NATIONAL COUNCIL FOR TECHNICAL EDUCATION

NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR COMPUTER ENGINEER

OCCUPATION: COMPUTER ENGINEERING

LEVEL: NTA 7

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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;
(e) Leather Technology.

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 Engineers are 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 endeavours 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 recognise 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	Changzhou Vocational Institute of Mechatronic Technology	Gu Weijie	Dean of School of Information Engineering/Computer Science and Technology
2		Gu Lijun	Director of Teaching Team of School of Information Engineering/Computer Science and Technology
3		Sun Hualin	Assistant Dean of School of Information Engineering/Computer Application Technology
4		Zuo Yamin	Teacher of School of Information

			Engineering/Internet of Things Application Technology
5		Sheng Yunyao	Director of Teaching Team of School of Information Engineering/Computer Science and Technology
6		Zhou Hanqing	Teacher of School of Information Engineering/Computer Network Technology
7		He Yaqin	Teacher of School of Information Engineering/Computer Network Technology
8	Shandong Labor Vocational and Technical College	Zhang Lifang	Head of Publicity Department/Higher Vocational Education
9		Chen Jing	Director of Department of Information Engineering/Computer Technology
10		Li Guowei	Head of Office of International Exchange and Cooperation/Higher Vocational Education
11		Bu Lingrui	Teacher of Department of Information Engineering/Big Data Technology
12		Sun Xuna	Teacher of Office of International Exchange and Cooperation/Higher

			Vocational Education, English
13		Xing Haiyan	Teacher of Department of Information Engineering/Application of Cloud Computing Technology
14		Qi Baosheng	Teacher of Department of Information Engineering/Computer Application Technology
15		Xu Chunxiu	Teacher of Department of Information Engineering/Application of Artificial Intelligence Technology
16		Wang Xufeng	Deputy Director of Department of Information Engineering/Software Technology Specialty
17		Gu Haining	Teacher of Department of Information Engineering/Computer Application Technology
18		Xu Xiangyue	Teacher of Office of International Exchange and Cooperation/Higher Vocational Education
19		Peng Furong	Teacher of Department of Information Engineering/Software Technology

20		Wang Hongyu	Teacher of Department of Information Engineering/Application of Cloud Computing Technology
21		Wang Ruyi	Teacher of Department of Information Engineering/Application of Cloud Computing Technology

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 analysing 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 need 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 TET 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 for 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 TET institutions,

In TET, 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 Civil Engineering Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0 OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

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

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

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

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the occupational standards. Engineers, supervisory technicians on the job, and experienced Civil Engineering technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of …….. online surveys were completed by experts from the labour market across the country. Apart from the 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 100 participants from different parts of the country representing various companies.

3.0 THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR COMPUTER ENGINEERING TECHNICIANS

These standards cover a broad range of duties and tasks that can be performed by a Computer Engineer. 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 Engineer 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.

A Computer Engineer is someone who creates, implements, tests, and maintains computer software and hardware. He/she verifies that all hardware and software components are in good working order. A hardware computer engineer studies, creates, develops, and tests computer systems and components such computer circuits and circuit components. S/He also monitors the functioning of an operating system in order to make any necessary adjustments or modifications to the computer system's hardware. A software engineer's job entails conducting research, designing, developing, testing, and maintaining software programs. These programs include operating systems and application software. .S/he also analyses software performance to ensure that it is optimized for the hardware of the computer system. To test, produce, and alter prototypes, they both use functioning or theoretical models built with computer simulation. Both sorts of Computer Engineers work together closely. These Occupational standards cover the following main duties for a Computer Engineer:

1. Developing ICT systems;
2. Supervising daily computer-related operations;
3. Managing software licenses;
4. Managing ICT assets;
5. Managing vendors and suppliers of ICT systems;
6. Managing network services;
7. Managing server-based software;
8. Performing Root-Cause Analysis;
9. Preparing reports on computer-related operations;
10. Managing maintenance plan;
11. Managing ICT governance tools;
12. Preparing procurement plan of ICT systems and services;
13. Managing computer systems security;
14. Managing user technical support;
15. Training ICT systems' users on new technologies;
16. Managing computer networks in a business with multiple office environments;
17. Introducing emerging ICT solutions;
18. Managing cloud computing based services.

These Occupational Standards have been clustered to fit into qualification levels i.e. NTA level 7 and 8.

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 STANDARDS FOR COMPUTER ENGINEERING – NTA 7

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DEVELOP ICT SYSTEMS	**DUTY NO.**	**701**
TASK TITLE	PREPARE REQUIREMENTS SPECIFICATION DOCUMENT	**TASK NO**	**7011**
Performance Criteria	A person carrying out this task must be able to assess and organize functional and non-functional requirement specifications as per industry standards and national guidelines.		
Range Statements	This task can be performed in a client's office. The following materials and tools should be available: 1. Requirements gathering guidelines 2. Requirements gathering standards 3. Business case 4. Computer 5. Relevant software tools This person can work independently		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify requirements 2. Analyse requirements **3.** Create requirements specification document	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Organize users 1.2. Get requirements from users 1.3. Study requirements 1.4. Specify requirements 1.5. Create requirements document **2.0. Principles** The person must be able to explain the principles of systems requirements gathering **3.0. Theories** The person must be able to explain: 3.1. Requirements techniques 3.2. Requirements modelling tools 3.3. Requirements standards **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. Mathematics skills: algebra 4.7. Interpersonal skills 4.8. Teamwork

Description of End Product/Service	Functional and non-functional requirement specifications assessed and organized as per industry standards and national guidelines.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Requirements Engineering 2. Systems requirements 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DEVELOP ICT SYSTEMS	**DUTY NO.**	**701**
TASKTITLE	DESIGN ICT SYSTEMS	**TASK NO**	**7012**
Performance Criteria	A person carrying out this task must be able to design an ICT system as per industry standards and national guidelines		
Range Statements	This task can be performed in a workshop or a client's office. The following materials and tools should be available: 1. Systems design guidelines 2. Systems design standards 3. Business case 4. Systems requirement specifications 5. Computer 6. Relevant software tools 7. Computer Technician's tool kit This person can work independently		

EVIDENCE REQUIREMENTS

DIRECT PERFORMANCE	**PRACTICAL PERFORMANCE**
The person must be able to: 1. Interpret requirements specification document 2. Identify design tools 3. Draw system designs **4.** Create systems' blueprints	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Read and interpret requirements document 1.2. Use variety of design tools 1.3. Draft system design component drawings 1.4. Explain every component in the design 1.5. Organize system components into a system blueprint **2.0. Principles** The person must be able to explain the principle of Information Systems Design **3.0. Theories** 3.1. Systems design techniques 3.2. Systems design tools 3.3. System design methodologies **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. Mathematics skills: algebra 4.7. Interpersonal skills 4.8. Teamwork
Description of End Product/Service	ICT systems designed per industry standards and

	national guidelines
Circumstantial Knowledge	Detailed knowledge about: 1. Systems Design Engineering 2. Systems Architecture 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DEVELOP ICT SYSTEMS	**DUTY NO.**	**701**
TASKTITLE	TEST ICT SYSTEMS	**TASK NO**	**7013**
Performance Criteria	A person carrying out this task must be able to perform various tests on the developed system as per industry standards and national guidelines		
Range Statements	This task can be performed in a workshop or in a client's office. The following materials and tools should be available: 1. Systems testing guidelines 2. Systems testing standards 3. Business case 4. Systems requirement specifications 5. Computer 6. Relevant software tools 7. Computer technician's tool kit This person can work independently.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Create test scenarios 2. Run test routines 3. Observe test routines **4.** Create a test report	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Read and interpret test scenario 1.2. Use variety of testing tools 1.3. Draft system test scenarios 1.4. Explain test routines 1.5. Present test reports **2.0. Principles** The person must be able to explain the principle of information systems testing **3.0. Theories** The person must be able to explain 3.1. Systems testing techniques 3.2. Systems testing tools 3.3. System testing methodologies **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork

Description of End Product/Service	Various tests performed on the developed system as per industry standards and national guidelines
Circumstantial Knowledge	**Detailed knowledge about:** 1. Systems Testing Engineering 2. Systems Testing Procedures 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	DEVELOP ICT SYSTEMS	**DUTY NO.**	**701**
TASKTITLE	MODIFY ICT SYSTEMS	**TASK NO**	**7014**
Performance Criteria	A person carrying out this task must be able to write computer programs using various programming languages 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. Designers' manuals 2. Manufacturers' manuals 3. Computer 4. Engineering toolkits 5. Relevant software tools 6. Change Documentation 7. Computer technician's tool kit This person can work independently		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret a test report 2. Gather facts and information 3. Make decision on bugs report 4. Implement modification	**Detailed knowledge about:** **1.0. Method used** The person perfuming this task must able to explain how to: 1.1. Read and interpret test scenario 1.2. Read and interpret changes 1.3. Choose appropriate test routines 1.4. Interpret and fix bugs 1.5. Implement system modifications **2.0. Principle**s The person must be able to explain the principle of Systems maintenance and repair **3.0. T**h**eories** The person must be able to explain: 3.1. Systems testing techniques 3.2. Systems testing tools 3.3. System development methodologies **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. Mathematics skills: algebra 4.7. Interpersonal skills

	4.8. Teamwork
Description of End Product/Service	ICT system modified as per industry standards and national guidelines
Circumstantial Knowledge	**Detailed knowledge about:** 1. Systems Engineering 2. Systems Change Management Procedures 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE DAILY COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**702**
TASKTITLE	PREPARE WORKPLAN	**TASK NO**	**7021**
Performance Criteria	A person carrying out this task must be able to prepare ICT work plan and assignments as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following materials and tools must be available: 1. Designers' manuals 2. Manufacturers' manuals 3. Computer 4. Logbooks 5. Employer's manual 6. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify computer-related operations 2. Plan computer-related operations **3.** Develop execution plan	**Detailed knowledge about:** **1.0. Method used** The person performing task must be able to explain how to: 1.1. Identify computer related operations 1.2. Assign computer related responsibilities 1.3. Organize computer operations 1.4. Prepare plan of operations 1.5. Implement computer operations **2.0. Principles** The person must be able to explain the principles of planning technical assignments **3.0. Theories** The person must be able to explain: 3.1. Basic computer related operations 3.2. Planning computer operations 3.3. Implementing computer operations **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. Mathematics skills: algebra

	4.7. Interpersonal skills **5.0.** Teamwork
Description of End Product Service	ICT plan and assignments prepared as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Preparation of workplans 2. Implementation of workplans 3. Using computer 4. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE DAILY COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**702**
TASKTITLE	ASSESS DAILY OPERATIONS	**TASK NO**	**7022**
Performance Criteria	A person carrying out this task must be able to assess the work done as per industry standards and workplan		
Range Statements	This task can be achieved in a workshop or in a client's office. The following equipment and tools should be available: 1. Designers' manuals 2. Manufacturers' manuals 3. Computer 4. Note books 5. Relevant software tools 6. Report books This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Review daily operations reports 2. Analyse daily operations **3.** Create an assessment report	**Detailed knowledge about:** **1.0. Method used** The person perfuming this task must be able to explain how to: 1.1. Differentiate operations 1.2. Explain the operations 1.3. Analyse operation activities 1.4. Organize operation activities 1.5. Review operations reports 1.6. Improve the daily operations 2.0. **Principles** The person must be able to explain the principle of Assessment of daily operations **3.0. Theories** The person must be able to explain: 3.1. Information analysis 3.2. Reports analysis 3.3. Reports production 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. Mathematics skills: algebra 4.7. Interpersonal skills 4.8. Teamwork
Description of End Product / Service	Work done assessed the as per industry standards and work plan
Circumstantial Knowledge	**Detailed knowledge about:** 1. Assessment of the work done 2. Writing reports 3. Using computer 4. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE DAILY COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**702**
TASKTITLE	PREPARE REPORT	**TASK NO**	**7023**
Performance Criteria	A person carrying out this task must be able to organize smaller reports and prepare bigger report of ICT operations as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following items and tools must be available: 1. Designers' manuals 2. Manufacturers' manuals 3. Computer 4. Institution's manual 5. Components reports 6. Relevant reporting software tools 7. Report books This person can work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Scrutinize an assessment report 2. Extracts status of daily reports from assessment report **3.** Compile a report	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Read information from assessment reports 1.2. Make use of daily reports 1.3. Summarize information from different reports 1.4. Prepare reports 1.5. Present reports **2.0. Principles** The person must be able to explain the principle of Engineering reports writing **3.0. Theories** The person must be able to explain: 3.1. Information recording 3.2. Reports writing 3.3. Reports review **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra

	4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Smaller reports organized and bigger report prepared for ICT operations as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Organizing reports 2. Writing reports 3. Using computer 4. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	SUPERVISE DAILY COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**702**
TASKTITLE	PREPARE REPORT OF IMPLEMENTATION	**TASK NO**	**7024**
Performance Criteria	A person carrying out this task must be able to prepare report of implementation as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following items and tools must be available: 1. Designers' manuals 2. Manufacturers' manuals 3. Computer 4. Institution's manual 5. Components reports 6. Relevant reporting software tools 7. Report books This person can work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Scrutinize an assessment report 2. Extracts status of daily reports from assessment report **3.** Compile a report of implementation	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Read information from assessment reports 1.2. Make use of daily reports 1.3. Summarize information from different reports 1.4. Prepare reports of implementation 1.5. Present reports of implementation **2.0. Principles** The person must be able to explain the principle of Engineering reports writing **3.0. Theories** The person must be able to explain: 3.1. Information recording 3.2. Reports writing 3.3. Reports review **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra

	4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Report of implementation prepared for ICT operations as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Organizing reports 2. Writing reports 3. Using computer 4. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SOFTWARE LICENSES	**DUTY NO.**	**703**
TASKTITLE	ADMINISTER LICENSE KEYS	**TASK NO**	**7031**
Performance Criteria	A person carrying out this task must be able to perform administration of software licenses as per industry standards, designers' manuals and manufactures' manuals		
Range Statements	This task can be achieved in a client's office. The following equipment and tools should be available: 1. User's manual 2. Designers' manuals 3. Manufacturers' manuals 4. Computer 5. Scanning tools 6. Relevant equipment This person will work independently		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify software license 2. Gather license information 3. Identify licensing properties	**Detailed knowledge about:** **1.0. Method used** The person performing this task must able to explain how to: 1.1. Differentiate different types of licenses 1.2. Study license information 1.3. Activate software licenses 1.4. Deactivate software licenses 1.5. Replace software licenses 1.6. Review active licenses 1.7. Renew software licenses **2.0. Principles** The person must be able to explain the principle of Software license administration **3.0. Theories** The person must be able to explain: 1.1. Software licensing modes 1.2. Perpetual licenses 1.3. Subscription licenses **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra

	4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Administration of software licenses performed as per industry standards, designers' manuals and manufactures' manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Software license agreements 2. Hacked software licenses 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SOFTWARE LICENSES	**DUTY NO.**	**703**
TASKTITLE	AUDIT SOFTWARE LICENSES FOR COMPLIANCE	**TASK NO**	**7032**
Performance Criteria	A person carrying out this task must be able to audit software licenses for compliance with industry standards, designers' manuals and manufactures' manuals		
Range Statements	This task can be achieved in a client's office. The following equipment and tools must be available: 1. User's manual 2. Designers' manuals 3. Manufacturers' manuals 4. Computer 5. Scanning tools 6. Relevant equipment This person will work independently		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify software monitoring tools 2. Monitor license usage 3. Track license expiration and renew	**Detailed knowledge about:** **1.0. Method used** The person performing this task must explain how to: 1.1. Differentiate license monitoring tools 1.2. Use licensing monitoring tools 1.3. Find expired licenses 1.4. Track active licenses 1.5. Renew licenses **2.0. Principles** The person must be able to explain the principle of Software license management **3.0. Theories** The person must be able to explain 3.1. Software management 3.2. Perpetual licenses 3.3. Subscription licenses 3.4. Pirated Software **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills

	4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Software licenses audited for compliance with industry standards, designers' manuals and manufactures' manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Software license agreements 2. Pirated software licenses 3. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SOFTWARE LICENSES	**DUTY NO.**	**703**
TASKTITLE	GENERATE COMPLIANCE REPORT	**TASK NO**	**7033**
Performance Criteria	A person carrying out this task must be able to generate compliance report 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. List license keys 2. Distribute keys 3. Track cost 4. Develop compliance report	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: verify software licenses **2.0. Principles** The person performing this task must be able explain Maintaining software licenses **3.0. Theories** The person performing this task must be able explain: 3.1. Types of software licenses 3.2. Software license compliance issues **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Compliance report generated as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE ICT ASSETS	**DUTY NO.**	**704**
TASKTITLE	PREPARE ICT ASSETS INVENTORY	**TASK NO**	**7041**
Performance Criteria	A person carrying out this task must be able to prepare ICT assets inventory 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. Computer 2. Barcode reader 3. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify ICT assets 2. Gather details of ICT assets 3. Document the details	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Disassemble ICT assets 1.2. Interpret codes of ICT assets 1.3. Assemble ICT assets 2.0. **Principles** The person must be able to explain the principle of: 2.1. Managing ICT assets 2.2. Procuring ICT assets 2.3. Coding ICT assets 3.0. **Theories** The person must be able to explain types of ICT assets 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. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	ICT assets inventory prepared as per industry standards
Circumstantial Knowledge	Detailed knowledge about: 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE ICT ASSETS	**DUTY NO.**	**704**
TASKTITLE	TEST ICT ASSETS	**TASK NO**	**7042**
Performance Criteria	A person carrying out this task must be able to test ICT assets 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. Computer Technician tools kit 5. Diagnostic tools 6. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Run diagnosis routines 2. Identify obsolete assets 3. List assets for replacement 4. Propose to the management assets replacement options	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Assemble computer and network devices 1.2. Connect computer and network devices 1.3. Visually inspect computer and network devices 1.4. Diagnose computer and network devices 1.5. Interpret readings of diagnostic tools 1.6. Disconnect computer and network devices 2.0. **Principles** The person must be able to explain the principles of: 2.1. Managing ICT assets 2.2. Testing ICT assets 3.0. **Theories** The person must be able to explain 3.1. Types of ICT assets and their functions 3.2. Type of tests of ICT assets 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. Mathematics skills: algebra 4.7. Interpersonal skills 4.8. Teamwork

Description of End Product/Service	ICT assets tested and functioning as per industry standards and manufactures' manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE ICT ASSETS	**DUTY NO.**	**704**
TASKTITLE	UPDATE ICT ASSETS INVENTORY	**TASK NO**	**7043**
Performance Criteria	A person carrying out this task must be able to update ICT assets inventory 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. Computer 2. Barcode reader 3. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret assets replacement report 2. Interpret procurement report 3. Modify assets inventory	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: 1.1. Disassemble ICT assets 1.2. Interpret codes of ICT assets 1.3. Assemble ICT assets 2.0. **Principles** of: The person must be able to explain the principle of : 2.1. Managing ICT assets 2.2. Procuring ICT assets 2.3. Coding ICT assets 3.0. **Theories** The person must be able to explain the types of ICT assets 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. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork 4.8. Computer application skills
Description of End Product/Service	ICT assets inventory updated as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:**

	1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE VENDORS AND SUPPLIERS OF ICT SYSTEMS	**DUTY NO.**	**705**
TASKTITLE	PREPARE SERVICE LEVEL AGREEMENTS (SLAS)	**TASK NO**	**7051**
Performance Criteria	A person carrying out this task must be able to prepare service level agreements 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify vendors and suppliers 2. Identify service level objectives (SLOs) 3. Identify evaluation metrics 4. Create SLAs	**Detailed knowledge about:** **1.0. Method used:** The person performing task must be able to explain how to: 1.1. Set scope of SLAs 1.2. Set response and resolution times **2.0. Principles** of: The person must be able to explain the principles of: 2.1. Preparing SLAs 2.2. Monitoring and evaluating ICT services **3.0. Theories** The person must be able to explain how to: 3.1. Types of services and their performance measures 3.2. Types of service elements 3.3. Types of SLAs and their standards **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Service level agreements prepared as per industry standards
Circumstantial Knowledge	Detailed knowledge about: 1. Safe handling of equipment and tools

	2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE VENDORS AND SUPPLIERS OF ICT SYSTEMS	**DUTY NO.**	**705**
TASKTITLE	MAINTAIN SLAS	**TASK NO**	**7052**
Performance Criteria	A person carrying out this task must be able to maintain service level agreements 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret SLAs 2. Liaise with vendors and suppliers 3. Monitor implementation of SLAs 4. Document implementation status of SLAs 5. Create interim implementation report	**Detailed knowledge about:** **1.0. Method used:** The person performing this task must be able to explain how to: Measure service elements **2.0. Principles** The person must be able to explain the principle of 2.1. Maintaining SLAs 2.2. Monitoring and evaluating ICT services **3.0. Theories** The person must be able to explain how to: 3.1. Types of services and their performance measures 3.2. Types of service elements 3.3. Types of SLAs and their standards **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Service level agreements maintained as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE VENDORS AND SUPPLIERS OF ICT SYSTEMS	DUTY NO.	705
TASKTITLE	ASSESS SLAS IMPLEMENTATION	TASK NO	7053
Performance Criteria	A person carrying out this task must be able to assess service level agreements 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret SLAs 2. Interpret SLAs interim implementation reports 3. Analyse SLAs implementation 4. Document findings	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to Measure service elements **2.0. Principles** The person must be able to explain to explain the principles of: 2.1. Maintaining SLAs 2.2. Monitoring and evaluating ICT services **3.0. Theories** The person must be able to explain 3.1. Types of services and their performance measures 3.2. Types of service elements 3.3. Types of SLAs and their standards **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product /Service	Service level agreements assed as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE VENDORS AND SUPPLIERS OF ICT SYSTEMS	DUTY NO.	705
TASKTITLE	ASSESS SECURITY SYSTEM	TASK NO	7054
Performance Criteria	A person carrying out this task must be able to assess security system 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret security system 2. Interpret security system interim implementation reports 3. Analyse security system implementation 4. Document findings	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to assess security system **2.0. Principles** The person must be able to explain to explain the principles of: 2.1. Maintaining security system 2.2. Monitoring and evaluating ICT services **3.0. Theories** The person must be able to explain 3.1. Types of system security and their performance measures 3.2. Types of system security elements 3.3. Types of system security and their standards **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Basic skills on Operating Systems 4.5. Basic skills on Cyber Security 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product /Service	Security system assed as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE VENDORS AND SUPPLIERS OF ICT SYSTEMS	DUTY NO.	705
TASKTITLE	ASSESS TECHNICAL SUPPORT SYSTEM	TASK NO	7055
Performance Criteria	A person carrying out this task must be able to assess technical support system 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. Computer 2. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret technical support system 2. Interpret technical support system interim implementation reports 3. Analyse technical support system implementation 4. Document findings	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to assess technical support system **2.0. Principles** The person must be able to explain to explain the principles of: 2.1. Maintaining technical support system 2.2. Monitoring and evaluating ICT services **3.0. Theories** The person must be able to explain 3.1. Types of technical support and their performance measures 3.2. Types of technical support elements 3.3. Types of technical support and their standards **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Skills on database technologies 4.5. Skills on computer networks 4.6. Skills on hardware 4.7. Interpersonal skills 4.8. Teamwork
Description of End Product /Service	Technical support system assed as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE NETWORK SERVICES	**DUTY NO.**	**706**
TASKTITLE	MONITOR NETWORK SERVICES	**TASK NO**	**7061**
Performance Criteria	A person carrying out this task must be able to monitor network services 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. Computer 2. Network tools kit 3. Technician toolkit 4. Relevant software tools 5. Relevant equipment This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Select tools 2. Identify aspects to be monitored 3. Create benchmarks 4. Analyze gathered data 5. Create network services performance report	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: 1.1. Gather data on network services 1.2. Measure performance aspects 1.3. Interpret measurements of monitoring tools 1.4. Create network service monitoring report **2.0. Principles** The person must be able explain the principle of Monitoring network services **3.0. Theories** The person be able explain: 3.1. Types of network services 3.2. Types of network service monitoring tools and their functions 3.3. Network service performance and their measuring metrics 3.4. Network services assessment methodologies **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. Mathematics skills: algebra 4.7. Interpersonal skills

	4.8. Teamwork
Description of End Product/Service	Network services monitored as per industry standards
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE NETWORK SERVICES	**DUTY NO.**	**706**
TASKTITLE	TROUBLESHOOT NETWORK SERVICES	**TASK NO**	**7062**
Performance Criteria	A person carrying out this task must be able to troubleshoot network services 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. Network tools kit 4. Technician toolkit 5. Relevant software tools 6. Relevant equipment This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify troubleshooting tools 2. Diagnose network services 3. Repair network services 4. Verify repairs 5. Create network services troubleshooting report	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: 1.1. Diagnose network services 1.2. Measure performance aspects 1.3. Interpret measurements of monitoring tools 1.4. View settings of network devices 1.5. Change settings of network services **2.0. Principles** The person must explain the principle of Network troubleshooting **3.0. Theories** The person must explain how to: 3.1. Types of network services 3.2. Types of network service troubleshooting tools and their functions 3.3. Network services assessment methodologies 3.4. Network service settings 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. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Network services troubleshot as per industry standards and designers' manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE NETWORK SERVICES	**DUTY NO.**	**706**
TASKTITLE	CONFIGURE NETWORK SERVICES	**TASK NO**	**7063**
Performance Criteria	A person carrying out this task must be able to configure network services 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. Network tools kit 4. Technician toolkit 5. Relevant software tools 6. Relevant equipment This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify user requirements 2. Identify network services 3. Identify network devices involved 4. Customize settings of the involved network devices 5. Verify customized settings	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. View settings of network services 1.2. Change settings of network services **2.0. Principles** The person must explain the principle of Network service configuration **3.0. Theories** The person must explain 3.1. Types of network services 3.2. Network service settings 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. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Network services configured successfully and functions as per industry standards and designers' manuals

Circumstantial Knowledge	Detailed knowledge about: 1. Safe handling of equipment and tools 2. Extend of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SERVER-BASED SOFTWARE	**DUTY NO.**	**707**
TASKTITLE	INSTALL SERVER-BASED SOFTWARE	**TASK NO**	**7071**
Performance Criteria	A person carrying out this task must be able to install server-based software as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following equipment and tools should be available: 1. Instruction manuals 2. Computer drivers 3. Relevant software tools This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify server-based software 2. Install server operating systems 3. Install server-based application software 4. Test installed software	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1 Remotely login to a server 1.2 Use scripting languages to manipulate server 1.3 Install server-based software libraries and add-ons 1.4 Test the installed server-based software **2.0. Principles** The person must explain the principles of: 2.1. Installation of server-based software 2.2. Software libraries and add-ons **3.0. Theories** The person must explain 3.1. Types of server-based software 3.2. Software libraries and add-ons 3.3. Scripting languages **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. Mathematics skills: algebra 4.7. Interpersonal skills 4.8. Teamwork

Description of End Product/Service	Server-based software installed as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SERVER-BASED SOFTWARE	**DUTY NO.**	**707**
TASKTITLE	CONFIGURE SERVER-BASED SOFTWARE	**TASK NO**	**7072**
Performance Criteria	A person carrying out this task must be able to configure server-based software as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following equipment and tools should be available: 1. Instruction manuals 2. Computer drivers 3. Relevant software tools 4. Technician's tool kit This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify settings of server-based software to be configured 2. Customize settings of server-based software 3. Test customized settings	**Detailed knowledge about:** **1.0. Method used** The person performing task must be able to explain how to: 1.1. Remotely login to a server 1.2. Use scripting languages to manipulate server 1.3. Perform data backup 1.4. Change settings of server-based software 1.5. Test the configured server-based software **2.0. Principles** The person must explain the principles of 2.1. Configuration of server-based software 2.2. Data backup **3.0. Theories** The person must explain: 3.1. Types of server-based software 3.2. Software libraries and add-ons 3.3. Scripting languages 3.4. Data backup **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. Mathematics skills: algebra 4.7. Interpersonal skills

	4.8. Teamwork
Description of End Product/Service	Server-based software installed and functioning as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SERVER-BASED SOFTWARE	**DUTY NO.**	**707**
TASKTITLE	UPGRADE SERVER-BASED SOFTWARE	**TASK NO**	**7073**
Performance Criteria	A person carrying out this task must be able to upgrade server-based software as per industry standards and instruction manuals		
Range Statements	This task can be achieved in a workshop or in a client's office. The following equipment and tools should be available: 1. Instruction manuals 2. Computer drivers 3. Relevant software tools 4. Technician's tool kit This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify upgrade requirements 2. Install upgraded server-based software 3. Test upgraded server-based software	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Remotely login to a server 1.2. Use scripting languages to manipulate server 1.3. Perform data backup 1.4. Install hardware drivers 1.5. Install software drivers and add-ons 1.6. Test the upgraded server-based software **2.0. Principles** The person must explain the principles of: 2.1. Configuration of server-based software 2.2. Data backup **3.0. Theories** The person must explain 3.1. Types of server-based software 3.2. Software libraries and add-ons 3.3. Scripting languages 3.4. Data backup **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills

	4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Server-based software upgraded and functions as per industry standards and instruction manuals
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	MANAGE SERVER-BASED SOFTWARE	**DUTY NO.**	**707**
TASKTITLE	UNINSTALL SERVER-BASED SOFTWARE	**TASK NO**	**7074**
Performance Criteria	A person performing this task must be able to uninstall server-based software as per industry standards and server administration 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. Operating Systems resource monitors 2. Server administration guideline 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify server-based software to be uninstalled 2. Create backup of data in a server 3. Set restoration point 4. Identify server uninstallation tools 5. Remove installed server-based software 6. Confirm uninstallation of software	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Identify server-based software to be uninstalled 1.2. Create backup of data in a server 1.3. Identify server uninstallation tools 1.4. Remove installed server-based software 1.5. Confirm uninstallation of software **2.0. Principles** The person must explain the principles of: 2.1. Creating backup of data in a server 2.2. Identifying server uninstallation tools 2.3. Testing uninstallation of the server-based software **3.0. Theories** The person must explain 3.1. Types of server uninstallation tools 3.2. Verifying uninstallation of the server-based software **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills

	4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Server-based software uninstalled as per industry standards and server administration guideline.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	OCCUPATION CODE	
DUTY TITLE	MANAGE SERVER-BASED SOFTWARE	**DUTY NO.**	**707**
TASKTITLE	UPDATE SERVER-BASED SOFTWARE	**TASK NO**	**7075**
Performance Criteria	A person performing this task must be able to update server-based software as per industry standards and server administration 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. Operating Systems resource monitors 2. Server administration guideline 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify required updates 2. Install server-based software updates (e.g. security patches) 3. Document installed updates	**Detailed knowledge about:** **1.0. Method used** The person must explain how to: 1.1. Identify required updates 1.2. Install server-based software updates (e.g.) security patches) **2.0. Principles** The person must explain 2.1. Identification of required updates 2.2. Installation of server-based software updates **3.0. Theories** The person must explain 3.1. Types of server-based software updates 3.2. Verifying uninstallation of the server-based software updates **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Server-based software updated and functioning as per industry standards and server

	administration guideline.
Circumstantial Knowledge	Detailed knowledge about: 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PERFORM SYSTEM ANALYSIS	**DUTY NO.**	**708**
TASKTITLE	PERFORM PROBLEM ANALYSIS	**TASK NO**	**7081**
Performance Criteria	A person performing this task must be able to perform problem analysis as per industry standards; and problem and system analysis 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. System analysis guideline 2. Problem analysis guideline 3. Computer system 4. Technician's tool kit This person will work independently.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify symptoms 2. List symptoms 3. Analyse symptoms and decide on the next action	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1 Identify symptoms 1.2 Analyse symptoms and decide on the next action **2.0. Principles** The person must explain the principles of: 2.1. Identification of symptoms of the problem 2.2. Analysis of symptoms of the problem **3.0. Theories** The person must explain 3.1. Types of symptoms of the problem 3.2. Verifying symptoms of the problem **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Problem analysis performed as per industry standards; and problem and system analysis guideline.

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

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PERFORM SYSTEM ANALYSIS	**DUTY NO.**	**708**
TASKTITLE	PLAN PROBLEM SOLVING	**TASK NO**	**7082**
Performance Criteria	A person performing this task must be able to plan problem solving as per industry standards; and problem and system analysis 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. System analysis guideline 2. Problem analysis guideline 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Form a team 2. Perform kick-off meeting 3. Review problem 4. Develop activity-time schedule 5. Assign responsibilities	**Detailed knowledge about:** **1.0. Method used** The person performing this task must able to explain how to: 1.1. Form a team 1.2. Review problem 1.3. Develop activity-time schedule 1.4. Assign responsibilities **2.0. Principles** The person must explain the principles of: 2.1. Reviewing problem 2.2. Developing activity-time schedule 2.3. Assigning responsibilities **3.0. Theories** The person must explain 3.1. Types of problem solving 3.2. Verifying the plan of problem solving **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product /Service	Problem solving planned as per industry standards and problem-solving guideline.

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

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PERFORM SYSTEM ANALYSIS	**DUTY NO.**	**708**
TASKTITLE	ANALYZE RISK FACTORS	**TASK NO**	**7083**
Performance Criteria	A person performing this task must be able to analyse risk factors as per industry standards; and problem and system analysis 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. System analysis guideline 2. Problem analysis guideline 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Identify risk factors 2. Assess risk factors 3. Mitigate the risk factors	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: 1.1. Identify risk factors 1.2. Assess risk factors 1.3. Mitigate the risk factors **2.0. Principles** The person must explain the principles of: 2.1. Identifying risk factors 2.2. Assessing risk factors 2.3. Mitigating the risk factors **3.0. Theories** The person must explain 3.1. Types of risk factor 3.2. Mitigating the risk factors **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Risk factors analysed as per industry standards and problem-solving guideline.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system

	2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PERFORM SYSTEM ANALYSIS	**DUTY NO.**	**708**
TASKTITLE	DESIGN PROBLEM SOLVING	**TASK NO**	**7084**
Performance Criteria	A person performing this task must be able to design problem solving as per industry standards; and problem and system analysis 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. System analysis guideline 2. Problem analysis guideline 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Analyse visible problems 2. Identify first-level causes of the problem 3. Identify possible higher-level causes of the problem 4. Discover the root cause 5. Solve the root cause of the problem	**Detailed knowledge about:** **1.0. Method used** The person must explain how to: 1.1. Analyse first-level causes of the problem 1.2. Identify possible higher-level causes of the problem 1.3. Discover the root cause 1.4. Solve the root cause of the problem **2.0. Principles** The person must explain 2.1. Analysing first-level causes of the problem 2.2. Identifying possible higher-level causes of the problem 2.3. Discovering the root cause 2.4. Solving the root cause of the problem 3.0. **Theories** The person must explain 3.1. Types of the root cause 3.2. Solving the root cause of the problem 4.0 **Essential Skills** 4.1 Problem solving skills 4.2 Communication skills 4.3 Report writing skills 4.4 Analytical skills 4.5 Mathematics skills: algebra 4.6 Interpersonal skills 4.7 Teamwork
Description of End Product/Service	Problem solving designed as per industry standards

	and problem-solving guideline.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	**COMPUTER ENGINEER**	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	CREATE RECORDS OF DAILY OPERATIONS	**TASK NO**	**7091**
Performance Criteria	A person performing this task must be able to create records of daily operations as per industry standards and operation manual.		
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. Operation manual 2. Operating Systems resource monitors 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Document daily operations 2. Prepare logbooks 3. Create interim reports	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able explain how to: 1.1. Document daily operations 1.2. Prepare logbooks 1.3. Create interim reports **2.0. Principles** The person must explain the principles of: 2.1. Documenting daily operations 2.2. Preparing logbooks 2.3. Creating interim reports **3.0. Theories** The person must explain 3.1. Types of daily operations 3.2. Preparing logbooks **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Records of daily operations created as per industry standards and operation manual.

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

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	CONSOLIDATE DAILY ACTIVITIES	**TASK NO**	**7092**
Performance Criteria	A person performing this task must be able to consolidate daily activities as per industry standards and operation manual.		
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. Operation manual 2. Operating Systems resource monitors 3. Computer system This person will work independently.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret interim reports 2. Interpret daily operation reports 3. Analyse the reports 4. Document findings	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Interpret interim reports 1.2. Interpret daily operation reports 1.3. Analyse the reports 1.4. Document findings **2.0. Principles** The person must explain the principles of: 2.1. Interpreting operation reports 2.2. Analysing the reports **3.0. Theories** The person must explain 3.1. Types of operation reports 3.2. Analysing the reports **4.0. Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills

	4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Daily activities consolidated as per industry standards and operation manual.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	PREPARE REPORT	**TASK NO**	**7093**

Performance Criteria	A person performing this task must be able to prepare report as per industry standards and operation manual.
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. Operation manual 2. Operating Systems resource monitors 3. Computer system This person will work independently.

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret findings 2. Identify appropriate structure of a report 3. Compile daily operations report	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Interpret findings 1.2. Identify appropriate structure of a report 1.3. Compile daily operations report 2.0. **Principles** The person must explain the principle of: 2.1. Identifying appropriate structure of a report 2.2. Compilation of daily operations report 3.0. **Theories** The person must explain 3.1. Types of daily operations report 3.2. Compilation of daily operations report 4.0. **Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Mathematics skills: algebra 4.6. Interpersonal skills 4.7. Teamwork
Description of End Product/Service	Report prepared as per industry standards and operation manual.
Circumstantial Knowledge	**Detailed knowledge about:**

	1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	DEPLOY CLOUD COMPUTING APPLICATIONS	**TASK NO**	**7094**

Performance Criteria	A person performing this task must be able to deploy cloud computing applications as per industry standards and operation manual.
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. Operation manual 2. Cloud computing applications 3. Computer system This person will work independently.

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret findings 2. Compile daily operations report 3. Interpret cloud computing applications 4. Deploy cloud computing applications 5. Test cloud computing applications	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Interpret cloud computing applications 1.2. Deploy cloud computing applications 1.3. Test cloud computing applications 2.0. **Principles** The person must explain the principle of: 2.1. Deploy cloud computing applications 2.2. Test cloud computing applications 3.0. **Theories** The person must explain 3.1. Types of cloud computing applications 3.2. Cloud computing service software 3.3. Cloud computing application software 4.0. **Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Basic skills on Operating Systems 4.4. Basic skills on Cyber Security 4.5. Analytical skills 4.6. Report writing skills 4.7. Interpersonal skills 4.8. Teamwork

Description of End Product/Service	Deploy cloud computing applications as per industry standards and operation manual.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	CONFIGURE CLOUD COMPUTING APPLICATIONS AND SERVICES	**TASK NO**	**7095**

Performance Criteria	A person performing this task must be able to configure cloud computing applications and services as per industry standards and operation manual.
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. Operation manual 2. Cloud computing applications 3. Computer system This person will work independently.

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret cloud computing applications and services 2. Deploy cloud computing applications 3. Configure cloud computing applications and services 4. Test cloud computing applications and services	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Interpret cloud computing applications and services 1.2. Configure cloud computing applications and services 1.3. Test cloud computing applications and services 2.0. **Principles** The person must explain the principle of: 2.1. Configure cloud computing applications and services 2.2. Test cloud computing applications and services 3.0. **Theories** The person must explain 3.1. Types of cloud computing applications 3.2. Cloud computing service software 3.3. Cloud computing application software 4.0. **Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Basic skills on Operating Systems

	4.4. Basic skills on Cyber Security 4.5. Analytical skills 4.6. Report writing skills 4.7. Interpersonal skills 4.8. Teamwork
Description of End Product/Service	Configure cloud computing applications and services as per industry standards and operation manual.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	PREPARE REPORTS ON COMPUTER-RELATED OPERATIONS	**DUTY NO.**	**709**
TASKTITLE	MONITOR CLOUD COMPUTING APPLICATIONS AND SERVICES	**TASK NO**	**7096**

Performance Criteria	A person performing this task must be able to monitor cloud computing applications and services as per industry standards and operation manual.
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. Operation manual 2. Cloud computing applications 3. Computer system This person will work independently.

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person must be able to: 1. Interpret cloud computing applications and services 2. Deploy cloud computing applications 3. Monitor cloud computing applications 4. Monitor cloud computing services	**Detailed knowledge about:** **1.0. Method used** The person performing this task must be able to explain how to: 1.1. Interpret cloud computing applications and services 1.2. Monitor cloud computing applications 1.3. Monitor cloud computing services 2.0. **Principles** The person must explain the principle of: 2.1. Monitor cloud computing applications 2.2. Monitor cloud computing services 3.0. **Theories** The person must explain 3.1. Types of cloud computing applications 3.2. Cloud computing service software 3.3. Cloud computing application software 4.0. **Essential Skills** 4.1. Problem solving skills 4.2. Communication skills 4.3. Basic skills on Operating Systems 4.4. Basic skills on Cyber Security 4.5. Analytical skills

	4.6. Report writing skills 4.7. Interpersonal skills 4.8. Teamwork
Description of End Product/Service	Monitor cloud computing applications and services as per industry standards and operation manual.
Circumstantial Knowledge	**Detailed knowledge about:** 1. Safe handling of computer system 2. Safe handling of software 3. Extent of responsibilities

TABLE 1: DACUM CHARTS FOR COMPUTER ENGINEERS – NTA 7

DUTIES	TASKS	ENABLERS
1.0. Develop ICT systems	1.1. Prepare requirements specification document 1.2. Design ICT systems 1.3. Test ICT systems 1.4. Modify ICT systems	**Generic Skills and Knowledge** • Computing mathematics • Low level programming skills • Electrical engineering • Computer based models • Software engineering skills • Project management skills • Analog and digital electronics skills • High level programming skills • Embedded electronics skills • Engineering design, drawing and interpretation • Control and measurements • Workshop management skills **Tools and Equipment** • AutoCAD • Digital multi-meter • LAN tester • Screw drivers • Thermal paste • Pliers and Tweezers • Windows performance monitor • Training boards • Internet
2.0. Supervise daily computer-related operations	2.1. Prepare workplan 2.2. Assess daily operations 2.3. Prepare report 2.4. Prepare report of implementation	**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

DUTIES	TASKS	ENABLERS
		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
3.0. Manage software licenses	3.1. Administer license keys 3.2. Audit software licenses for compliance 3.3. Generate compliance report	**Generic Skills and Knowledge** • Skills on copyrights • Legal issues • Open source software issues • Database technologies • Skills on hardware • Basic skills on Operating Systems • Basic skills on Cyber Security • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills **Tools and Equipment** • Diagnostic tools • Computer **Materials** Software licenses **Work Behaviors** • Patience • Meticulous attention to detail • A logical approach to work

DUTIES	TASKS	ENABLERS
4.0. Manage ICT assets	4.1. Prepare ICT assets inventory 4.2. Test ICT assets 4.3. Update ICT assets inventory	**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** • Computer **Materials** Data **Work Behaviors** • Patience • Meticulous attention to detail • A logical approach to work
5.0. Manage vendors and suppliers of ICT systems	5.1. Prepare service level agreements (SLA) 5.2. Maintain SLAs 5.3. Assess SLAs implementation 5.4. Assess security system 5.5. Assess technical support system	**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 • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills **Tools and Equipment** • Computer **Materials** Data **Work Behaviors** • Patience • Meticulous attention to detail

DUTIES	TASKS	ENABLERS
		• A logical approach to work
6.0. Manage network services	6.1. Monitor network services 6.2. Troubleshoot network services 6.3. Configure network services	**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
7.0. Manage server-based software	7.1. Install server-based software 7.2. Configure server-based software 7.3. Upgrade server-based software 7.4. Uninstall server-based software 7.5. Update server-based software	**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
8.0. Perform Root-Cause Analysis	8.1. Perform problem analysis 8.2. Plan problem solving 8.3. Analyze risk factors 8.4. Design problem solving	**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
9.0. Prepare reports on computer-related operations	9.1. Create records of daily operations 9.2. Consolidate daily activities 9.3. Prepare report 9.4. Deploy cloud computing applications 9.5. Configure cloud computing applications and services 9.6. Monitor cloud computing applications and services	**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