REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

ELECTRICAL ENGINEERING TECHNICIAN (POWER OPTION)

KNQF LEVEL: 6

ISCED OCCUPATIONAL STANDARD CODE: 0713 554B

TVET CDACC
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NAIROBI

AUTOMATE AN ELECTRICAL MACHINE

UNIT CODE: ENG/OS/PO/CR/05/6/B

UNIT DESCRIPTION

This unit covers the competencies required to automate an Electrical machine. Competencies includes an automation system design, components mountings, programming of an automation system, simulation of an automation system and test running of an automation system.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicised terms are elaborated in the Range)***
1. Design Automation System	1.1 Design is performed as per the scope of the automation system 1.2 Design is done as per the system's functionality 1.3 ***Design tools and equipments*** are identified as per the scope of the system 1.4 Complexity is established as per the scope of the system
2. Mount Electrical components	2.1 ***Electrical components*** to be mounted are identified as per the design 2.2 Components are configured as per the system functionality 2.3 Components are mounted as per the standard operating procedure 2.4 Components are connected and wired as per the design
3. Program Automation System	3.1 Programming language is identified as per the functionality of the system 3.2 Coding of the identified programming language is performed 3.3 Program is tested and debugged as per standard operating procedure 3.4 Program is uploaded in the automation system as per the manufacturers specifications

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicised terms are elaborated in the Range)***
	3.5 Automation system is configured as per the standard operating procedure
4. Simulate Automation System	4.1 Automation system modelling components are identified as per the design 4.2 Automation system model is implemented as per the design 4.3 System model is interfaced with the program as per the design 4.4 Test running of the system is performed for its functionality
5. Test run Automation system	5.1 Types of test are Identified 5.2 ***Testing tools and equipments*** are identified 5.3 Automation system is tested for its functionality as per the design 5.4 Reliability of the system is tested as per the standard operation procedure 5.5 Accuracy and efficiency of the system is tested as per design 5.6 Automation system parameters are tested as per the design 5.7 ***Visual inspection*** is performed

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	**Range**
1. Design tools and equipment may include but is not limited to:	• Scientific calculators • Drawing tools • Laptops

Variable	Range
	• Stationeries • Drawing boards • Measuring tools
2. Test tools and equipment may include but is not limited to:	• Multimeter/AVO meter • Wattmeter • Insulation resistance tester • Loop impedance tester • Earth resistance tester • Clamp meter • Power quality analyser • Infrared camera • Phase sequence meter • Frequency meter • Synchroscope • Tachometer • Tacho generator • Laser meter • Lux meter

3. Visual inspection may include but is not limited to:	• Check for:
	  o Firmness of accessories/equipment
	  o Loose connections
	  o Damaged equipment/component if any
	• Colour coding

Variable	Range
4. Electrical components may include but is not limited to:	• Microcontrollers • PLCs • Timers • Relays • Switches • Circuit breakers • LEDs • Fuses • Cables
5. Tests may include but is not limited to:	• Continuity • Accuracy • Efficiency • Insulation resistance • Polarity • Earth electrode resistance • Earth fault loop impedance • Phase sequence • Frequency • Speed

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

- The manufacturer's warranty requirements relating to inspection and testing activities for the Electrical automation system and related components.

- The legal and statutory requirements relating to the electrical automation system and components
- Legislation and workplace procedures relevant to:
    - Health and safety;
    - The environment (including waste disposal);
    - Appropriate personal protection equipment (PPE).
- Workplace procedures for:
    - Using test tools and instruments
    - Work place communication;
- Time management
- Tools and equipment management
- The importance of using the correct sources of technical information.
- Performing tests including:
    - Connection of testing equipment
    - Operation of testing equipment
    - Recording and interpretation of test results
    - Making recommendations based on test results
    - Compiling test report

FOUNDATION SKILLS

The individual needs to demonstrate the following foundation skills:

- Communications (verbal and written);
- Proficient in using test equipment;
- Time management;
- Analytical;
- Faults troubleshooting;
- Problem solving;
- Planning; Decision making;
- First aid;
- Report writing

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Designed the Automation system as per the scope of the job 1.2 Implemented the Designed automation system 1.3 Configured the automation system as per the system functionality 1.4 Programmed the automation system with the appropriate language 1.5 Performed testing and debugging of the coded programming language 1.6 Testing of the parameters of the automation system was performed 1.7 System efficiency tests was performed 1.8 Test running of the system was performed to ascertain functionality 1.9 Simulate the designed model of the automation system before implementing 1.10 Applied and adhered to safety procedures Applied the procedures of testing according to the standard 1.11 Obtained and recorded test values accurately 1.12 Interpreted the recorded test results
2. Resource Implications	Resources the same as that of workplace are advised to be applied including 2.1 Multimeter/AVO meter 2.2 Wattmeter 2.3 Insulation resistance tester 2.4 Clamp meter 2.5 Phase sequence meter 2.6 Frequency meter 2.7 Tacho meter

3. Methods of Assessment	Competency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Practical test
4. Context of Assessment	Competency may be assessed individually 4.1 On job 4.2 Off job 4.3 During Industrial Attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.