

TRADESPERSONS ELECTRICAL WORK CERTIFICATE 135 - MARKING SCHEDULE

- Notes:
1. (1 mark) means that the preceding statement/answer earns 1 mark.
 2. This schedule sets out the expected answers to the examination questions. The marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.
 3. Symbols and terms - alternatives
Power W or P
Voltage V or E or U
Phase Active
 4. Key to abbreviated terms:
EA Electricity Act 1992
ER Electricity Regulations 1997
AS/NZS Australia and New Zealand Joint Standard
NZS New Zealand Standard
AS Australian Standard
ECP New Zealand Electrical Code of Practice
GK General Knowledge

Section 1 – All Candidates

Question 1

(a) Any TWO of:

- Voltage applied.
- Current level .
- Contact duration.
- Skin dryness.
- Current path.

(2 marks)

(b) (i) Any ONE of:

- The cord must be replaced.
- The cord must be re-terminated so no basic insulation is exposed.
- The appliance must be unplugged and tagged unsafe.

(1 mark)

(ii) If the basic insulation becomes damaged, an immediate shock hazard exists.

(1 mark)

(c) (b) 230 volts.

(2 marks)

(d) $I = \frac{W}{V}$
 $= \frac{1200}{230}$
 $= 5.22A$ (2 marks)

- (e) • To avoid possible contact with a live terminal when removing or replacing the fuse carrier. (1 mark)
 • To avoid flash burns from the fuse if it fails again because the initial fault has not been cleared. (1 mark)

- (f) • Damage to the circuit wiring.
 • Overheating or fire hazard. (2 marks)

- (g) Any TWO of:
 • Length of cord
 • Cross-sectional area
 • Number of cores
 • Type of insulation or sheath
 • Correct conductor colours (2 marks)

(h) $W = \frac{V^2}{R}$ (½ mark)
 $= \frac{240 \times 240}{23}$ (½ mark)
 $= 2504W$ (also accept 2.5kW) (1 mark)

- (i) (i) Water, gas flow control, washing machine. (1 mark)
 (ii) Gas fires, cookers, clothes dryer, air compressor, pump. (1 mark)

- (j) • A fault in the fixed wiring or socket outlet. (1 mark)
 • A registered electrician must be called to repair the fault. (1 mark)

Question 2

(a) (i) Three.

(1 mark)

- (ii)
- Brown or Red.
 - Blue/Light Blue or Black.
 - Green/yellow .

(3 marks)

(b) Any FIVE of:

- Number of cores required.
- Mechanical strength.
- Operating environment.
- Flexibility required.
- Temperature at point of entry to appliance.
- Shape.
- Voltage rating
- Current rating
- Length
- Size

(5 marks)

(c) The cross sectional area of the flexible cord conductors.

(1 mark)

Question 3

- (a) (i) • Utilisation category (fusing factor) is the ratio of minimum fusing current to the current rating of the fuse.

alternatively this may be expressed as:

- Utilisation category (fusing factor) = $\frac{\text{Minimum Fusing Current}}{\text{Current Rating}}$
(3 marks)

- (ii) The lower the **Utilisation category (fusing factor)**, the less excess current is required to blow the fuse.
(2 marks)

(b) $I = \frac{W}{V}$
(1/2 mark)

$= \frac{3000}{230}$
(1/2 mark)

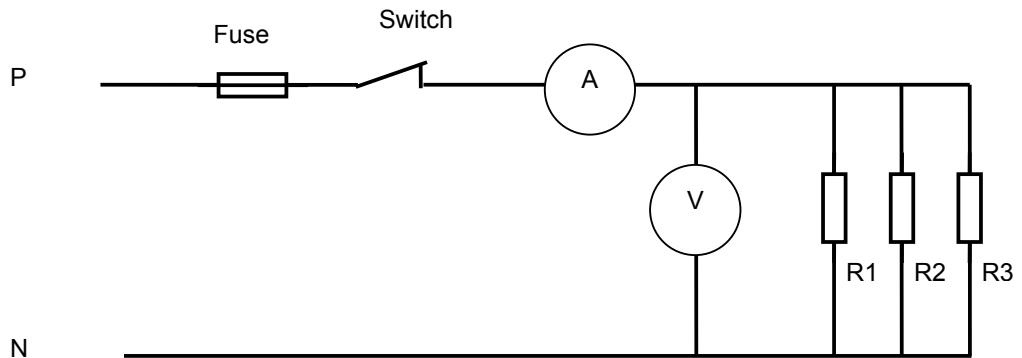
$= 13A$
(1 mark)

16 amp fuse (15 amp fuse is also acceptable) would be purchased.
(1 mark)

- (c) To ensure that the replacement fuse link will safely interrupt the prospective short-circuit current level for that circuit.
(2 marks)

Question 4

(a)



- Correct polarity of the supply (½ mark)
- Correctly connected fuse (½ mark)
- Correctly connected switch (½ mark)
- Correctly connected voltmeter (½ mark)
- Correctly connected ammeter (½ mark)
- Correctly connected resistors. (½ mark)

(b) (i) $I = \frac{V}{R}$ (½ mark)

$= \frac{230}{50}$ (½ mark)

$= 4.6 \text{ amps}$ (1 mark)

(ii) 230 volts (1 mark)

(iii) $W = VA$ (½ mark)

$= 230 \times 4.6$ (½ mark)

$= 1058W \text{ or } 1.058 \text{ kW}$ (1 mark)

(iv) $P = \frac{V^2}{R}$ (½ mark)

$= \frac{240 \times 240}{50}$ (½ mark)

$= 1152W \text{ or } 1.152 \text{ kW}$ (1 mark)

Section 2 - Plumbers Only

Question 5

- (a) • Locate and identify the fuse on the switchboard for the appliance. (1 mark)
- Switch off the circuit power supply and remove fuse carrier. (1 mark)
- Attach Danger tag to fuse base. (1 mark)
- (b) Test for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)
- (c) • Go through the isolation procedure as in (a) above. (1 mark)
- Test for isolation using the prove test prove method as per (b) above. (1 mark)
- (d) Disconnect from the supply and remove for major servicing work. (1 mark)
- (e) • Ensure the permanent connection unit is securely fixed with no exposed live parts. (1 mark)
- Replace danger tag with an out of service tag. (1 mark)

Question 6

- (a) Any THREE of:
- TPS cable entering the switch with bare exposed basic insulation.
 - Broken switch cover.
 - Flexible conduit removed from its clamp.
 - Cover off the element thermostat enclosure or not fitted.
- (3 marks)
- (b)
- To prevent basic insulation from being exposed.
 - To prevent the connections pulling away in the event of strain on the flexible cord.
- (2 marks)
- (c) Any TWO of:
- The wiring is damaged, faulty or wrongly installed.
 - The wrong isolating switch has been operated.
 - The isolating switch is damaged or faulty
 - The appliance is supplied from two sources, e.g., main and control supplies.
- (2 marks)
- (d)
- Earth continuity resistance. AS/NZS 3760: 2.3.3.1
 - Insulation resistance. AS/NZS 3760: 2.3.3.2
 - Visual inspection AS/NZS 3760: 2.3.2
- (3 marks)

Question 7

- (a) (i) A coding system to indicate the degree of protection provided by the enclosure against access to live parts from solid objects, or the ingress of water or other liquids

AS 1939 supplement 1 – 1990
(2 marks)

OR

- A degree of protection in accordance with AS 1939.
AS/NZS 3000: 1.4.58

- (ii) • The degree of protection of persons against live or moving parts inside the enclosure
• And protection of the fitting against ingress of solid foreign bodies

AS 1939 supplement 1 – 1990
(2 marks)

OR

- The degree of protection against solid objects
- Protection of persons against access to hazardous parts.
AS/NZS 3000: 1.4.58

- (iii) • The degree of protection of persons against live or moving parts inside the enclosure
• And protection of the fitting against ingress of solid foreign bodies

AS 1939 supplement 1 – 1990
(2 marks)

OR

- The degree of protection against solid objects
- Protection of persons against access to hazardous parts.
AS/NZS 3000: 1.4.58

- (b) (i) Number 2
Protection of fingers against access to hazardous parts, and protection of equipment against objects larger than 12.5 mm.
(Note accept 12.5 mm² as this is how it is presented in some documents)

(1 mark)

- (ii) Number 3
Protection against spraying water at up to 60° from the vertical

(1 mark)

AS 1939 Supplement 1:1990

- (c) A **damp situation** is a situation in which moisture is either permanently or intermittently present to such an extent as would be likely to impair the effectiveness or safety of an electrical installation.

(2 marks)

Question 8

- (a) (i) All equipment shall be visually inspected and physically checked in accordance with Clause 2.3.2

AS/NZS 3760:2001 : 2.3.1

or

An external inspection of the equipment and connecting facilities (e.g., supply flexible cord)

AS/NZS 3760:2001 : 2.3.1(a)
(2 marks)

- (ii) Test: Protective earthing conductor (earth continuity) test
AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
(½ mark)

Instrument: Low reading ohmmeter or any instrument incorporating a low ohms scale

GK
(½ mark)

Result Maximum 1 ohm

AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
(1 mark)

Test Insulation resistance test.
AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2003: 2.3.3.2
(½ mark)

Instrument 500V d.c insulation resistance tester

AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2001: 2.3.3.2(b)
(½ mark)

Result Not less than 1 Mohm

AS/NZS 3760: 2001: 2.3.3.2(a)
AS/NZS 3760: 2003: Table 2
(1 mark)

OR

Instrument 250V d.c insulation resistance tester

AS/NZS 3760: 2001: 1.1(e)(Note 3) Warning
AS/NZS 3760:2003: 2.3.3.2(b)
(½ mark)

Result Not less than 1 Mohm

AS/NZS 3760: 2001: 2.3.3.2(a)
AS/NZS 3760: 2003: Table 2

(1 mark)

OR

Instrument

Leakage current tester

AS/NZS 3760:2001: 2.3.3.2

(½ mark)

Result

Not greater than 5mA

AS/NZS 3760: 2001: 2.3.3.2(a)

AS/NZS 3760: 2003: Table 1

(1 mark)

(b) (1) Withdrawn from service immediately, have a label attached to it warning against further use; and

(1 mark)

(2) Sent for repair, disposal or destruction by an authorized repair agent or service personnel.

(1 mark)

AS/NZS 3760: 2001: 2.4.1

(c) Any TWO of:

- By use of the appropriate wording - double insulation.
- By use of the international symbol for double insulated equipment.
- By the wording **Class II** on the appliance.

(2 marks)

Question 9

- (a) (i) • To ensure that the resistance to earth from protectively earthed parts is low enough to permit adequate fault current to flow to earth.
Ref: AS/NZS3760: Foreword
or
• To ensure that the resistance of the protective earthing conductor is not greater than 1 ohm. (1 mark)
- (ii) • To ensure the integrity of the insulation between live mains parts and exposed or external metal parts.
Ref: AS/NZS3760: Foreword
or
• To ensure that the insulation resistance:
- between active and neutral and between neutral and earth
- between active and earth (1 mark)
- is not less than 10,000 ohms. (1 mark)
- (iii) • Ensure phase, neutral and earth conductors are terminated at the correct terminals (1 mark)
• Ensure switch and thermostat are in the phase conductor. (1 mark)
- (b) • Use an insulation resistance tester. (1 mark)
• Check meter's operation. (1 mark)
• Bridge the phase and neutral. (1 mark)
• Test between the phase/neutral and accessible metal on the appliance. (1 mark)
• Minimum acceptable value - 10,000Ω. (1 mark)
- (c) 500V d.c. or 250V d.c. (1 mark)

Section 3 – Gasfitters Only

Question 10

- (a)
- Locate and identify the fuse on the switchboard for the appliance. (1 mark)
 - Switch off the circuit power supply and remove fuse carrier. (1 mark)
 - Attach Danger tag to fuse base. (1 mark)
 - Test for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)
- (b)
- Go through the isolation procedure as in (a) above. (1 mark)
 - Test for isolation using the prove test prove method as per (b) above. (1 mark)
- (c) Disconnect from the supply and remove for major servicing work. (1 mark)
- (d)
- Ensure the permanent connection unit is securely fixed with no exposed live parts. (1 mark)
 - Replace danger tag with an out of service tag. (1 mark)

Question 11

- (a) (i) All equipment shall be visually inspected and physically checked in accordance with Clause 2.3.2

AS/NZS 3760:2001 : 2.3.1

or

An external inspection of the equipment and connecting facilities (e.g., supply flexible cord)

AS/NZS 3760:2001 : 2.3.1(a)
(2 marks)

- (ii) Test: Protective earthing conductor (earth continuity) test
AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
(½ mark)

Instrument: Low reading ohmmeter or any instrument incorporating a low ohms scale

GK
(½ mark)

Result Maximum 1 ohm

AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
(1 mark)

Test Insulation resistance test.

AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2003: 2.3.3.2
(½ mark)

Instrument 500V d.c insulation resistance tester

AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2001: 2.3.3.2(b)
(½ mark)

Result Not less than 1 Mohm

AS/NZS 3760: 2001: 2.3.3.2(a)
AS/NZS 3760: 2003: Table 2
(1 mark)

OR

Instrument 250V d.c insulation resistance tester

AS/NZS 3760: 2001: 1.1(e)(Note 3) Warning
AS/NZS 3760:2003: 2.3.3.2(b)
(½ mark)

Result Not less than 1 Mohm

AS/NZS 3760: 2001: 2.3.3.2(a)
AS/NZS 3760: 2003: Table 2

(1 mark)

OR

Instrument

Leakage current tester

AS/NZS 3760:2001: 2.3.3.2

(½ mark)

Result

Not greater than 5mA

AS/NZS 3760: 2001: 2.3.3.2(a)

AS/NZS 3760: 2003: Table 1

(1 mark)

(b) (1) Withdrawn from service immediately, have a label attached to it warning against further use; and

(1 mark)

(2) Sent for repair, disposal or destruction by an authorized repair agent or service personnel.

(1 mark)

AS/NZS 3760: 2001: 2.4.1

(c) Any TWO of:

- By use of the appropriate wording - double insulation.
- By use of the international symbol for double insulated equipment.
- By the wording **Class II** on the appliance.

(2 marks)

Question 12

- (a) • The motor will operate normally (1 mark)
- But the on/off switch would effectively be in the neutral (1 mark)
- The motor circuitry could be live whilst switched off (1 mark)
- A latent shock hazard is created. (1 mark)
- (b) • The motor will operate normally (1 mark)
- The protective earthing conductor is the wrong colour – potential hazard. (1 mark)
- (c) • The motor will not operate (1 mark)
- Its framework will be alive at 230V to earth
An immediate and serious shock hazard exists.
OR
Could operate the protective device (2 marks)
- (d) Any ONE of:
- Earth continuity test
- Polarity test (1 mark)

Question 13

(a) The isolating transformer will:

- Provide protection against damaged leads between the transformer and the appliance. (2 marks)
- Remove the possibility of an electric shock when a plug is withdrawn from a cord connector on an extension lead. (1 mark)

(b) So that the transformer protects the extension leads as well as the portable appliance. (2 marks)

- (c)
- Check the test instrument on a known live source. This proves that the meter is working correctly. (2 marks)
 - Test for isolation (between all conductors) on the circuit being isolated. (1 mark)
 - Re-check the test instrument on the known live source. This ensures that it is working correctly. (2 marks)

Question 14

- (a)
- Visual check.
 - Insulation resistance test.
 - Earth continuity test.
 - Polarity test.
 - Circuit continuity test.
- (5 marks)
- (b)
- Use a low ohms continuity tester. (1 mark)
 - Maximum acceptable value 1 ohm. (1 mark)
 - Check that meter reads zero with leads together. (1 mark)
 - To obtain an accurate reading choose a point that will provide a good connection to earth i.e. free from paint, corrosion etc. (1 mark)
 - Measure the resistance between the earth pin on the plug and the exposed metal of the appliance. (1 mark)