NATIONAL COUNCIL FOR TECHNICAL EDUCATION

NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR COMPUTER ENGINEERING TECHNICIAN

LEVEL: NTA 5

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FOREWORD

The National Council for Technical Education (NACTE) is a corporate body established by the National Council for Technical Education Act, Cap.129. The Act provides a legal framework for the Council to coordinate the provision of technical education and training in Tanzania. The mandate of NACTE is three-fold, namely; Regulatory, Quality Assurance and Policy Advisory.

In discharging its mandate, the Council has been charged with the responsibilities, among others, to:

(a) assist technical institutions in the transmission of knowledge, principles and training in the field of technical education and training for the benefit of the people of Tanzania;
(b) assist technical institutions in the overall development of the quality of education they provide and to promote and to maintain approved academic standards;
(c) establish and make awards in technical education which are consistent in standard and comparable to related awards in Tanzania and internationally; and
(d) ensure that the quality of education required for the awards is met and maintained throughout the duration of the delivery of the course.

In the course of execution of these responsibilities, the Council has been instituting various measures aiming at advancing the quality of training provided in technical institutions in respect of the changing demands of the labour market, both local and international.

To achieve the above obligation, NACTE, under the Ministry of Education, Science and Technology implemented the East Africa Skills for Transformation and Regional Integration Project (EASTRIP), a project aiming at promoting regional integration through supporting the regional corridors and sector markets, developing common standards and qualifications, and promoting mobility of students, faculty, and graduates. The project supports the Government of Tanzania to address shortage of skills in five sectors namely:

(a) Energy;
(b) Construction;
(c) Information and Communication Technology (ICT);
(d) Transportation; and
(e) Agribusiness.

To address the skills miss-match and shortage in the five (5) sectors in the country, the project funded, among others, a component of Development of Occupational Standards for Technical and Vocational Education and Training (TVET). In this regard, NACTE endeavored to identify qualified and highly experienced experts in the five sectors from both the industry and training institutions to carry out the development of Occupational Standards. The exercise was carried out at Morogoro Teachers College – Morogoro from 16th July to 10th August, 2021. The output of the exercise is Occupational Standards for 12occupations. Occupational standards for Computer Engineering Technicians is among the 12 occupational standards which have been developed.

Since Occupational Standards are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills, attitudes and understanding in an occupation, it is the Council's expectations that the developed standards will form a robust base for decision making and provide explicit guidance to policy makers, curriculum developers, educators, employers and other stakeholders in matters related to manpower planning as well as execution of Technical and Vocational Education and Training undertakings.

Prof. J. W. Kondoro — Dar es Salaam

Chairman — **October 2022**

ACKNOWLEDGEMENT

The National Council for Technical Education (NACTE) is charged with the mandate to be the Quality Assurance organ of the Government in matters related to Technical and Vocational Education and Training (TVET) and production of qualified manpower for both local and international labour markets. In order to realize this obligation, NACTE endeavors to institute policies, guidelines and standards and to set the quality benchmarks for training institutions.

However, this is only possible if there is a strong base, linking the training institutions on one hand and the demands of the industry/labour market for relevant manpower on the other hand. Therefore, the Council undertook a step to develop Occupational Standards in sectors considered to be the engine to steer the country's desire to achieve an industrial economy. This exercise would not be a success without the input and support from our stakeholders. I am indebted to acknowledge some of them here.

I wish to acknowledge and appreciate the support from the Ministry of Education, Science and Technology through the East Africa Skills for Transformation and Regional Integration Project (EASTRIP) for the financial support which facilitated the preparation of this document. I wish also to appreciate Eng. Dr. Simon Baregu and Mrs Leah Lukindo for the tireless efforts and commitment in facilitating and guiding the standards development process, Ms. Eileen Tzamburakis and Ms. ChausikuYakweli Ibrahim for compiling and type setting the final document; and the NACTE Secretariat for coordinating the whole activity.

In a very special way I wish further to extend my sincere gratitude to this team of wonderful experts who tirelessly dedicated their time and availed their invaluable intellect in the preparation of this document. I would like to recognize the colossal inputs of the following experts:

S/N	Name	Designation	Organization
1	Dr. Dennis Lupiana	Lecturer	Institute of Finance Management (IFM)
2	Eng. Dr. Moses Makoko	Head of ICT	University of Dar-es-Salaam – College of Information Communication Technology
3	Dr. Kwame Ibwe	Lecturer	University of Dar-es-Salaam – College of Information Communication Technology
4	Dr. Nkundwe Mwasaga	Lecturer	Dar-es-Salam Institute of Technology

In addition, NACTE hopes to further enhance the internationalization of occupational standards and promote the modernization and internationalization of industries, facilitating

Tanzania's integration into the international market and exploiting its development potential. Therefore, NACTE has invited China-Africa Vocational Education Alliance and China-Africa (Chongqing) Vocational Education Alliance to participate in the development, revision and review of occupational standards documents in collaboration with Chinese vocational institutions, so as to make use of their rich experience in vocational education efforts and rely on China's advanced and complete industrial chain and its position in the international market to contribute to the development of vocational education and related industries in Tanzania.

Therefore, I would like to express my sincere gratitude to this specialized team of Chinese institutions and experts. I thank them for their hard work and dedication, and for contributing their wisdom and experience to the preparation of this document. I would like to thank the following institutions and experts for their support:

S/N	Institute	Name	Title
1	Shandong Labor Vocational and Technical College	Zhang Lifang	Head of Publicity Department/Higher Vocational Education
2		Chen Jing	Director of Department of Information Engineering/Computer Technology
3		Li Guowei	Head of Office of International Exchange and Cooperation/Higher Vocational Education
4		Bu Lingrui	Teacher of Department of Information Engineering/Big Data Technology
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			English
6		Xing Haiyan	Teacher of Department of Information Engineering/Application of Cloud Computing Technology
7		Qi Baosheng	Teacher of Department of Information Engineering/Computer Application Technology
8		Xu Chunxiu	Teacher of Department of Information Engineering/Application of Artificial Intelligence Technology
9		Wang Xufeng	Deputy Director of Department of Information Engineering/Software Technology Specialty
10		Gu Haining	Teacher of Department of Information Engineering/Computer Application Technology
11		Xu Xiangyue	Teacher of Office of International Exchange and Cooperation/Higher Vocational Education
12		Peng Furong	Teacher of Department of Information Engineering/Software Technology
13		Wang Hongyu	Teacher of Department

			of Information Engineering/Application of Cloud Computing Technology
14		Wang Ruyi	Teacher of Department of Information Engineering/Application of Cloud Computing Technology
15	Changzhou Vocational Institute of Mechatronic Technology	Gu Weijie	Dean of School of Information Engineering/Computer Science and Technology
16		Gu Lijun	Director of Teaching Team of School of Information Engineering/Computer Science and Technology
17		Sun Hualin	Assistant Dean of School of Information Engineering/Computer Application Technology
18		Zuo Yamin	Teacher of School of Information Engineering/Internet of Things Application Technology
19		Sheng Yunyao	Director of Teaching Team of School of Information Engineering/Computer Science and Technology
20		Zhou Hanqing	Teacher of School of

			Information Engineering/Computer Network Technology
21		He Yaqin	Teacher of School of Information Engineering/Computer Network Technology

Last but not least, I would like to acknowledge the enormous inputs from all stakeholders who were consulted during the validation process to provide their expert views and opinions on the validity of the contents and preparation of this document for customers' consumption.

Dr. A. B. Rutayuga — Dar es Salaam

Executive Secretary — **October 2022**

ABREVIATIONS

NACTE	National Accreditation Council of Technical Education
NOS	National Occupational Standards
OS	Occupational Standards
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

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 program 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 analysis:	A process used to identify the tasks that are important to employees in any given occupation
Occupational area	This is a broad grouping of related jobs. Example: food service
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 performance tool of assessment of the pre – scribed outcomes.
Occupational/job analysis:	A process used to identify the tasks that are important to employees in any given occupation**.**
Performance criteria:	indicate the expected end results or outcome in form of evaluative statements.
Skill:	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.
Standard:	it is a set of statement, 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 analyzing each task to determine the steps, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.
Underpinning Knowledge:	This is crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification:	The process of having experts review and conform 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.
Occupational Competence	The application of knowledge and skills to perform consistently to the standards required in the work context.

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 trouble shooting 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 in 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 demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education (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) programs. 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 Computer 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 workshop thereafter continued with the development of occupational standards. Experts in Occupational Analysis and development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the occupational standards. Engineers, supervisory technicians on the job, and experienced Computer Maintenance technicians were key informants in the survey to establish occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are equipped for working in the occupation. A total of …….. online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they served to engage a wide cross-section of experts in the

occupation. 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 FORCOMPUTER ENGINEERING TECHNICIAN

These standards cover a broad range of duties and tasks that can be performed by a Computer Engineering Technician. However, the occupational standards are not meant to replace individual job descriptions, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Computer Engineering Technician may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. The most common job titles in this cadre include (i) Programmer/Analyst, (ii) System/Network Administrator, (iii) System Security expert, (iv) System Testing Technician, etc.

Computer engineering technicians assist engineers in the design of computer hardware and software, as well as apply science and engineering principles in the implementation of designs. Generally, computer engineering technicians apply knowledge of computer principles to implement the designs of hardware and software engineers. Technicians perform calculations and projections to help create designs, build and test prototypes to improve their designs and conduct quality control in production environments. On the other hand, computer technicians, also known as computer support specialists, don't only design, build, or improve computer parts or systems, but troubleshoot and repair those already in place as well..

These occupational standards cover the following main duties for a Computer Engineering Technician:

1. Maintain computer hardware and accessories in a business environment
2. Maintain software in standalone computers
3. Provide user technical support
4. Build prototypes of planned ICT systems
5. Maintain electronic circuits of computer devices
6. Manage computer networks in a business with a single office environment
7. Improve data processing and management
8. Participate in preparation of procurement plan of ICT systems and services
9. Manage computer users in a business environment

10. Maintain network-based services (e.g. network file sharing, network printing and data backup)
11. Prepare records of daily operations

4.0. VALIDITY PERIOD

The occupational standards will be valid for 3-5 years due to the fast-changing nature of technology. The review will proceed in the same manner as the previous one, with new occupational standards being developed based on current labor market Information.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDRADS FOR COMPUTER ENGINEERING TECHNCIAN – NTA 5

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	BUILD PROTOTYPES OF PLANNED ICT SYSTEMS	**DUTY NO**	501
TASK TITLE	DESIGN SYSTEM ARCHITECTURE DIAGRAMS	**TASK NO**	5011
Performance Criteria:	A person carrying out this task must be able to design system architecture diagrams as per industry standards and designers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Computer 3. Relevant software for designing system architecture diagrams 4. Computer technician's tool kit This person will work under minimum supervision.		

KNOWLEDGE AND SKILL REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The operation contents of the person performing this task are as follows: 1. System outline design 2. System's functional structure division 3. Database structure design 4. Determination of programming language	**Detailed knowledge about:** **1.0. Methods** The person performing this task needs to consider how to: 1.1. Make model design 1.2. Conduct functional partitioning 1.3. Select development language **2.0. Principles** The person performing this task must be able to design schemas as follows: 2.1. Designing organizational charts 2.2. Drawing circuit diagrams 2.3. Designing datasheets 2.4. Object-oriented programming **3.0. Theories** The person performing this task must be able to explain: 3.1. Standards and specifications for the design of organizational charts 3.2. Datasheet design principles 3.3. Programming specifications for an object-oriented language **4.0. Essential skills** 4.1. Problem analysis skills 4.2. Problem communication skills

	4.3. Problem solving skills 4.4. Report writing skills 4.5. Interpersonal skills 4.6. Teamwork **5.0. Math skills** 5.1. Algebra and logic
Description of End Product or Service:	Systems' schemas are interpreted as per industry standards and designers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of system schemas 3. Use of design software 4. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	BUILD PROTOTYPES OF PLANNED ICT SYSTEMS	**DUTY NO**	501
TASK TITLE	PREPARE SPECIFICATIONS	**TASK NO**	5012
Performance Criteria:	A person carrying out this task must be able to identify, present and describe systems components' specifications as per industry standards and designers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Computer 3. Relevant software for designing system architecture diagrams 4. Computer technician's tool kit This person will work under minimum supervision.		

SKILLS AND REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify specifications 2. Verify specifications 3. Compile specifications	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Specify systems components' requirements 1.2. Verify systems components' specifications 1.3. Use software tools to prepare systems components' specifications **2.0. Principles** The person must be able to fully understand and master the working methods of: 2.1. Specifying systems' requirements 2.2. Integrating systems' components 2.3. Securing computer systems 2.4. Universal design **3.0. Theories** The person must be able to explain: 3.1. Types of system requirements 3.2. System components/modules **4.0. Essential skills** 4.1. Problem analysis skills 4.2. Problem communication skills 4.3. Problem solving skills 4.4. Report writing skills 4.5. Interpersonal skills 4.6. Teamwork

	5.0. Math skills 5.1. Algebra and logic
Description of End Product or Service:	Systems components' specifications are prepared as per industry standards and designers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of documents 3. Specifications verification methods 4. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	BUILD PROTOTYPES OF PLANNED ICT SYSTEMS	**DUTY NO**	501
TASK TITLE	CREATE PROTOTYPE	**TASK NO**	5013
Performance Criteria:	A person carrying out this task must be able to create systems components as per industry standards, designers' manuals and component specifications		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Component specifications 3. Computer 4. Relevant software for designing system architecture diagrams 5. Computer technician's tool kit This person will work under minimum supervision.		

SKILLS AND REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Design components 2. Identify implementation technologies 3. Create components 4. Integrate components 5. Test prototype	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Create systems components 1.2. Test systems components 1.3. Integrate systems components **2.0. Principles** The person must be able to explain the principles of: 2.1. System development models 2.2. Software engineering 2.3. Integrating systems' components 2.4. Securing computer systems 2.5. Universal design **3.0. Theories** The person must be able to explain: 3.1. Prototype systems 3.2. System components **4.0. Essential skills** 4.1. Problem analysis skills 4.2. Problem communication skills 4.3. Problem-solving skills 4.4. Report writing skills 4.5. Interpersonal skills

	4.6. Teamwork **5.0. Math skills** 5.1. Algebra and logic
Description of End Product or Service:	Systems components' are created and functioning as per industry standards, designers' manuals and component specifications
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of documents 3. Use of prototype design tools 4. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTAIN ELECTRONIC CIRCUITS OF COMPUTER DEVICES	**DUTY NO.**	502
TASK TITLE	CONSTRUCT ELECTRONIC CIRCUITS	**TASK NO.**	5021
Performance Criteria:	A person carrying out this task must be able to construct electronic circuits as per industry standards and designers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Computer 3. Electronic circuit making tools 4. Relevant software tools 5. Static-free workbench This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Interpret circuit schematic diagram 2. Select tools for the task and safety gear 3. Identify electronic components 4. Create the desired circuit on a printed circuit board 5. Place electronic components on the circuit board 6. Test electronic circuits 7. Store tools, equipment and safety gear 8. Clean workplace and tools	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Fix printed circuit board on a workbench 1.2. Place circuit components 1.3. Solder joints and bridges 1.4. Test circuit components 1.5. Unfix printed circuit board from a workbench **2.0. Principles** The person must be able to explain the principles of: 2.1. Making soldered joints **3.0. Theories** The person must be able to explain: 3.1. Types of electronic circuit boards 3.2. Methods of constructing electronic circuit boards 3.3. Soldering techniques 3.4. Electronic circuit repairing tools **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Soldering and desoldering skills 4.4. Report writing skills

	4.5. Analytical skills 4.6. Interpersonal skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Electronic circuits are constructed and functioning as per industry standards and designers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of electric power sources 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTAIN ELECTRONIC CIRCUITS OF COMPUTER DEVICES	**DUTY NO**	502
TASK TITLE	DIAGNOSE ELECTRONIC CIRCUITS	**TASK NO**	5022
Performance Criteria:	A person carrying out this task must be able to diagnose electronic circuits as per industry standards, designers' manuals and manufactures' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Known good circuit 2. Designers' manuals 3. Manufacturers' manuals 4. Computer 5. Diagnostic tools (i.e. software tools and test equipment such as multimeters and oscilloscopes) 6. Static-free workbench This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify diagnosis tools for electronic circuits 2. Inspect soldered joints in electronic circuits 3. Troubleshoot printed circuit board 4. Detect failure symptoms of electronic circuits 5. Detect fault in electronic circuits 6. Create electronic circuit diagnosis report	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Securely connect test equipment 1.2. Visually inspect faulty electronic circuits 1.3. Conduct simple tests (e.g. measuring resistance, voltage and waveforms) 1.4. Interpret readings of test equipment and tools 1.5. Securely disconnect test equipment **2.0. Principles** The person must be able to explain the principles of: 2.1. Diagnosing electronic circuits 2.2. Interpreting readings of test equipment and tools **3.0. Theories** The person must be able to explain: 3.1. Types of electronic circuit boards 3.2. Reasons for faults 3.3. Fault types 3.4. Diagnosis tools 3.5. Diagnosis techniques 3.6. Coatings removal techniques

	4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork **5.0. Math skills** 5.1. Algebra
Description of end Product or Service:	Electronic circuits are diagnosed as per industry standards, designers' manuals and manufacturers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of electric power sources 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MAINTAIN ELECTRONIC CIRCUITS OF COMPUTER DEVICES	**DUTY NO**	502
TASK TITLE	REPAIR ELECTRONIC CIRCUITS	**TASK NO**	5023
Performance Criteria:	A person carrying out this task must be able to repair electronic circuit as per industry standards, designers' manuals and manufactures' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Manufacturers' manuals 3. Electronic circuit diagnosis report 4. Computer 5. Electronic circuit repairing tools 6. Relevant software tools 7. Static-free workbench 8. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Interpret electronic circuit diagnosis report 2. Select tools for repairing electronic circuits 3. Repair electronic circuits 4. Test repaired circuit 5. Observe health and safety precautions 6. Store tools and equipment 7. Clean workplaces	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Fix printed circuit board on a workbench 1.2. Solder joints and bridges 1.3. Replace circuit components 1.4. Test circuit components 1.5. Unfix printed circuit board from a workbench **2.0. Principles** The person must be able to explain the principles of: 2.1. Repairing soldered joints **3.0. Theories** The person must be able to explain: 3.1. Types of electronic circuit boards 3.2. Soldering techniques 3.3. Electronic circuit repairing tools **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills

	4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 4.7. Soldering and de-soldering skills **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Electronic circuits are repaired and functioning as per industry standards, designers' manuals and manufactures' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Safe handling of electric power sources 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	MANAGE COMPUTER NETWORK DEVICES	**TASK NO**	5031
Performance Criteria	A person carrying out this task must be able to manage computer network devices as per industry standards and manufacturers' manuals		
Range Statements	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Manufacturers' manuals 2. Network tools kit 3. Computer 4. Network testing tools 5. Relevant software tools 6. Other relevant equipment This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Establish computer network 3. Obtain network devices' manuals 4. Interpret network devices manuals 5. Test network devices 6. Clean tools and workplace 7. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble network devices 1.2. Connect network devices 1.3. Use network testing tools 1.4. Interpret results of testing tools **2.0. Principles** The person must be able to explain the principles of: 2.1. Managing computer network devices **3.0. Theories** The person must be able to explain: 3.1. Types of network devices and their functions 3.2. Types of network testing tools and their functions 3.3. Types of network interfaces **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills

	4.6. Teamwork **5.0. Math skills** 5.1. Algebra
Description of end Product or Service:	Computer network devices are managed as per industry standards and manufactures' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	MAINTAIN COMPUTER NETWORK DEVICES	**TASK NO**	5032
Performance Criteria:	A person carrying out this task must be able to maintain computer network devices as per industry standards and manufacturers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Manufacturers' manuals 2. Network tools kit 3. Other relevant equipment This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Prepare network cables 3. Install network cables 4. Maintain network cables 5. Maintain network connectors 6. Clean tools and workplace 7. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Connect network connectors into cables 1.2. Plug connectors into network interfaces **2.0. Principles** The person must be able to explain the principles of: 2.1. Network cabling **3.0. Theories** The person must be able to explain: 3.1. Types of network connections 3.2. Types of network cables 3.3. Types of network interfaces 3.4. Color codes of network cables **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 4.7. Computer application skills **5.0. Math skills** 5.1. Algebra

Description of End Product or Service:	Computer network devices are maintained and functioning as per industry standards and manufactures' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	PLAN COMPUTER NETWORKS	**TASK NO**	5033
Performance Criteria	A person carrying out this task must be able to plan computer networks as per industry standards and designers' manuals		
Range Statements	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Network tools kit 3. Other relevant equipment This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Identify network topologies 3. Interpret network topology drawings 4. Identify installation tools required 5. Interpret network needs from administration 6. Estimate required materials 7. Install network devices **8.** Perform network tests **9.** Clean tools and workplace **10.** Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble network devices 1.2. Install network cables 1.3. Install network devices 1.4. Determine required network materials (e.g. cables and connectors) **2.0. Principles** The person must be able to explain the principles of: 2.1. Network cabling 2.2. Network devices installation **3.0. Theories** The person must be able to explain: 3.1. Types of network connections 3.2. Types of network cables 3.3. Types of network interfaces 3.4. Types of network topologies **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 4.7. Computer application skills **5.0. Math skills** 5.1. Algebra

Description of End Product or Service:	Computer networks is set up successfully and functions as per industry standards and designers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	CONFIGURE COMPUTER NETWORK DEVICES	**TASK NO**	5034
Performance Criteria:	A person carrying out this task must be able to configure computer network devices as per industry standards and manufacturers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Manufacturers' manuals 2. Network tools kit 3. Other relevant equipment This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Identify interfaces of network devices 3. Connect network devices 4. Access devices' interfaces 5. Customize device settings **6.** Perform network test **7.** Clean tools and workplace **8.** Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble network devices 1.2. Connect network devices 1.3. Change settings of network devices 1.4. Disconnect network devices **2.0. Principles** The person must be able to explain the principles of: 2.1. Network configuration **3.0. Theories** The person must be able to explain: 3.1. Types of network devices and their functions 3.2. Types of network interfaces **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Computer application skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra

Description of End Product or Service:	Computer network devices are configured successfully and functions as per industry standards and manufacturers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	MAINTAIN COMPUTER NETWORKS	**TASK NO**	5035
Performance Criteria:	A person carrying out this task must be able to diagnose network faults and restore network communication as per industry standards and manufacturers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Manufacturers' manuals 2. Computer 3. Network tools kit 4. Network diagnostic tools 5. Relevant software tools 6. Other relevant equipment 7. Static-free workbench This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Diagnose network devices 3. Identify faulty device 4. Propose solution to identified faults 5. Prepare report to management 6. Replace faulty device 7. Perform network tests 8. Clean tools and workplace 9. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble network devices 1.2. Connect network devices 1.3. Visually inspect faulty network devices 1.4. Diagnose network faults 1.5. Interpret readings of network diagnostic tools 1.6. Change settings of network devices **2.0. Principles** The person must be able to explain the principles of: 2.1. Diagnosing network faults 2.2. Repairing network faults **3.0. Theories** The person must be able to explain: 3.1. Types of network devices and their functions 3.2. Types of network diagnostic tools and their functions 3.3. Types of network interfaces 3.4. Network fault removal methods and steps 3.5. Types of network diagnostic tools and their functions

	4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Computer network devices are repaired successfully and functions as per industry standards and manufacturers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	UPGRADE COMPUTER NETWORKS	**TASK NO**	5036
Performance Criteria:	A person carrying out this task must be able to upgrade computer networks as per industry standards		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Manufacturers' manuals 2. Computer 3. Network tools kit 4. Network diagnostic tools 5. Relevant software tools 6. Other relevant equipment 7. Static-free workbench This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Identify network diagnostic tools 3. Run diagnostic tests 4. Interpret diagnosis reports 5. Repair fault computer network 6. Perform network tests 7. Compile report on repaired computer network 8. Clean tools and workplace 9. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble network devices 1.2. Connect network devices 1.3. Diagnose limitations of network communication 1.4. Develop computer network topology diagram 1.5. Configure computer network **2.0. Principles** The person must be able to explain the principles of: 2.1. Limitations of network communication 2.2. Computer network topology diagram **3.0. Theories** The person must be able to explain: 3.1. Types of networks 3.2. Computer network topologies **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills

	4.6. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Troubleshooting of computer networks is conducted as per industry standards
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE COMPUTER NETWORKS	**DUTY NO**	503
TASK TITLE	CONSTRUCT WIRELESS NETWORK ENVIRONMENT	**TASK NO**	5037
Performance Criteria:	A person carrying out this task must be able to construct wireless network architecture, update and maintain wireless network communication and upgrade network devices as per industry standards and manufacturers' manuals		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Wireless network equipment manufacturers' manuals 2. Computer 3. Wireless network tools kit 4. Relevant software tools 5. Other relevant equipment 6. Static-free workbench This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check wireless network performance metrics 2. Compare metrics with standard values 3. Identify wireless network bottlenecks 4. Propose wireless network replacement or upgrade 5. Upgrade or replace wireless network 6. Test upgraded or repaired wireless network	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Assemble wireless network devices 1.2. Connect wireless network devices 1.3. Install new version of firmware 1.4. Change settings of wireless network devices 1.5. Disconnect wireless network devices **2.0. Principles** The person must be able to explain the principles of: 2.1. Upgrading wireless network devices 2.2. Upgrading wireless network device firmware **3.0. Theories** The person must be able to explain: 3.1. Types of wireless networks 3.2. Wireless network technologies 3.3. Wireless firmware **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills

	4.4. Analytical skills 4.5. Computer application skills 4.6. Interpersonal skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Computer network devices are upgraded successfully and functioning as per industry standards and manufacturers' manuals
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	COLLECT AND PROCESS DATA	**TASK NO**	5041
Performance Criteria:	A person performing this task must be able to use equipment and tools for the collection of raw business data into a storage system as per industry standards and technical support guidelines.		
Range Statements:	This task can be performed in a workshop or a client's office. The following equipment and tools should be available: 1. Python and artificial intelligence integration software 2. Database Management System 3. Data processing 4. Computer system 5. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Install Python and common artificial intelligence integration software 5. Configure the environment 6. Obtain conventional internet data tools 7. Store data **8.** Switch "OFF" the computer **9.** Clean tools and workplace 10. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Collect data 1.2. Transform data type 1.3. Keep data persistent **2.0. Principles** The person must be able to explain the principles of: 2.1. Data collection 2.2. Data type 2.3. Data storage **3.0. Theories** The person must be able to explain: 3.1. Data type 3.2. Data structure 3.3. Data collection method **4.0. Essential skills** 4.1. Windows and Linux system operation 4.2. Python and common basic artificial intelligence software operation 4.3. HTML principle and result 4.4. Database operation

	4.5. Interpersonal skills 4.6. Computer application skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Data is collected as per industry standards and data management standards
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Computer Windows and Linux systems 2. Use of data collection tools 3. Database data collection methods 4. Data sorting specifications and methods 5. Data summarization specifications and methods 6. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	DATA LABELING	**TASK NO**	5042
Performance Criteria:	A person performing this task must be able to complete data cleaning and data labeling and statistics as per industry standards and technical support guidelines.		
Range Statements:	This task can be performed in a workshop or a client's office. The following equipment and tools should be available: 1. Python and artificial intelligence integration software 2. Database Management System 3. Data processing 4. Computer system 5. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Install Python and common artificial intelligence integration software 5. Configure the environment 6. Data preprocessing programming 7. Data labeling 8. Data statistics 9. Store data **10.** Switch "OFF" the computer **11.** Clean tools and workplace 12. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Data preprocessing tools 1.2. Preprocess data 1.3. Label data **2.0. Principles** The person must be able to explain the principles of: 2.1. Data processing 2.2. Data labeling 2.3. Data statistics **3.0. Theories** The person must be able to explain: 3.1. Data preprocessing operation 3.2. Data structure 3.3. Data labeling specifications **4.0. Essential skills** 4.1. Windows and Linux system operation 4.2. Python as well as Numpy and Pandas module operation 4.3. Writing programs to manipulate files 4.4. Using an artificial intelligence labeling platform to

	label files 4.5. Interpersonal skills 4.6. Computer application skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Data is labeled as per industry standards and data management standard
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Computer Windows and Linux systems 2. Data preprocessing methods 3. Database operation and storage types 4. Data statistics and analysis 5. Writing scripts with Python tools to process data in batches 6. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	MIGRATE DATA	**TASK NO**	5043
Performance Criteria:	A person performing this task must be able to migrate data from one storage system to another as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Data management guideline 2. Database Management System 3. Data 4. Computer system 5. External hard disk 6. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Extract data from source 5. Transform data 6. Load data to receiving system 7. Review data **8.** Switch "OFF" the computer **9.** Clean tools and workplace **10.** Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Extract data 1.2. Transform data 1.3. Load data **2.0. Principles** The person must be able to explain the principles of: 2.1. Extracting data 2.2. Transformation of data 2.3. Loading of data **3.0. Theories** The person must be able to explain: 3.1. Types of data migration 3.2. Transformation of data 3.3. Data migration triggers **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Computer application skills

	4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Data is migrated as per industry standards and data management standard.
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	MAINTAIN DATA	**TASK NO**	5044
Performance Criteria:	A PERSON PERFORMING THIS TASK MUST BE ABLE TO MAINTAIN DATA AS PER INDUSTRY STANDARDS AND TECHNICAL SUPPORT GUIDELINE.		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Data management guideline 2. Database Management System 3. Data 4. Computer system 5. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Test computer's data processing capability 5. Add data 6. Modify data 7. Delete data 8. Retest computer 9. Switch "OFF" the computer 10. Clean tools and workplace 11. Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Add data 1.2. Modify data 1.3. Delete data 1.4. Maintain database **2.0. Principles** The person must be able to explain the principles of: 2.1. Adding data 2.2. Modifying data 2.3. Data management **3.0. Theories** The person must be able to explain: 3.1. Types of data maintenance 3.2. Manipulation of data 3.3. Data back-up **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Computer application skills 4.6. Interpersonal skills

	4.7. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or Service:	Data is maintained as per industry standards and data management standard.
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	BACKUP DATA	**TASK NO**	5045
Performance Criteria:	A person performing this task must be able to backup data as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Data management guideline 2. Database Management System 3. Data 4. Computer system 5. External hard disk 6. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Prepare data backup procedures 5. Schedule data backups 6. Create backups 7. Secure backup storage media **8.** Switch "OFF" the computer **9.** Clean tools and workplace **10.** Store tools and equipment.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. backup data 1.2. Create backups 1.3. Secure backup storage media **2.0. Principles** The person must be able to explain the principles of: 2.1. Data backup 2.2. Secure backup storage media **3.0. Theories** The person must be able to explain: 3.1. Types of data backups 3.2. Securing of data **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Computer application skills 4.5. Analytical skills 4.6. Interpersonal skills 4.7. Teamwork **5.0. Math skills** 5.1. Algebra

Description of End Product or Service:	Data is backed up as per industry standards and data management standard.
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	IMPROVE DATA PROCESSING AND MANAGEMENT	**DUTY NO**	504
TASK TITLE	RECOVER DATA	**TASK NO**	5046
Performance Criteria	A person performing this task must be able to recover data as per industry standards and technical support guideline.		
Range Statements	This task can be performed in a workshop or in a client's office. The following equipment and tools should be available: 1. Data management guideline 2. Database Management System 3. Data 4. Computer system 5. Computer technician's tool kit This person will work under minimum supervision.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Set up a computer 3. Switch "ON" the computer 4. Identify data for recovery 5. Locate data for recovery 6. Restore data 7. Verify restored data **8.** Switch "OFF" the computer **9.** Clean tools and workplace **10.** Store tools and equipment	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Perform data recovery 1.2. Verify restored data **2.0. Principles** The person must be able to explain the principles of: 2.1. Recovering data 2.2. Verifying restored data **3.0. Theories** The person must be able to explain: 3.1. Types of data recovery 3.2. Verifying data 3.3. Data management systems **4.0. Essential skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork **5.0. Math skills** 5.1. Algebra
Description of End Product or	Data is recovered as per industry standards and data

service:	management standard.
Circumstantial Knowledge:	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

TABLE 1: DACUM CHARTS FOR COMPUTER ENGINEERING TECHNICIAN LEVEL 5

DUTIES	TASKS	ENABLERS
1.0. Build prototypes of planned ICT systems	1.1. Interpret systems' blueprints 1.2. Prepare specifications	**Generic Skills and Knowledge** • Basic knowledge on control and measurements • Basic programming skills • Interpret engineering drawings • Basic electronics skills • Hands on experience soldering and assembling electronics components • Communication and report writing skills • Analytical skills **Tools and Equipment** • Vernier • Micrometers • Dial indicator and bases • Precision levels • Screw drivers • Squares • Protractors and bevel protractors • Graduated rules • Measuring tapes • Spirit levels • Safety gears **Work Behaviors** • Team work • Time management

DUTIES	TASKS	ENABLERS
2.0. Maintain electronic circuits of computer devices	2.1. Diagnose electronic circuits 2.2. Repair Electronic circuits 2.3. Fix electronic circuits 2.4. Reconstruct Electronic Circuits 2.5. Upgrade computer hardware and accessories 2.6. Grant user permissions and rights 2.7. Revoke user permissions and rights 2.8. Administer group and security policies	**Generic Skills and Knowledge** • Basic knowledge of electronics • Basic computer skills on hardware and software installation • Knowledge on computer file systems, data backup and recovery options • Knowledge on computer drivers and supported systems • Problem solving skills • Communication skills **Tools and Equipment** • Electronic circuits diagnostic tools • Online support systems • Safety gears • Technician toolkit **Materials** • Electronics circuit boards **Work Behaviors** • Team work • Time management

DUTIES	TASKS	ENABLERS
3.0. Manage computer networks	3.1. Manage computer network devices 3.2. Maintain computer network devices 3.3. Plan computer networks 3.4. Configure computer networks 3.5. Maintain computer networks 3.6. Upgrade computer networks 3.7. Construct a wireless network environment	**Generic Skills and Knowledge** • Basic skills on Operating Systems • Basic skills on Cyber Security • Basic skills on scripting languages • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills **Tools and Equipment** • Operating Systems resource monitors **Materials** • User profiles • User management manual **Work Behaviors** • Team work • Time management

DUTIES	TASKS	ENABLERS
4.0. Improve data processing and management	4.1. Install data 4.2. Maintain data 4.3. Backup data 4.4. Recover data	**Generic Skills and Knowledge** • Skills on database technologies • Basic skills on Operating Systems • Basic skills on Cyber Security • Basic skills on scripting languages • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills **Tools and Equipment** • MySQL. • SQL Server Management Studio. • DevOpsTools • Visual Studio Code • Enterprise Service Management (ESM) Tools. • PhpMyAdmin Tool. • Python • Anaconda • Numpy • Pandas **Materials** • Data **Work Behaviors** • Patience • Meticulous attention to detail • A logical approach to work

DUTIES	TASKS	ENABLERS
5.0. Provide user technical support	5.1. Assess user problem 5.2. Execute user problem 5.3. Obtain feedback from user 5.4. Document final results 5.5. Consolidate daily activities 5.6. Prepare report	**Generic Skills and Knowledge** • Skills on database technologies • Skills on computer networks • Skills on hardware • Basic skills on Operating Systems • Basic skills on Cyber Security • Basic skills on scripting languages • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills **Tools and Equipment** • Diagnostic tools • Technician toolbox • MySQL. • SQL Server Management Studio. • DevOpsTools • Visual Studio Code • Enterprise Service Management (ESM) Tools. • PhpMyAdmin Tool. • Computer **Materials** • Data **Work Behaviors** • Patience • Meticulous attention to detail • A logical approach to work