REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

ELECTRICAL ENGINEERING TECHNICIAN (POWER OPTION)

KNQF LEVEL: 6

ISCED OCCUPATIONAL STANDARD CODE: 0713 554B

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APPLY ELECTRICAL PRINCIPLES

UNIT CODE:ENG/OS/PO/CC/03/6/B

UNIT DESCRIPTION

This unit describes the competencies required by a technician in order to apply a wide range of electrical principles in their work. Which includes; use of the concept of basic electrical quantities, use of the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, use of power factor in electrical installation, use of earthing in electrical installations, apply lightning protection measures, apply electromagnetic field theory , apply electrodynamics, apply energy and momentum in electromagnetic field, apply transient in electrical circuit analysis, use two port network, demonstrate understanding of refrigeration and air conditioning

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 italicized terms are elaborated in the Range.***
1. Use the concept of basic Electrical quantities	1.1 Basic ***SI unit***s in Electrical are identified 1.2 ***Quantitie***s of Charge, force, work and power are identified 1.3 Perform calculations involving Ohm's law i.e Current, Resistance and voltage 1.4 Calculations involving various electrical quantities are performed
2. Use the concepts of D.C and A.C circuits in electrical installation	2.1 Calculations involving parallel and series circuits are performed 2.2 Calculations involving DC and AC Network theorems are performed. E.g. Kirchoff's laws, Superposition, Thevinin's, Norton's
3. Use of basic electrical machine	3.1 Types of various electrical machines are identified 3.2 Single phase and three phase motor starting methods are performed 3.3 DC motor starting methods are performed 3.4 Calculations involving single phase and three phase AC and DC Motors are performed 3.5 Calculations involving single and three phase AC and DC transformers are performed 3.6 Calculations involving single and three phase generators are performed

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	3.7 Special machines are identified 3.8 Calculations involving special machines are performed 3.9 Calculations involving Electric Drives are performed
4. Demonstrate understanding of three phase power supply	4.1 Connections of three phase power supply are performed as per the standard operating procedure 4.2 Calculations involving three phase power supply connections are performed 4.3 Measurements of three phase power supply is performed 4.4 Interconnections of three phase power supply are performed as per the nature of the load.
5. Use of power factor in electrical installation	5.1 Power triangle is identified i.e. Active, Apparent and reactive power 5.2 The use of power factor is performed 5.3 Calculations involving power factor correction is performed 5.4 Methods of power factor correction are applied
6. Use of earthing in Electrical installations	6.1 Earthing types are identified 6.2 Earthing points on Electrical installation are identified 6.3 Calculation involved in determining the earthing type is performed 6.4 Test on an earthing system is performed in line with the IEE regulations
7. Apply lightning protection measures	7.1 Types of lightening strokes are identified 7.2 Components of lightening protection system are identified 7.3 Test to be carried out in lightening protection system are established 7.4 Application of lightening protection system is determined
8. Apply Electromagnetic field Theory	8.1 Electromagnetic radiation sources are identified 8.2 Detectors of Electromagnetic radiations are determined 8.3 Electromagnetic waves are applied 8.4 Electromagnetics Laws are Identified 8.5 Behaviours and effects of Electromagnetic waves are established
9. Apply Electrodynamics	9.1 Electrostatics terms are identified 9.2 Magnetostatics terms are identified 9.3 Electrodynamics laws are identified

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10. Apply Energy and Momentum in Electromagnetic field	10.1 Energy conservation theorem is identified 10.2 Electromagnetic Energy flow is determined
11. Apply transients in Electrical Circuit Analysis	11.1 Growth and decay in R-L-C circuits are determined 11.2 Calculations involving Growth and decay in R-L-C are performed
12. Use Two Port networks	12.1 Basic passive networks are performed 12.2 Characteristic impedance is determined 12.3 Types of transmission lines and their applications are performed
13. Demonstrate understanding of Refrigeration and Air conditioning	13.1 Use of Refrigeration and Air conditioning is demonstrated 13.2 Installation of the Refrigeration and Air conditioning system is simulated

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. SI unit may include but not limited to:	1.1 Power – Watts (W) 1.2 Current – Amperes (A)

	1.3 Resistance – Ohms(Ω) 1.4 Voltage – Volts (V)
2. Quantities may include but not limited to:	2.1 Charge 2.2 Force 2.3 Work 2.4 Power

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

Required Skills

The individual needs to demonstrate the following skills:

- Apply basic Electrical formulas
- Use of basic Electrical instruments
- Perform various unit conversions of Electrical quantities
- Electrical earthing
- Lightening arrestors
- Power factor correction
- logical thinking
- problem solving
- applying statistics
- drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Electrical power calculations
- Various laws in Electrical engineering
- Electrical formulas
- Power triangle
- SI units of various electrical parameters
- Earthing testing
- Lightening arrestor testing
- Selecting the correct type of electrical machines for various uses
- Types and purpose of measuring instruments
- Units of measurement and abbreviations

EVIDENCE GUIDE

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

1 Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied the correct SI units of Electrical quantities 1.2 Stated, Calculate and relates the quantities in Ohm's law 1.3 Identified the components of an earthing system 1.4 Stated and apply various laws in Electrical system 1.5 Differentiated between AC and DC network 1.6 Applied correct formulas in the calculation of AC and DC machines 1.7 Used power triangle in calculating power factor 1.8 Applied various methods in power factor correction 1.9 Identified types of lightening arrestors and their applications
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring equipment 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Oral Questioning 3.3 Written tests
Context of Assessment	Competency may be 4.1 On job 4.2 Off job 4.3 During Industrial Attachment
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.