



Candidate Code No.	
For Board Use Only	
Result	Result
Date	Date
Int	Int

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

27 September 2008

PLUMBERS OR GASFITTERS

QUESTION AND ANSWER BOOKLET

Time Allowed two hours and 30 minutes

INSTRUCTIONS – READ CAREFULLY

You have 10 minutes to read this paper but do not start writing until you are told to do so by the supervisor.

Write your Candidate Code Number in the box provided above. Your name must NOT appear anywhere on this paper

The pass mark for this examination is 60 marks.

Plumbers must attempt all questions in Sections 1 and 2.

Gasfitters must attempt all questions in Sections 1 and 3.

Use a pen for written answers. **Do not** use a pencil or a red pen.

Drawing instruments and pencils may be used when diagrams are required. Marks are allocated on the basis of correctness.

Do not use correcting fluid or correcting tape.

Non-programmable calculators may be used.

It is recommended that the reference source for your answers be included in the space provided if a question can be answered from the Act, Regulations, Standard or Code. However, just stating a reference only will earn no marks.

For calculation questions all workings, including formulae, must be shown to gain full marks.

Warning – You could get 0 marks for any question, or part of a question, if you show anything hazardous or dangerous in your answer.

You will need to use some of the following documents in this examination:

- The Electricity Act 1992 reprinted at 19 August 2005.
- The Electricity Regulations 1997 reprinted at 5 September 2005.
- AS 60529 or AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, A and 3) or AS/NZS 3000:2007; NZS 3019 (Int):2002 or NZS 3019:2004; AS/NZS 3760:2001 or AS/NZS 3760:2003.

**PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM
(turn over)**

SECTION 1 – ALL CANDIDATES

Question 1

- (a) Refer to the Electricity Act and state **TWO** actions that may be taken by the Electrical Workers Registration Board against the holder of a Tradespersons Electrical Work Certificate who is found guilty of a disciplinary offence. (2 marks)

(1) _____

(2) _____

Ref:

- (b) Refer to the Electricity Regulations and briefly state what is meant by each of the following terms:

- (i) Insulated (1 mark)

Ref:

- (ii) Live (1 mark)

Ref:

(turn over)

Question 1 continued

- (c) A handheld electrical appliance used on a building or structure under construction must be used in conjunction with an appropriate safeguard. Refer to the Electricity Regulations 1997 and state **TWO** such safeguards.

(2 marks)

(1) _____

(2) _____

Ref:

- (d) If a Class I portable electrical 230V appliance with a phase to framework fault is being used outdoors, what type of protection device will rapidly disconnect the electricity supply.

(2 marks)

- (e) Repairs have been carried out on a fixed wired electrical appliance rated at 1500W, 230V. Calculate the current drawn by the appliance.

(2 marks)

(turn over)

Question 1 continued

- (f) An HRC fuse on a switchboard has blown because of an overload. You need to replace a fuse cartridge but it is not practical to turn off the main switch. State **TWO** precautions that should be taken while replacing the fuse cartridge.

(2 marks)

(1) _____

(2) _____

- (g) State **TWO** ways of identifying a double insulated appliance from the nameplate of the appliance.

(2 marks)

(1) _____

(2) _____

- (h) State **ONE** reason why the earth pin of a standard New Zealand 3 pin 10 amp plug is longer than the phase and neutral pins.

(2 marks)

- (i) State **TWO** factors that determine the severity of electric shock upon the human body.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 1 continued

(j) What is the minimum output voltage required from an insulation resistance tester when testing the insulation resistance of a Class I, 230V electric appliance:

(i) That has an MOV connected?

(1 mark)

(ii) That does not have an MOV connected?

(1 mark)

(turn over)

Question 2

- (a) Draw and label the circuit diagram of a 230V, single phase circuit, controlled by a double pole switch and protected by a fuse that supplies three resistors.

The first branch contains only resistor R_1

The second branch contains resistors R_2 and R_3 in series.

$$R_1 = 30\Omega$$

$$R_2 = 50\Omega,$$

$$R_3 = 40\Omega$$

Include an ammeter to measure the total circuit current and a voltmeter to measure the voltage across the resistors. The correct polarity must be shown.

(3 marks)

(turn over)

Question 2 continued

(b) Calculate the reading on the ammeter.

(5 marks)

(c) Calculate the total power used by the resistors.

(2 marks)

(turn over)

Question 3

A repaired Class I, 230V, plug-in appliance must be inspected and tested in accordance with AS/NZS 3760 before being returned to service.

- (a) Refer to AS/NZS 3760 and state **FOUR** visual checks (inspections) that must be carried out.

Note: **The visual checks (inspections) must relate to a Class I plug-in appliance.**

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 3 continued

(b) Refer to AS/NZS 3000 and complete the following in relation to the tests using test instruments:

- Note:**
1. A PAT tester is not to be used
 2. An earth leakage tester is not to be used
 2. The appliance does not contain MOV or EMI components

Test No.1

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 4

- (a) State **TWO** reasons why you should not complete a permanent isolation of a circuit by only removing the carrier of a fuse.

(2 marks)

(1) _____

(2) _____

- (b) State **THREE** reasons why covers must be in place and secured before returning a repaired electrical appliance to service.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 4 continued

(c) A fixed wired Class I electrical appliance is supplied from a surface mounted isolating switch via PVC cables enclosed in PVC flexible conduit.

(i) State **THREE** possible causes of exposed basic insulation in this situation.

(3 marks)

(1) _____

(2) _____

(3) _____

(ii) State **TWO** reasons why the PVC flexible conduit must be securely clamped.

(2 marks)

(1) _____

(2) _____

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

- (a) Electrical equipment designed for use in damp situations has an International Protection Classification (IP rating). This is often referred to as ingress protection.

An IP rating consists of the initials IP followed by two numbers. Refer to AS1939, AS 60529 or AS/NZS 3000 and answer the following:

- (i) State what is meant by an International Protection Classification (IP rating)

(2 marks)

Ref:

- (ii) Explain what the first number after the letters IP indicates.

(2 marks)

Ref:

- (iii) Explain what the second number after the letters IP indicates.

(2 marks)

Ref:

(turn over)

Question 5 continued

(b) Refer to AS1939 or AS 60529 or AS/NZS 3000:2007 and describe the level of protection offered by fittings rated at IP23.

(2 marks)

2 _____

3 _____

Ref:

(c) Electrical appliances are used in electrical installations. There are three damp situations relating to electrical appliances which are deemed not to be electrically safe. Refer to the Electricity Regulations and state **ONE** of those damp situations.

(2 marks)

Ref:

(turn over)

Question 6

(a) When selecting a replacement cartridge for an open circuit HRC fuse, it is necessary to consider its **Utilisation category (fusing factor)**.

(i) State what is meant by **Utilisation category (fusing factor)**.
(2 marks)

(ii) How does the Utilisation category (fusing factor) influence the fuse operation?
(2 marks)

(b) A circuit supplies a fixed wired electrical appliance rated at 3000W, 230V. The HRC fuse protecting the circuit has blown. Show by calculation, the rating of the HRC fuse cartridge that should be purchased to replace the blown one.

(3 marks)

(turn over)

Question 6 continued

- (c) State why is it important when selecting a fuse link to ensure that the correct "category of duty" is chosen.

(2 marks)

- (d) State the primary purpose of using an HRC fuse to protect a circuit.

(1 mark)

(turn over)

Question 7

- (a) A new flexible cord is to be fitted to a Class I single-phase electrical appliance. State the polarity and colours of the cord conductors

(3 marks)

- (b) The cores of a flexible cord are being terminated in an electrical appliance. Explain why it is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

- (c) State **TWO** methods of minimising the possibility of exposing basic insulation when connecting a flexible cord to an appliance.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 7 continued

- (d) When a three core flexible cord is fitted to an appliance, it is recommended that the protective earthing conductor should be left longer than the active (phase) and neutral conductors.

State the main reason why this is recommended.

(2 marks)

- (e) Explain the meaning of the term "current rating" in relation to flexible cords.

(1 mark)

(turn over)

Question 8 continued

- (c) State **THREE** other checks or electrical tests that should be carried out to ensure that the electrical appliance in (a) above, is electrically safe.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 9

- (a) State the main reason why it is recommended that a portable isolating transformer be placed as near as practical to the socket outlet when using a handheld electrical appliance and extension lead outdoors.

(2 marks)

- (b) Isolating transformers are often used to provide protection in outdoor or damp situations.

- (i) Briefly explain how an isolating transformer protects the user of a Class I electrical appliance from receiving an electric shock, when a phase conductor in the appliance contacts the frame of the appliance.

(1 mark)

- (ii) State **ONE** reason why two Class I electrical appliances should not be used from the same isolating transformer at the same time.

(2 marks)

(turn over)

Question 9 continued

(c) The prove-test-prove method of testing is used for checking that isolation has been achieved.

(i) What are the **TWO** conditions that the prove-test-prove method is intended to verify?

(2 marks)

(1) _____

(2) _____

(ii) Explain how prove-test-prove method of testing is carried out.

(3 marks)

Question 10 continued

- (ii) After completing the prove-test-prove test in (a)(i) above you find that the gas-fired boiler is still live. Describe the procedure you would follow to prove that the appliance is isolated.

(4 marks)

- (b) Describe what you would do to leave the site safe.

(2 marks)

(turn over)

Question 11

(a) When selecting a replacement cartridge for an open circuit HRC fuse, it is necessary to consider its **Utilisation category (fusing factor)**.

(i) State what is meant by **Utilisation category (fusing factor)**.
(2 marks)

(ii) How does the Utilisation category (fusing factor) influence the fuse operation?
(2 marks)

(b) A circuit supplies a fixed wired electrical appliance rated at 3000W, 230V. The HRC fuse protecting the circuit has blown. Show by calculation, the rating of the HRC fuse cartridge that should be purchased to replace the blown one.

(3 marks)

(turn over)

Question 11 continued

- (c) State why is it important when selecting a fuse link to ensure that the correct category of duty is chosen.

(2 marks)

- (d) State the primary purpose of using an HRC fuse to protect a circuit.

(1 mark)

(turn over)

Question 12

- (a) A new flexible cord is to be fitted to a Class I single-phase electrical appliance. State the polarity and colours of the cord conductors

(3 marks)

- (b) The cores of a flexible cord are being terminated in an electrical appliance. Explain why it is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

- (c) State **TWO** methods of minimising the possibility of exposing basic insulation when connecting a flexible cord to an appliance.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 12 continued

- (d) When a three core flexible cord is fitted to an appliance, it is recommended that the protective earthing conductor should be left longer than the active (phase) and neutral conductors.

State the main reason why this is recommended.

(2 marks)

- (e) Explain the meaning of the term "current rating" in relation to flexible cords.

(1 mark)

(turn over)

Question 13 continued

- (c) State **THREE** other checks or electrical tests that should be carried out to ensure that the electrical appliance in (a) above, is electrically safe.
(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 14

- (a) State the main reason why it is recommended that a portable isolating transformer be placed as near as practical to the socket outlet when using a handheld electrical appliance and extension lead outdoors.

(2 marks)

- (b) Isolating transformers are often used to provide protection in outdoor or damp situations.

- (i) Briefly explain how an isolating transformer protects the user of a Class I electrical appliance from receiving an electric shock, when a phase conductor in the appliance contacts the frame of the appliance.

(1 mark)

- (ii) State **ONE** reason why two Class I electrical appliances should not be used from the same isolating transformer at the same time.

(2 marks)

(turn over)

Question 14 continued

(c) The prove-test-prove method of testing is used for checking that isolation has been achieved.

(i) What are the **TWO** conditions that the prove-test-prove method is intended to verify?

(2 marks)

(1) _____

(2) _____

(ii) Explain how prove-test-prove method of testing is carried out.

(3 marks)

For Candidate's Use

In the box, write the number of **EXTRA** sheets you have used. Write **NIL** if you have not used any

For Examiner's Use Only

Questions Answered	Marks	
<u>Section 1</u>		
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TOTAL SECTIONS 1 & 3		