NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

FEBRUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MOBILE APPLICATION DEVELOPMENT TECHNICIAN

LEVEL: NTA 6

TABLE OF CONTENT

CONTENTS

ABBREVIATIONS ii

GLOSSARY OF TERMS iii

1.0. INTRODUCTION 1

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS 2

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIANS 2

4.0. VALIDITY PERIOD 3

5.0. OCCUPATIONAL STANDARDS 3

5.1 OCCUPATIONAL STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIAN - NTA 6 4

TABLE 1: DACUM CHARTS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIAN - NTA 6 .. 30

ABBREVIATIONS

APP	Application
CDN	Content Delivery Network
CBET	Competency Based Education and Training
GCC	GNU Compiler Collection
HTTP	Hypertext Transfer Protocol
JDK	Java Development Kit
JSON	JavaScript Object Notation
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
URL	Uniform Resource Locator
UI	User Interface

GLOSSARY OF TERMS

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

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

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

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

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

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

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Mobile Application Development 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 experts 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 Mobile Application Development Technicians were key informants in the survey to discover occupational trends. The 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 also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Mobile Application Development Technician. However, the occupational standards are not meant to

replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Mobile Application Development Technician may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mobile Application Development Technicians shall complete the mobile APP development, mobile Web development and mobile application testing under the supervision of engineers. Technicians complete the basic works of setting up mobile application development environments, designing and creating mobile application interfaces, writing basic function codes of mobile applications, maintaining program codes and testing mobile application software. Generally, the Mobile Application Development Technician performs the following responsibilities:

a) Program document writing
b) Operating system usage
c) Program code maintenance
d) Computer network configuration
e) Mobile application interface development
f) Webpage design
g) Coding and environment maintenance
h) Database installation and simple usage
i) Linux operating system configuration and usage
j) Mobile application development
k) Mobile Web front-end development
l) Server-side application development
m) Mobile application software testing

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

4.0. VALIDITY PERIOD

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

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIAN - NTA 6

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION DEVELOPMENT	**DUTY NO.**	601
TASK TITLE	APP PAGE DESIGN THROUGH THE LAYOUT MANAGER	**TASK NO.**	6011
PERFORMANCE CRITERIA	The person performing this task must be able to design APP pages through the layout manager in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Operating systems, such as Windows, Mac and Linux; 3. Mobile application development software, such as Android Studio and Xcode.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Create a project; 2. Determine the APP page style; 3. Plan the APP page layout and determine the page layout form; 4. Prepare resource documents, including multimedia documents and related data documents; 5. Add various page controls; 6. Set page control properties; 7. Beautify the page and unify the style; 8. Save and submit the project code.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Plan the APP page layout; 1.2 Manage and use resource documents; 1.3 Set controls. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Specifications for document naming; 2.2 Principles of APP page adaptation; 2.3 Specifications for the size, font and annotation of controls. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 APP page layouts; 3.2 Commonly-used properties and settings of controls; 3.3 Resource document management mode.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	APP pages are designed in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION DEVELOPMENT	**DUTY NO.**	601
TASK TITLE	APPLICATION FUNCTION IMPLEMENTATION	**TASK NO.**	6012
PERFORMANCE CRITERIA	The person performing this task must be able to implement application functions one by one in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used operating systems, such as Windows, Mac and Linux; 3. Mobile application development software, such as Android Studio and Xcode.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Write logical codes as per service requirements; 2. Write the codes that implement page jumps; 3. Write function codes that implement user interaction; 4. Handle exceptions and critical values; 5. Optimize codes, solve code reuse and improve memories; 6. Debug the program and verify critical values and normal values.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Write program codes and implement page functions; 1.2 Debug the program. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Coding specifications; 2.2 Code optimization specifications and principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Event handling mechanism; 3.2 Steps to implement functions; 3.3 Function code debugging methods; 3.4 Secure operations of program codes. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END	Applications with specific functions are developed in

PRODUCT / SERVICE	accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Secure operations of data management; 3. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION DEVELOPMENT	**DUTY NO.**	601
TASK TITLE	APPLICATION DATA PROCESSING	**TASK NO.**	6013
PERFORMANCE CRITERIA	The person performing this task must be able to process application data in accordance with technical requirements and service features.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software, such as Android Studio and Xcode.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select to add Data Display controls; 2. Obtain Data Load controls; 3. Encapsulate and send the data in Send page; 4. Receive and process the data in Receive page; 5. Save the data to the database; 6. Manage the data stored in the database.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Display the data in controls; 1.2 Transfer the data between pages; 1.3 Store and manage the application data. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Data storage specifications; 2.2 Database operation specifications; 2.3 Data management specifications. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Data Display control use methods; 3.2 Document storage methods; 3.3 Database storage methods; 3.4 Database management methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END	Applications with data processing are developed in

PRODUCT / SERVICE	accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION DEVELOPMENT	**DUTY NO.**	601
TASK TITLE	DEVELOPMENT OF MULTIMEDIA PLAYING FUNCTION OF MOBILE APPLICATIONS	**TASK NO.**	6014
PERFORMANCE CRITERIA	The person performing this task must be able to play multimedia documents in mobile applications in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software materials, such as Android Studio and Xcode.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Import a video or audio document to the project's resource folder; 2. Use the class that manipulates the audio or video document to set the document access path; 3. Write the codes; 4. Use methods in the audio document function class to control the audio document playing state; 5. Use methods in the video document function class to control the video document playing state.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Play video or audio documents in the application. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Audio document format requirements; 2.2 Video document format requirements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods to import audio or video documents; 3.2 Methods to implement audio or video document playing; 3.3 Methods to control audio or video document playing; 3.4 Secure operations of program codes. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills;

	4.4 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Mobile applications that can play multimedia documents are developed in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Secure operations of data management; 3. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION DEVELOPMENT	**DUTY NO.**	601
TASK TITLE	ACCESS NETWORKS IN APPLICATIONS	**TASK NO.**	6015
PERFORMANCE CRITERIA	The person performing this task must be able to implement network access in mobile applications in accordance with technical requirements and service features.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software materials, such as Android Studio and Xcode.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select the way to send HTTP requests; 2. Write the codes to set the URL object to be accessed; 3. Set the application's network access permission to allow it to access networks in its operation; 4. Write the codes; 5. Read the data returned from network access; 6. Parse the data in JSON format; 7. Process the data parsed.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Send HTTP requests; 1.2 Process the data returned from requests. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic format of URL; 2.2 Principles of network access permissions; 2.3 Basic communication process of HTTP; 2.4 JSON data format requirements. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 GET and POST requests; 3.2 Methods to use commonly-used classes through sending HTTP requests; 3.3 JSON data parsing methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills;

	4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Mobile applications that can access network data are developed in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Secure operations of data management; 3. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE WEB FRONT-END DEVELOPMENT	**DUTY NO.**	602
TASK TITLE	FRONT-END FRAMEWORK TECHNOLOGY USAGE.	**TASK NO.**	6021
PERFORMANCE CRITERIA	The person performing this task must be able to set up and use front-end frameworks in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Development tools and related framework dependence, such as VS Code and Sublime Text.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the precompiled document; 2. Unzip the downloaded document to get the document containing JS and CSS; 3. Use CDN to load Bootstrap framework; 4. Create an HTML document in the precompiled folder; 5. Import the Bootstrap document bootstrap.min.css; 6. Enter the development software HbuliderX to create a project; 7. Load and test Bootstrap framework.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Download and install Bootstrap development environment; 1.2 Use Bootstrap framework. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Path downloading and installation specifications; 2.2 Document structure specifications; 2.3 Installation operation specifications. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods to download and install Bootstrap; 3.2 Methods to create Bootstrap precompiled documents; 3.3 Methods to import CSS and JavaScript plug-ins; 3.4 Secure operations of data management; 3.5 Secure operations of program codes. **4.0 Essential Skills**

	4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Bootstrap framework is set up in the development software, with pages designed, in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE WEB FRONT-END DEVELOPMENT	**DUTY NO.**	602
TASK TITLE	STATIC MOBILE WEB PAGE DEVELOPMENT	**TASK NO.**	6022
PERFORMANCE CRITERIA	The person performing this task must be able to develop static mobile Web pages in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Development tools and related framework dependence, such as VS Code and Sublime Text		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine the web page style; 2. Plan the web page layout; 3. Prepare resource documents, images, video and audio materials; 4. Write HTML structure codes; 5. Add Bootstrap components; 6. Set page components to be uniform in style, color, size and rounded corners.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Plan the Web page layout; 1.2 Use Bootstrap framework components; 1.3 Set Bootstrap component properties. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Specifications and principles of coding; 2.2 Specifications for document naming; 2.3 Principles of web page adaptation; 2.4 Specifications for component usage. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Web page layouts; 3.2 Methods to set the properties of commonly-used Bootstrap components; 3.3 Basic steps to use Bootstrap grid system; 3.4 Flex layout; 3.5 Secure operations of data management; 3.6 Secure operations of program codes.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Front-end pages are developed using the Bootstrap framework in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE WEB FRONT-END DEVELOPMENT	**DUTY NO.**	602
TASK TITLE	IMPLEMENTATION OF DYNAMIC INTERACTION OF MOBILE WEB PAGES	**TASK NO.**	6023
PERFORMANCE CRITERIA	The person performing this task must be able to implement dynamic interaction of mobile web pages in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Development tools and related framework dependence, such as VS Code and Sublime Text.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Write logical codes as per service requirements; 2. Develop the drop-down menu interaction codes; 3. Develop the pop-up box interaction codes; 4. Develop the click button interaction codes; 5. Develop the slideshow interaction codes; 6. Debug code functions; 7. Execute the unit tests.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Write the codes to implement dynamic interaction of web pages; 1.2 Debug the program. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Coding specifications; 2.2 Responsive web design principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Methods to use Bootstrap interactive components; 3.2 Methods to use JavaScript plug-ins; 3.3 Steps to use response events; 3.4 Methods to debug codes; 3.5 Secure operations of data management; 3.6 Secure operations of program codes.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Pages with interaction function are developed using the Bootstrap framework in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	SERVER-SIDE APPLICATION DEVELOPMENT	**DUTY NO.**	603
TASK TITLE	SERVER SOFTWARE INSTALLATION AND CONFIGURATION	**TASK NO.**	6031
PERFORMANCE CRITERIA	The person performing this task must be able to install and configure servers in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software materials, such as Eclipse or MyEclipse software and MySQL database software.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Download environmental development tools, server software and integrated development environment software; 2. Install environmental development tool software; 3. Install server software; 4. Install integrated development environment software; 5. Configure the server in integrated development environment software.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Set up the server environment; 1.2 Manage and configure the server; 1.3 Install and configure integrated development software; 1.4 Implement the server-based web project publishing. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Web transmission protocols; 2.2 Web server's working principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 XML (Extensible Markup Language); 3.2 HTTP; 3.3 BS structure; 3.4 Request/response principles; 3.5 Secure operations of data management; 3.6 Secure operations of program codes.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Web project development environment is set up in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	SERVER-SIDE APPLICATION DEVELOPMENT	**DUTY NO.**	603
TASK TITLE	SERVER-SIDE SOFTWARE DATABASE APPLICATION DEVELOPMENT	**TASK NO.**	6032
PERFORMANCE CRITERIA	The person performing this task must be able to manage and operate server-side databases in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software materials, such as Eclipse or MyEclipse software and MySQL database software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Connect the database; 2. Create an entity class corresponding to the database; 3. Create a corresponding database access object class, and encapsulate basic operations of database tables; 4. Write the codes to organize the program process; 5. Call the database access class to access the database.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Write the program to implement database connection; 1.2 Write the program to implement basic database operations. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Specifications for database access; 2.2 Organizational structure of the data access layer; 2.3 Structure of the entity class. **3.0 Theories** The person performing this task must be able to explain the following theories: 3.1 Database connection methods; 3.2 Basic database operations; 3.3 Database access object (DAO) class; 3.4 Secure operations of data management; 3.5 Secure operations of program codes.

	4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database access programs that meet the application requirements are designed in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	SERVER-SIDE APPLICATION DEVELOPMENT	**DUTY NO.**	603
TASK TITLE	FUNCTION CODE DEVELOPMENT AS PER SERVICE LOGIC	**TASK NO.**	6033
PERFORMANCE CRITERIA	The person performing this task must be able to write program codes to implement the service logic function in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Software materials, such as Eclipse or MyEclipse software and MySQL database software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Write logical code modules; 2. Create the service logic class; 3. Encapsulate related code modules; 4. Manage the service logic class; 5. Run and debug the program; 6. Modify related codes.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Write program codes to implement the service logic function; 1.2 Debug the program. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 MVC design specifications; 2.2 Service logic class design specifications. **3.0 Theories** The person performing this task must be able to explain the following theories: 3.1 MVC design modes; 3.2 Methods to implement the service logic class; 3.3 Secure operations of data management; 3.4 Secure operations of program codes. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills;

	4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Service logical codes are written in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION SOFTWARE TESTING	**DUTY NO.**	604
TASK TITLE	TESTING ENVIRONMENT SETUP	**TASK NO.**	6041
PERFORMANCE CRITERIA	The person performing this task must be able to set up mobile application software testing environments in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Testing software, such as Appium and UI Automator; 4. Software materials, such as Android Studio software.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Set up the Android environment, and install Android SDK and an Android emulator; 2. Install Appium testing tool; 3. Use a language such as Java or Python as the automation testing script language, and install a script editor; 4. Test the script writing environment; 5. Install the testing software through adb commands, or drag the software to the Android emulator interface to complete its installation.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select a testing tool as per the testing requirements; 1.2 Install and debug the testing tool. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of Appium automation testing framework; 2.2 Principles of UI Automator testing framework. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Features of mobile application software testing; 3.2 Differences between mobile application software testing and traditional software testing; 3.3 Methods of mobile application software testing; 3.4 Secure operations of data management; 3.5 Secure operations of program codes. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills;

	4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Mobile application software testing environments are set up in accordance with technical requirements and service specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MOBILE APPLICATION SOFTWARE TESTING	**DUTY NO.**	604
TASK TITLE	APPLICATION SOFTWARE TESTING AND DEFECT MODIFICATION	**TASK NO.**	6042
PERFORMANCE CRITERIA	The person performing this task must be able to test application software and modify defects in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Testing software, such as Appium and UI Automator.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Test tasks and select testing methods; 2. Connect the emulator, configure Appium server, and set UI testing parameters; 3. Start Appium UI testing, and complete the UI testing task; 4. Use the Appium testing tool to capture pages, and complete the page function testing; 5. Obtain the test running information; 6. Write defect reports, or modify defects.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Execute the process of mobile application software testing; 1.2 Write software defect reports. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Process of mobile application software testing; 2.2 Working steps of testing tools; 2.3 Standards for defect reports. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 White-box testing method; 3.2 Black-box testing method; 3.3 Testing script writing method; 3.4 Secure operations of data management; 3.5 Secure operations of program codes. **4.0 Essential Skills** 4.1 Communication skills;

	4.2 Teamwork skills; 4.3 Entrepreneurial skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Defect reports are written after automation testing and functional testing in accordance with technical requirements and service specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Secure operations of network information; 2. Information literacy.

TABLE 1: DACUM CHARTS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIAN - NTA 6

DUTIES	TASKS	ENABLERS
1.0 Mobile application development	1.1 APP page design through the layout manager. 1.2 Application function implementation. 1.3 Application data processing. 1.4 Development of multimedia playing function of mobile applications. 1.5 Access networks in applications.	**General skills and knowledge** · Development environment setup · Resource management and usage · Interface controls and layout · Event handling mechanism · Basic data storage operations · Audio/video processing methods · Network access with http · Network data processing **Tools and equipment** · Computers · Commonly-used computer operating systems · Software materials · Development tools and related framework dependence · Testing software **Materials** · Virtual machine software installation package · Database software installation package **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment
2.0 Mobile web front-end development	2.1 Front-end framework technology usage. 2.2 Static mobile web page development.	**General skills and knowledge** · Selector, style and animation usage · Property, content, element, size and location usage

	2.3 Implementation of dynamic interaction of mobile web pages.	· Basic data storage operations · Event binding, event delegation, event unbinding, event objects and trigger events · Flex layout and responsive layout · Bootstrap and JQuery use methods **Tools and equipment** · Computers · Commonly-used computer operating systems · Software materials · Development tools and related framework dependence · Testing software **Materials** · Virtual machine software installation package · Database software installation package **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment
3.0 Server-side application development	3.1 Server software installation and configuration. 3.2 Server-side software database application development. 3.3 Function code development as per service logic.	**General skills and knowledge** · Web application servers · Server-side development languages · Session technologies, request and response technologies · Database connection technologies, and MVC design modes **Tools and equipment** · Computers · Commonly-used computer operating systems · Testing software · Database management software · Database software **Requirements for employees** · Teamwork spirit

		· Integrity · Time management · Intensive study and emphasis on commitment
4.0 Mobile application software testing	4.1 Testing environment setup. 4.2 Application software testing and defect modification.	**General skills and knowledge** · Concepts and contents of mobile application software testing · Knowledge of designing test cases with black/white-box testing methods · Knowledge of executing test cases · Application software testing and defect modification · Automation testing and performance testing methods · Automation testing and performance testing **Tools and equipment** · Computers · Commonly-used computer operating systems · Testing software · Automation testing framework **Requirements for employees** · Teamwork spirit · Integrity · Time management · Intensive study and emphasis on commitment