

TEWC 139A - TRADESPERSONS ELECTRICAL WORK CERTIFICATE 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

Question 1

- (a) $R = \frac{V^2}{W}$ (1/2 mark)
 $= \frac{230 \times 230}{2300}$ (1/2 mark)
 $= 23 \Omega$ (1 mark)
- (b) The cross sectional area of the flexible cord conductors. (2 marks)
- (c) 500V d.c. (2 marks)
- (d) (i) Water, gas flow control, washing machine. (1 mark)
- (ii) Gas fires, cookers, clothes dryer, air compressor, pump, washing machine, dishwasher (1 mark)

- (e) Any TWO of:
- Maintain adequate insulation and clearance between instrument clips, leads and probes.
 - Avoid personal contact with either live conductors or earth when using instruments on live circuits.
 - Leads are in good condition.
 - Ensure the correct range is selected on the instrument.
 - Use the prove-test-prove method
- (2 marks)
- (f) Any TWO of:
- Use a double insulated electric drill.
 - Connect the electricity supply to the drill through a residual current device.
 - Connect the electricity supply to the drill through an isolating transformer.
- (2 marks)
- (g) 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)
- (h) Closed circuit means a continuous conducting circuit from, and back to, the source of electricity.
- (2 marks)
- (i) (i) The section with the lowest resistance.
- (1 mark)
- (ii) The section with the highest resistance.
- (1 mark)
- (j) So that the transformer protects the extension leads as well as the portable appliance.
- (2 marks)

Question 2

- (a)
- Some current is diverted to earth (1 mark)
 - This causes an imbalance between phase and neutral currents (1 mark)
 - Which is detected by the sensing coil (1 mark)
 - Which trips and disconnects the supply to the load (1 mark)

(b) RCD

- To ensure the tripping mechanism has not become stuck or "frozen"

or

- To ensure it works correctly

or

PRCD

- To ensure the tripping mechanism has not become stuck or "frozen"

or

- To ensure PRCD does not reset to the "on" position after loss of supply.

(1 mark)

- (c) It is the maximum fault current that a fuse or circuit breaker can safely interrupt.

(2 marks)

- (d)
- 45A is the current rating.
 - 415V is the maximum nominal circuit voltage of the circuit.
 - AC 46 is the category of duty (i.e. 46,000A prospective short-circuit current).

(3 marks)

Question 3

(a) (i) 1 ohm.

(1 mark)

- (ii)
- The protective earthing conductor (earth continuity conductor) will ensure that if a phase to framework fault occurs, sufficient current will flow to ensure the rapid operation of the circuit protective device.
 - Exposed metal remains at earth potential if there is insufficient current to operate the circuit protective device.

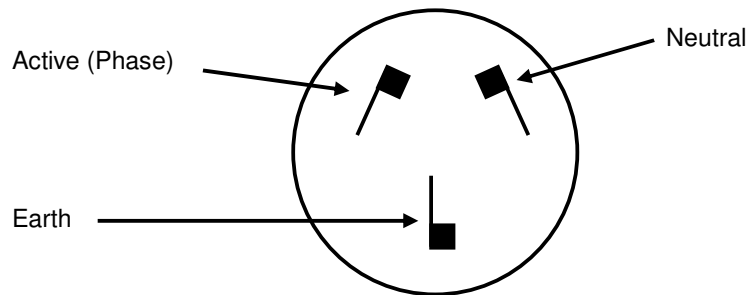
(2 marks)

(b) So that the earth pin:

- Is first to make contact when inserted,
- And the last to break contact when the plug is withdrawn,

(2 marks)

(c)



(3 marks)

(d) Any TWO of:

- Building site under construction.
- Outdoor area.
- Factory with concrete floor and steel supports.
- Bathroom or any damp indoor situation.

(2 marks)

Question 4

- (a) (i) • To ensure that the multimeter - even though indicating zero - is operating correctly. (1 mark)
- To ensure that the correct circuit has been isolated before it is worked on. (1 mark)
- (ii) • First - prove the meter is operating correctly on a known live circuit. (1 mark)
- Then - test that the isolated circuit shows no voltage present. (1 mark)
- Then - again prove the meter is operating correctly on a known live circuit. (1 mark)
- (b) (i) • 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)
- (ii) • Switch off the load on the particular fuse circuit where possible.
- Hold face well back and averted when withdrawing/replacing the carrier.
or
Wear safety glasses
- Withdraw, and replace, carrier with firm, fast action. (3 marks)

Question 5

- (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) = $\frac{\text{Minimum Fusing Current}}{\text{Current Rating}}$ (2 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)

- (d) To disconnect a large fault current safely. (1 mark)

Question 6

- (a) 1. Identify the fuse on the switchboard for the appliance. (1 mark)
2. Switch off the main switch and remove fuse carrier. (1 mark)
- or
- Remove load from circuit and remove fuse carrier (1 mark)
3. Attach Danger tag to fuse base. (1 mark)
4. Test for isolation at the supply side of the permanent connect unit using the prove-test-prove method. (2 marks)

Note: 3 and 4 can be interchanged.

(b) Any FIVE of:

- Replace storage water cylinder heater elements that have an electrical rating of not more than 230 volts and 15 amperes; and
- Replace storage water cylinder thermostats that have an electrical rating of not more than 230 volts and 15 amperes; and
- Disconnect from and reconnect to fixed wiring waste disposal units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring dishwashing units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring electronic water control units that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring water pressure devices that have an electrical rating of not more than 230 volts and 15 amperes:
- Disconnect from and reconnect to fixed wiring storage water heater cylinders that have an electrical rating of not more than 230 volts and 15 amperes:
- Remove and replace fusible links in relation to plumbing work.

(5 marks)
ER 49(6)

Question 7

- (a) AS/NZS 3760 (1 mark)
- (b) (i) (I) Low reading ohmmeter. (1 mark)
(II) 1 ohm maximum (1 mark)
- (ii) (I) Insulation resistance tester. (1 mark)
(II) 1 M Ω minimum (1 mark)
- (c) Any **FIVE** of – from AS/NZS 3760:2001:

- Check for obvious damage or defects in the accessories, connectors or plugs.
- Check that flexible cords are effectively anchored to equipment and plugs.
- Check for damage to flexible cords - the inner cores of flexible supply cords are not exposed or twisted;
- Check for damage to flexible cords the external sheaths are not cut, abraded, twisted, or damaged to such an extent that the insulation of the inner cores is visible; and (In) unprotected conductors or insulation tape are not in evidence.
- Check that any controls are in good working order i.e. they are secure, aligned and appropriately identified.
- Check that covers, guards and the like are secured in the manner intended by the manufacturer or supplier.
- Check that safety facilities and devices are in good working order.
- Check that ventilation inlets and exhausts are unobstructed.

AS/NZS 3760: 2.3.2
(5 marks)

Or

Any **FIVE** of – from AS/NZS 3760:2003:

- Check for obvious damage or defects in the accessories, connectors or plugs and for discolouration that may indicate exposure to heat, chemicals and moisture.
- Check that flexible cords are effectively anchored to equipment and plugs.
- Check for damage to flexible cords - the inner cores of flexible supply cords are not exposed or twisted;
- Check for damage to flexible cords - the external sheaths are not cut, abraded, twisted, or damaged to such an extent that the insulation of the inner cores is visible.
- Check for damage to flexible cords - unprotected conductors or banding insulation tape are not in evidence.
- Check that any operating controls are in good working order i.e. they are secure, aligned and appropriately identified.

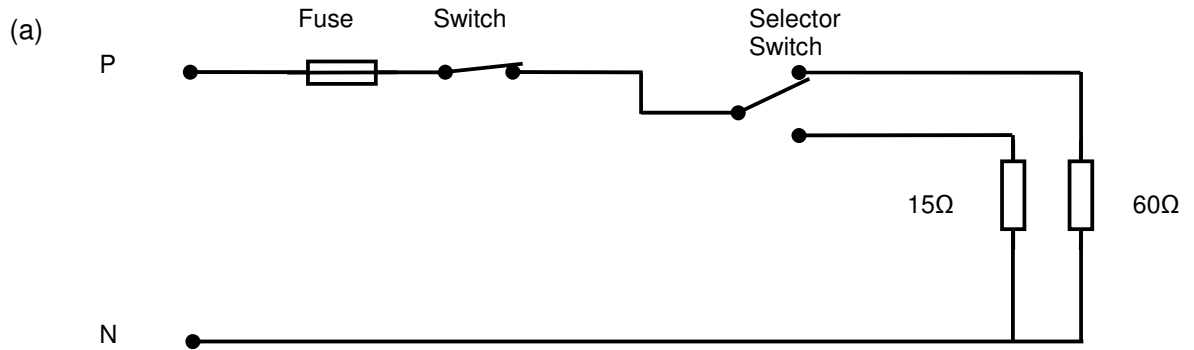
- Check that covers, guards and the like are secured in the manner intended by the manufacturer or supplier.
- Check that ventilation inlets and exhausts are unobstructed.
- The pins of insulated pin plugs should be inspected for damage to the insulation of the pins, and, if fitted, the shroud on cord extension sockets.

AS/NZS 3760: 2.3.2
(5 marks)

Question 8

- (a) (i)
 - The motor will operate normally (1 mark)
 - The motor circuitry could be live whilst switched off (1 mark)
- (ii) Any ONE of:
- The motor will operate normally (1/2 mark)
 - The protective earthing conductor is the wrong colour – potential hazard. (1/2 mark)
- (iii)
 - 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)
- (iv) Any ONE of:
- Earth continuity test
 - Polarity test (1 mark)
- (b) Any THREE 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. (3 marks)

Question 9



- The fuse is in the phase. (1 mark)
- The fuse protects the whole circuit. (1 mark)
- The switch is in the phase. (1 mark)
- The switch controls the whole circuit. (1 mark)
- The selector switch and resistors are connected so two different load settings can be achieved. (2 marks)

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

$= \frac{230}{60}$ (1/2 mark)

$= 3.83 \text{ A}$ (1 mark)

(c) $I = \frac{V}{R}$ (1/2 mark)

$= \frac{230}{15}$ (1/2 mark)

$= 15.33 \text{ A}$ (1 mark)