Australian Government

Assessment Requirements for UEECD0044 Solve problems in multiple path 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, performance criteria and range of conditions on at least two separate occasions and include:

- applying work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures, including:
  - identifying and assessing hazards and risks
  - implementing control measures
  - safely measuring the parameters for the whole or any part of a d.c. circuit
- working safety with electric circuits in the electrotechnology sector, including:
  - checking circuits are isolated in accordance with workplace procedures and regulatory requirements
  - applying protections against the physiological effects of electrical currents
- calculating values of voltage, current and resistance in single source series/parallel circuits given any two of these quantities
- calculating power in single source series/parallel circuits from known values of voltage, current and/or resistance
- connecting a parallel circuit: power supply, protection device, switch and loads
- connecting a series/parallel circuit: power supply, protection device, switch and loads
- measuring values of voltage and current in single source ELV series/parallel circuits
- measuring values of resistance, including insulation resistance and continuity/no continuity
- measuring values of capacitance
- testing capacitors to determine serviceability
- altering an existing circuit to comply with specified operating parameters
- developing circuits to comply with a specified function and operating parameters
- using methodical techniques to solve circuit problems from measured and calculated values
- ensuring compliance with relevant Australian Standards and legislation
- completing work and documenting activities.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of

the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- factors affecting resistance, including:
  - four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature)
  - affect the change in the type of material (resistivity) has on the resistance of a conductor
  - affect the change in 'length' has on the resistance of a conductor
  - affect the change in 'cross-sectional area' has on the resistance of a conductor
  - effects of temperature change on the resistance of various conducting materials
  - effects of resistance on the current-carrying capacity and voltage drop in cables
  - techniques for calculation of the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature
  - using digital and analogue ohmmeter to measure the change in resistance of different types of conductive materials (copper, aluminium, nichrome and tungsten) when those materials undergo a change in type of material length, cross-sectional area and temperature
- series/parallel circuits including:
  - schematic diagram of a single source d.c. series/parallel circuit
  - identification of the major components of a series/parallel circuit (power supply, protection device, switch and loads)
  - applications where series/parallel circuits are used in the electrotechnology industry
  - characteristics of a series/parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a series/parallel circuit)
  - relationship between voltages, currents and resistances in a bridge network
  - calculation of the total:
    - resistance of a series/parallel circuit
    - current of a series/parallel circuit
    - voltage and the individual voltage drops of a series/parallel circuit
  - techniques for setting up and connecting a single source d.c. series/parallel circuit
  - resistance, voltage and current measurements in a single source d.c. series/parallel circuit
  - the voltage, current, resistances or power dissipated from measured values of any two of these quantities
- parallel circuits including:
  - schematic diagram of a single source d.c. parallel circuit
  - identification of the major components of a parallel circuit (power supply, protection device, switch and loads)
  - applications where parallel circuits are used in the electrotechnology industry
  - characteristics of a parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a parallel circuit)
  - relationship between currents entering a junction and currents leaving a junction
  - relationship between branch currents and resistances in a two-branch current divider

network
    - methods to calculate total:
        - resistance of a parallel circuit
        - current of a parallel circuit
        - voltage and the individual voltage drops of a parallel circuit
    - techniques for setting up and connecting a single source d.c. parallel circuit
    - resistance, voltage and current measurements in a single source parallel circuit
    - voltage, current, resistance or power dissipated from measured values of any of these quantities
    - output current and voltage levels of connecting cells in parallel
- meters in a circuit, including:
    - types, operating characteristics and purpose of instruments/meters used to measure voltage, current, resistance and insulation resistance
    - advantages and disadvantages of different instruments/meters commonly used in the field
    - hazards involved in using electrical instruments/meters and relevant safety control measures
    - techniques to correctly connect and accurately read instruments/meters used in the field and common errors that may occur when connecting and reading meters
    - consequences of incorrect connection of instruments/meters into a circuit
    - techniques for calculation of resistance values using voltmeter and ammeter reading
- resistance measurement, including:
    - types, operating characteristics, purpose and storage of instruments to measure resistance (including insulation resistance)
    - functions of various analogue and digital insulation resistance testers
    - reasons why the supply must be isolated prior to using the insulation resistance tester
    - where and why the continuity test and insulation resistance test would be used in an electrical installation
    - the voltage ranges of an insulation resistance tester and where each range may be used
    - AS/NZS 3000 requirements for resistance measurement/testing
    - purpose and method to carry out a calibration check on an resistance tester
    - techniques for measurement of:
        - low values of resistance using a resistance tester continuity functions
        - high values of resistance using a resistance tester insulation resistance function
        - resistance using volt-ammeter methods
- capacitors and capacitance including:
    - techniques for identification of various types of capacitors commonly used in the electrotechnology industry
    - circuit symbol of various types of capacitors: standard, variable, trimmer and polarised
    - terms and units for capacitance and electric charge
    - behaviour of a series d.c. circuit containing resistance and capacitance components. - charge and discharge curves

  - techniques for calculation of quantities from given information: capacitance, charge and voltage
  - techniques for calculation one time constant as well as the time taken to fully charge and discharge a given capacitor
  - techniques for connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit
- capacitors in series and parallel, including:
  - hazards involved in working with capacitance effects and the safety control measures that should be taken
  - safe handling and the correct methods of discharging various size capacitors
  - dangers of a charged capacitor and the consequences of discharging a capacitor through a person
  - effects of capacitors connected in parallel by calculating their equivalent capacitance
  - effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance
  - techniques for connecting capacitors in series and/or parallel configurations to achieve various capacitance values
  - common faults in capacitors
  - techniques for testing of capacitors to determine serviceability
  - application of capacitors in the electrotechnology industry.

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 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 other simulations
- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, manufacturer instructions, 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