Australian Government

Assessment Requirements for UETTDRIS33 Solve electrical problems in remote community network systems

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector 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 two separate occasions and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- applying work procedures and instructions as they apply to risk control measures
- participation in consultation processes, identifying hazards and implementing and monitoring control measures
- preparing to enter the workplace, including the use of work permits and clearances and isolation permissions
- dealing with accidents and emergencies within the scope of responsibility
- altering an existing circuit to comply with specified operating parameters
- following accepted industry workplace procedures and instructions for remote communities
- determining the correct operation of remote community network systems
- diagnosing and providing solutions as they apply to remote community network systems.
- identifying predictable problems including at least three (3) of the following:
  - hi/low volts
  - high resistance
  - low resistance
  - fault current (fuses)
  - kilowatt hour meter faults (no supply, reverse polarity, etc)
  - streetlight faults
- dealing with unplanned events on at least (1) one occasion.

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:

- alternating current (a.c.) quantities, including:

- sine, cosine and tangent ratios of a right-angle triangle
- Pythagoras theorem to a right-angle triangle
- use of the cathode ray oscilloscope (CRO) to measure direct current (d.c.) and a.c. voltage levels
- sinusoidal voltage generated by a single turn coil rotated in uniform magnetic fields
- terms ‘period’, ‘maximum value’, ‘peak-to-peak value’, ‘instantaneous value’, ‘average value’, and ‘root-mean-square (r.m.s.) value’, in relation to a sinusoidal waveform
- calculation of the instantaneous value of induced voltage of a generated sinusoidal waveform
- measurement of instantaneous, peak and peak-to-peak values and the period of a sinusoidal waveform
- calculation of r.m.s. value and frequency of a sinusoidal waveform from values of peak voltage and period

- phasor diagrams, including:
  - purpose of phasor diagrams
  - ‘in-phase’, ‘out-of-phase’, ‘phase angle’ ‘lead’ and ‘lag’
  - phase angle between two or more alternating quantities from a given sinusoidal waveform diagram
  - convention for representing voltage, current and the reference quantity in a phasor diagram
  - drawing phasor diagrams to show the relationship between two or more a.c. values of voltage and/or current
  - determination of phase relationship between two or more sinusoidal waveforms from a given diagram and measurements
- single element a.c. circuits, including:
  - setting up and connecting a single-source resistive a.c. circuit and taking voltage and current measurements to determine the resistance
  - determining the voltage, current resistances from measure of given values of any two of these qualities
  - relationship between voltage drops and current in resistive a.c. circuits
  - applications of resistive a.c. circuits
  - defining ‘inductive reactance’
  - calculation of inductive reactance for a given inductor and the relationship between inductive reactance and frequency
  - applying Ohm’s law to determine voltage, current of inductive reactance in a purely inductive a.c. circuit given any two to these quantities
  - applications of inductive a.c circuits
  - calculation of capacitive reactance
  - applying Ohm’s law to determine voltage, current or capacitive reactance in a purely capacitive a.c circuit given any two of the quantities
  - applications of capacitive a.c circuits
- impedance a.c. circuits, including:

  - impedance and impedance triangle
  - determining the impedance, current and voltages for a series a.c circuit
  - drawing and labelling the impedance triangle for a series resistor–capacitor (RC) circuit
  - examples of capacitive components in power circuits and systems and the effect on the phase relationship between voltage and current
  - drawing the equivalent circuit of a practical inductor
  - examples of inductive components in power circuits and systems and their effect on the phase relationship between voltage and current
- power in an a.c. circuit, including:
  - difference between true power, apparent power and reactive power and the units in which these quantities are measured
  - drawing the power triangle to show the relationships between true power, apparent power and reactive power
  - defining the term power factor and phase angle
  - methods used to measure single phase power, energy and demand
- power factor improvement, including:
  - effects of low power factor
  - requirements for power factor improvement
  - methods used to improve low power factor of an installation
  - local supply authority and AS/NZS 3000:2018 Wiring rules requirements regarding the power factor of an installation and power factor improvement equipment
- harmonics effect in a.c. systems, including:
  - term harmonic in relation to the sinusoidal waveform of an a.c. power system
  - sources in a.c. systems that produce harmonics
  - problems that may arise in a.c. circuits as a result of harmonics and how these are overcome
  - methods and test equipment used to test for harmonics
  - methods used to reduce harmonics in a.c. power system
- three phase systems, including:
  - features of a multiphase system
  - comparison of voltages generated by single and multi-phase alternators
  - reasons for the adoption of three phases for power systems
  - how three phases are generated in a single alternator
  - calculation of root mean square (r.m.s.) value of voltage generated in each phase given the maximum value
  - relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each
  - term phase sequence (also, referred to as phase rotation)
  - determining the phase sequence of a three-phase supply
- three phase star-connections, including:
  - connecting a three-phase star-connection load

- phase relationship between line and phase voltages and line and phase currents of a star-connected system
- determining the r.m.s. value of line and phase voltage given any one of these quantities
- determining the r.m.s. value of line and phase current given any one of these quantities
- terms balanced load and unbalanced load
- examples of balanced and unbalanced loads in typical power systems
- three phase four wire systems, including:
  - purpose of the neutral conductor in three phase four wire systems
  - determining the effects of a high impedance in the neutral conductor of a three phase four wire system supplying an unbalanced load where multiple earthed neutral (MEN) earthing is employed
- three phase delta-connections and interconnected systems, including:
  - connecting three phase delta loads
  - phase relationship between line and phase voltages and line and phase currents of a delta-connected system
  - determining the r.m.s. value of line and phase voltage given any one of these quantities
  - determining the r.m.s. value of line and phase current given any one of these quantities
  - limitations and uses of open delta connections
  - example of loads in typical power systems
  - drawing the typical combinations of three phase interconnected systems using star-connections and a delta connection
  - relationship between line and phase voltages and line and phase currents in the typical interconnected systems using star-connections and delta connections
- fault loop impedance, including:
  - term fault loop impedance of an a.c. power system
  - measuring fault loop impedance of typical circuits
  - procedures for testing fault loop impedance.

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 workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated conditions involving realistic and authentic activities that replicate operational 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 other simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry for solving electrical problems in remote community network systems
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7