts for users who no longer need access rights; 5. Enforce password policies and ensure that all user accounts have strong ciphers; 6. Monitor any unauthorized access or suspicious behaviour of user account activities; 7. Manage permissions and access control lists to control access to documents, folders, and other resources; 8. Configure user roles and groups to simplify access management;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Create, disable or delete user accounts, according to user requirements; 1.2 Modify user account settings as needed; 1.3 Monitor the activities of users' accounts; 1.4 Manage permissions and access control lists; 1.5 Control the access to other documents and other resources to the account; 1.6 Configure user access management; 1.7 Adopt corresponding means to quarantine problems; 1.8 Detect and prevent viruses and malicious software. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic principles of event response; 2.2 Compliance requirements of safety management.

9. Monitor access logs for unauthorized access attempts or suspicious behaviour; 10. Scan the system regularly for security bugs; 11. Execute security policy; 12. Configure firewall and intrusion detection systems; 13. Implement anti-virus and anti-malware software and keep it up to date; 14. Conduct regular security audits to identify potential risks and bugs. 15. Observe health, occupational and environmental safety, rules and regulations	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 Various authentication methods and technologies; 3.2 Different types of access control models; 3.3 Access control lists; 3.4 Best practices in the industry for implementing security policies; 3.5 Influence of security policies on system performance and user experience; 3.6 Various methods of protecting systems and data; 3.7 Methods of identifying and analysing event responses to security events. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The organization's computer systems' security, availability, reliability and efficiency are ensured, so that the organization can achieve its business objectives.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MANAGEMENT AND MAINTENANCE OF SYSTEMS	**DUTY NO.**	503
TASK TITLE	CONDUCT BACKUP AND RECOVERY PROCEDURES, AND DATA STORAGE AND ARCHIVING	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to ensure the effectiveness of backup and recovery procedures and data storage and archiving systems in protecting the organization's data as well as their availability in the event of a system faults or other catastrophic events.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Operating system installation medium; 2. Network monitoring tools; 3. System backup and recovery tools; 4. Command line utilities; 5. Remote access tools; 6. Hardware diagnostic tools; 7. Configuration management tools; 8. Virtualization software. 9. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Define backup requirements; 2. Select the backup scheme; 3. Configure backup software; 4. Test backups; 5. Data recovery; 6. Define data retention requirements; 7. Choose an archive storage solution; 8. Configure archive storage; 9. Test archive storage; 10. Retrieve data. 11. Observe health, occupational and environmental safety, rules and regulations	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Make plans according to backup requirements; 1.2 Configure and test backup software; 1.3 Recover software data; 1.4 Configure and test archive storage. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Data retention policies. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods and technical knowledge of various data backup; 3.2 Technical knowledge of monitoring backup data;

	3.3 Methods and technical knowledge of commonly-used data backup; 3.4 Knowledge of file storage solutions; 3.5 Technical knowledge of storage management; 3.6 Security knowledge of authorized access; 3.7 Technical knowledge related to retrieving archived data and maintaining accurate metadata. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The organization's computer systems' security, usability, reliability, and efficiency are ensured through appropriate backup and recovery procedures, in accordance with industry standards and user requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT DATA COLLECTION AND PRE-PROCESSING	**DUTY NO.**	504
TASK TITLE	CARRY OUT COLLECTION, CLEANING, TRANSFORMATION AND STORAGE OF LARGE AMOUNTS OF DATA	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to collect data from various sources, prepare data for analysis by cleaning and validating data, and store data in databases, data warehouses or data lakes to protect sensitive data from unauthorized access and ensure compliance with data privacy regulations.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Data collection tools; 2. Data cleansing and validation tools; 3. Data conversion tools; 4. Data storage and management tools; 5. Big data analysis tools; 6. High performance servers, clusters and storage systems; 7. Cloud computing service platforms. 8. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Collect data from various sources, such as databases, APIs, network crawling tools, social media and sensors; 2. Clean and verify data to ensure its accuracy and consistency; 3. Ensure data compatibility with various software tools and systems; 4. Store the converted data in databases, data warehouses or data lakes; 5. Implement backup and recovery plans; 6. Implement security measures to protect sensitive data from unauthorized access; 7. Analyse and extract large amounts of data; 8. Make data-driven decisions.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect data extensively; 1.2 Process data; 1.3 Ensure data compatibility with various software tools and systems; 1.4 Store data. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Data security and privacy regulations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical knowledge of data collection; 3.2 Technical knowledge of data cleaning; 3.3 Technical knowledge of data conversion;

9. Observe health, occupational and environmental safety, rules and regulations	3.4 Methods of data storage and management; 3.5 Technical knowledge of Big data processing for processing and analysing a large amount of data; 3.6 Commonly-used programming languages. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Data collection, cleaning and transformation are conducted, better decision-making is driven and business results are improved.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT DATA COLLECTION AND PRE-PROCESSING	**DUTY NO.**	504
TASK TITLE	PROCESS, OPERATE AND TRANSFORM DATA THROUGH DEVELOPMENT AND IMPLEMENTATION OF SOFTWARE TOOLS AND SCRIPTS	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to process large amounts of data in a reasonable time range, handle increasing data volume without degrading performance, make the data easy to maintain and modifiable according to changing requirements with flexibility and adaptability, ensures data security and protect sensitive data from unauthorized access.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Data collection tools; 2. Data cleansing and validation tools; 3. Data conversion tools; 4. Data storage and management tools; 5. Big data analysis tools; 6. High performance servers, clusters and storage systems; 7. Cloud computing service platforms. 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Define the problem; 2. Collect and clean data; 3. Analyse and pre-process data; 4. Develop software; 5. Test and verify software functions; 6. Deploy the software and run it; 7. Monitor and optimize performance; 8. Maintain and update software tools and scripts. 9. Observe health, occupational and environmental safety, rules and regulations	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Collect and process data; 1.2 Develop and test software; 1.3 Run the software; 1.4 Update and optimize the software. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Best practices for data security and privacy and compliance regulations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Commonly-used programming languages;

	3.2 Technical knowledge of database system operation; 3.3 Methods of distributed system deployment and configuration; 3.4 Knowledge of cloud computing principles and cloud platform operation; 3.5 Knowledge of statistics and visualization tools application. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Data processing, operating and transforming is completed through the development of software tools and scripts.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT DATA COLLECTION AND PRE-PROCESSING	**DUTY NO.**	504
TASK TITLE	MAINTAIN HIGH LEVEL EXECUTION OF SYSTEM UPTIME, PERFORMANCE, SCALABILITY, SECURITY AND RECOVERABILITY	**TASK NO.**	5043
PERFORMANCE CRITERIA	The big data technician performing this task must be able to maintain a high level of system uptime, performance, scalability, security and recoverability, while effectively collaborating with other teams and maintaining the latest documents of the system, in terms of ensuring the availability, performance criteria and reliability of data systems.		
RANGE STATEMENT	The task can be performed under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Data collection tools; 2. Data cleansing and validation tools; 3. Data conversion tools; 4. Data storage and management tools; 5. Big data analysis tools; 6. High performance servers, clusters and storage systems; 7. Cloud computing service platforms. 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Monitor the health status of the system; 2. Maintain regularly; 3. Back up and recover data; 4. Take security measures for data systems; 5. Optimize system performance; 6. Troubleshoot and debug; 7. Make disaster recovery plans; 8. Collaborate and communicate. 9. Observe health, occupational and environmental safety, rules and regulations	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Monitor and maintain system health; 1.2 Backup and recovery; 1.3 Optimize data system performance; 1.4 Troubleshoot and debug. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of cloud computing. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Technical knowledge of database system operation; 3.2 Knowledge of operating Linux, Windows and other operating systems; 3.3 Basic knowledge of network engineering; 3.4 Knowledge of cloud platform operation; 3.5 Technology of automated script development; 3.6 Basic knowledge of network security; 3.7 Usage of monitoring tools; 3.8 Knowledge and design related to disaster recovery plans. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	A high level of system uptime, performance, scalability, security and recoverability is maintained.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT INSTALLATION AND MAINTENANCE OF HARDWARE	**DUTY NO.**	505
TASK TITLE	PERFORM COMPUTER HARDWARE PROBLEM DIAGNOSIS AND HARDWARE COMPONENT INSTALLATION AND UPGRADE	**TASK NO.**	5051
PERFORMANCE CRITERIA	The person performing this task must be able to diagnose hardware problems timely and accurately, follow security protocols and ensure the efficiency of the process to minimize downtime, ensure the normal operation of computer hardware, identify potential problems before they worsen, provide excellent customer service and communicate effectively with users, keep professionality in action, respect users' privacy and confidentiality, and abide by ethical standards.		
RANGE STATEMENT	The task can be performed on the network layout site under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Screwdrivers; 2. Pliers; 3. Multimeters; 4. Diagnostic software; 5. Magnetic screw pallets; 6. Cable testers; 7. Heat conductive pastes; 8. Anti-static wristbands; 9. Soldering irons; 10. Power supply testers. 11. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify problems reported by users or observe symptoms of problems; 2. Perform diagnostic tests; 3. Repair or replace components; 4. Update equipment drivers or other software components; 5. Try the components to ensure their normal operation; 6. Record all maintenance activities performed.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Perform diagnostic tests; 1.2 Repair or replace components; 1.3 Update equipment drivers or other software components; 1.4 Troubleshooting and debugging. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Knowledge of safety operation procedures;

7. Observe health, occupational and environmental safety, rules and regulations	2.2 Computer hardware and composition principles; 2.3 Operating system operation and management standards; 2.4 Specifications for the use of diagnostic tools. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic knowledge of network engineering; 3.2 Basic knowledge of electrical engineering. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Computer hardware problems are diagnosed, hardware components are installed and updated, and daily maintenance activities are performed in accordance with industry standards and user requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT INSTALLATION AND MAINTENANCE OF HARDWARE	**DUTY NO.**	505
TASK TITLE	PERFORM PERIODIC MAINTENANCE AND REPARATION OR REPLACEMENT OF DAMAGED HARDWARE	**TASK NO.**	5052
PERFORMANCE CRITERIA	The person performing this task must be able to ensure that the downtime is minimized and the hardware service is restored as soon as possible, that the hardware is properly repaired or replaced, that the hardware components are correctly installed and all cables and connections are correctly fixed, that effective communication is possible with other members of IT department and end users, and that accurate and up-to-date records of hardware maintenance, repair and replacement are maintained.		
RANGE STATEMENT	The task can be performed on the network layout site under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Screwdrivers; 2. Pliers; 3. Multimeters; 4. Cable testers; 5. Soldering irons; 6. Power supply testers; 7. Diagnostic software; 8. Anti-static wristbands; 9. Compressed air tanks; 10. Substitute hardware components. 11. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Turn off and disconnect the power supply; 2. Clean hardware components; 3. Check for any signs of wear and tear; 4. Update firmware and drivers; 5. Ensure that the hardware is turned off and the power supply is disconnected; 6. Diagnose problems; 7. Replace damaged hardware components; 8. Test hardware;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Clean and maintain hardware components; 1.2 Update firmware and drivers regularly; 1.3 Maintain and replace damaged hardware components; 1.4 Provide maintenance and guidance to users. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 USB, HDMI, Ethernet, Wi-Fi and other hardware interface principles; 2.2 Computer hardware and composition principles;

9. Maintain accurate and up-to-date records; 10. Track when maintenance is needed or when hardware components need to be replaced; 11. Communicate with other members of IT department; 12. Provide end users with guidance on hardware maintenance and troubleshooting as needed. 13. Observe health, occupational and environmental safety, rules and regulations	2.3 Maintenance and replacement procedures and standard specifications for hardware components; 2.4 Application specifications of diagnostic tools and software. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Knowledge related to computer system software; 3.2 Security procedures for computer hardware maintenance; 3.3 Methods of updating firmware and drivers of different hardware components. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Periodic maintenance and replacement of damaged hardware is performed in accordance with industry standards and technical knowledge.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

OCCUPATION	BIG-DATA TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT INSTALLATION AND MAINTENANCE OF HARDWARE	**DUTY NO.**	505
TASK TITLE	CONDUCT HARDWARE COMPONENT TESTING, RECORD MAINTENANCE ACTIVITIES AND TECHNICAL SUPPORT SERVICES	**TASK NO.**	5053
PERFORMANCE CRITERIA	The person performing this task must be able to complete tasks within a reasonable time frame, diagnose problems accurately and solve them effectively, communicate effectively with colleagues, supervisors and customers, have a keen eye for details, ensure accurate recording of all maintenance activities and thorough testing of hardware components, and ensure that all maintenance activities comply with manufacturer's specifications and any relevant regulations or standards.		
RANGE STATEMENT	The task can be performed on the network layout site under the supervision of senior technicians or big data engineers. The tools and equipment to be used include: 1. Diagnostic software; 2. Screwdrivers and pliers; 3. Multimeters; 4. Cable testers; 5. Soldering irons; 6. Stamp tools; 7. Document software; 8. Remote access software. 9. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure that any power supply or network is disconnected; 2. Perform diagnostic tests; 3. Take appropriate measures to repair the problem; 4. Reconnect to the power supply or network and test again to ensure that it works as expected; 5. Create records of all maintenance activities; 6. Store records in a secure location; 7. Listen to the user's description of the problem;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct diagnostic tests of hardware components; 1.2 Fix the problems in the tested hardware; 1.3 Use remote access software to diagnose remote problems; 1.4 Record repair and maintenance process. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Computer hardware and composition principles; 2.2 Standard procedures and specifications for materials entering and leaving the warehouse;

8. Try to diagnose problems remotely using remote access software; 9. Arrange time for on-site service; 10. Let users know the schedules and provide clear instructions on how to solve the problem; 11. Record the maintenance activity in the log after the problem is solved. 12. Observe health, occupational and environmental safety, rules and regulations	2.3 Principles and specifications of customer satisfaction survey; 2.4 Specifications for the use of remote-control software. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods of compiling maintenance logs and reports; 3.2 Methods of the maintenance and long-term preservation for electronic equipment; 3.3 Plan-making and implementation procedures of return visits. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document editing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Testing of hardware components is completed, maintenance activities and technical support services are provided in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety.

APPENDIX: DACUM CHART FOR BIG-DATA TECHNICIAN - NTA LEVEL 5

DUTIES	TASKS	ENABLERS
1.0 Carry out networking design and deployment	1.1 Plan and prepare network and network layout site. 1.2 Conduct installation of network hardware and configuration of network software. 1.3 Carry out testing, troubleshooting, maintenance and upgrading of network systems.	**General skills and knowledge** · Safety operations of circuits · Safety operations of operating tools · Safety operations of work at heights · Occupational health and safety · Standard operation of network cabling · Waste disposal methods · Design of network topology **Tools and equipment** · Cable tester · Crimping tools · Wire stripper · Cable tie · Labelling machine · Network analyser · Electric drill/Electric saw · Ladder · Measuring tape · Screwdrivers **Materials** · Safety measures and documentation materials **Requirements for employees** · Teamwork spirit · Time management · Integrity · Emphasis on commitment
2.0 Perform database design and application	2.1 Carry out installation and configuration of databases to ensure their security. 2.2 Carry out database troubleshooting, library backup, and data recovery. 2.3 Conduct design, operation and optimization of database tables.	**General skills and knowledge** · Principles of database design · Database management system · SQL · Database backup and recovery · Security · Performance optimization · Monitoring and troubleshooting · Database maintenance · Scalability of databases

DUTIES	TASKS	ENABLERS
		Tools and equipment · Database Management System (DBMS) · Database management tools · Backup and recovery tools · Firewall · Intrusion detection system · Security scanning tools · Monitoring tools · Command line interface · Hardware such as servers, storage equipment and backup equipment **Materials** · Documents · Training and support materials **Requirements for employees** · Teamwork spirit · Time management · Integrity · Emphasis on commitment
3.0 Carry out management and maintenance of systems	3.1 Conduct installation and configuration of software and hardware. 3.2 Manage user accounts, access, and safety. 3.3 Conduct backup and recovery procedures, and data storage and archiving.	**General skills and knowledge** · Various authentication methods and technologies · Different types of access control models · Access control list · Best practices in the industry for implementing security policies · Influence of security policies on system performance and user experience · Various security tools and technologies to protect systems and data · Basic principles of event response · Event response tools and technologies for identifying and analysing security events · Compliance requirements of safety management **Tools and equipment**

DUTIES	TASKS	ENABLERS
		· Operating system installation medium · Network monitoring tools · System backup and recovery tools · Command line utilities · Remote access tools · Hardware diagnostic tools · Configuration management tools · Virtualization software **Materials** · Documents · Training and support materials **Requirements for employees** · Teamwork spirit · Time management · Integrity · Emphasis on commitment
4.0 Conduct data collection and pre-processing	4.1 Carry out collection, cleaning, transformation and storage of large amounts of data. 4.2 Process, operate and transform data through development and implementation of software tools and scripts. 4.3 Maintain high level execution of system uptime, performance, scalability, security and recoverability	**General skills and knowledge** · Various data collection techniques · Data cleansing techniques · Data conversion technology · Various storage and management technologies · Big data processing technologies used to process and analyse large amounts of data · Data security and privacy regulations · Commonly-used programming languages in big data processing · The cloud computing platform · Statistical analysis techniques **Tools and equipment** · Data collection tools · Data cleansing and validation tools · Data conversion tools · Data storage and management tools · Big data analysis tools · High performance servers, clusters and storage systems · Cloud computing service platforms

DUTIES	TASKS	ENABLERS
		Materials · Documents · Training and support materials **Requirements for employees** · Teamwork spirit · Time management · Integrity · Emphasis on commitment
5.0 Carry out installation and maintenance of hardware	5.1 Perform computer hardware problem diagnosis and hardware component installation and upgrade. 5.2 Perform periodic maintenance and reparation or replacement of damaged hardware 5.3 Conduct hardware component testing, record maintenance activities and technical support services.	**General skills and knowledge** · Professional knowledge of computer hardware · Operation and application knowledge of operating systems · Network infrastructure · Diagnostic tools, including software for testing hardware components, such as memory testing software and hard disk diagnostic tools · Knowledge of welding and electronic equipment · Strong communication and problem-solving competence · Safety procedures, including knowledge of handling electrical equipment and safe handling of hazardous materials **Tools and equipment** · Diagnostic software · Screwdrivers and pliers · Multimeters · Cable testers · Soldering irons · Stamp tools · Document software · Remote access software **Materials** · Documents · Training and support materials **Requirements for employees** · Teamwork spirit

DUTIES	TASKS	ENABLERS
		· Time management · Integrity · Emphasis on commitment