Australian Government

Assessment Requirements for UEEEL0062 Provide engineering solutions to problems in complex polyphase power circuits

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least one occasion and include:

- determining the operating parameters of existing circuit
- using established problem-solving methods
- taking relevant measurements accurately
- interpreting measured values appropriately
- providing effective solutions to circuit problems from measurements and calculations
- giving written justification of solutions provided
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- checking and isolating circuits
- documenting completed work and notifying relevant person/s
- identifying sources of materials required for work
- identifying the scope of the complex polyphase power circuit problems
- preparing for problems in complex polyphase power circuits
- testing and measuring live work
- using tools, equipment and testing equipment.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- polyphase power circuit analysis, including:
  - polyphase supply system encompassing:
    - advantage of three phase system compared to single phase systems
    - double subscript notation
    - phase sequence
    - 120 degree operator
    - given circuit component parameters, solve practically-based problems using:

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    - equivalent circuits of transformers, lines and loads
    - component values using rectangular and polar notation
    - current divider and potential divider rules using complex impedances
    - the "per unit" values of voltage, current and impedance to a common VA base
- types of three phase system connections encompassing:
    - supply to balanced star, three and four wire loads
    - supply to delta connected loads
    - effects of phase reversal
    - representation of currents and voltages as complex phasors for three phase, and three phase and neutral quantities
    - calculation of the values of, and drawing labelled phasor diagrams, not to scale, to represent complex values of current and voltage for balanced and unbalanced loads for star and delta systems
    - calculation of values of P, Q and S for balanced and unbalanced systems
    - draw and label single phase diagrams to represent one phase of a complex three phase system
    - represent unbalanced voltages or currents as symmetrical components
    - phase-to-phase currents
    - phase-to-neutral/earth currents
- balanced three phase loads encompassing:
    - calculations of balanced loads connected in star
    - calculations of balanced loads connected in delta
    - calculation of steady state values of fault current for various configurations
    - evaluation of the symmetrical component impedances for the various distribution system components, transformers (earthed neutral case) and generators (high impedance earth)
    - calculation of fault currents using the per unit approach
    - calculation using the "worst case" values based on transformer impedance only (i.e. a short circuit fault)
    - estimation of peak values using accepted multipliers
    - effects of the direct current (d.c.) component on the instantaneous magnitudes of fault currents in transformers and generators
- unbalanced three phase loads encompassing:
    - star – four wire systems
    - delta systems
    - star – three wire systems
    - star - four wire with neutral impedance
- power in three phase circuits encompassing:
    - summation of phase powers and power in balanced loads
    - measurement of power in balanced loads – two Wattmeter methods
- reactive three phase power encompassing:

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    - power triangle calculation
    - measurement of VAR
    - power factor correction
  - fault currents encompassing:
    - symmetrical components
    - positive, negative and zero sequence impedance
    - fault current breaking and let-through energy capacities of circuit breakers and fuses
    - importance of fault/arc impedance
    - calculation of fault currents - phase-to-earth faults
    - calculation of fault currents - phase-to-phase faults
    - analysis of asymmetrical fault currents
  - harmonics in three phase systems encompassing:
    - presence of triple in harmonics in three phase systems
    - effects of three phase harmonics for different star and delta connections
    - methods for reducing harmonics in three phase systems
- problem-solving techniques
- relevant checks and isolation of circuits
- relevant manufacturer specifications and operating instructions
- relevant materials, tools, equipment and testing devices
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace instructions, policies and procedures.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to providing engineering solutions for solving problems in complex polyphase power circuits

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- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

Companion Volume implementation guides are found in VETNet - - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6

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