ELECTRICAL WORKERS REGISTRATION BOARD
Safety • Competency

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

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

29 September 2007

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 may need to use 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); 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) Briefly explain the conditions that make a pressure switch function.

(2 marks)

_____

_____

(b) An HRC fuse, that protects a circuit, blows every time the correct fuse link is inserted. State **TWO** undesirable effects that may occur if the fuse link is replaced with one of a higher current rating.

(2 marks)

(1) _____

(2) _____

(c) Briefly explain how an isolating transformer protects the user of a Class I electrical appliance from receiving an electric shock, when a phase to earth fault occurs.

(2 marks)

_____

_____

_____

(d) State the term used for:

(i) The electrical output of an appliance.

(1 mark)

_____

(ii) The flow of electricity.

(1 mark)

_____

(turn over)

Question 1 continued

(e) State **TWO** ways of identifying double insulated appliances.

(2 marks)

(1) _____

(2) _____

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

(2 marks)

_____

_____

_____

(g) Name **TWO** types of **electrical safeguards** which could be used with a Class I electrical appliance to provide personal safety when operating outdoors.

(2 marks)

(1) _____

(2) _____

(h) An isolating switch for a single phase, fixed wired appliance has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **TWO** reasons why the terminals may still be live.

(2 marks)

(1) _____

_____

(2) _____

_____

(turn over)

Question 1 continued

(i) Briefly explain the conditions that make a thermostat function.

(2 marks)

_____

_____

(j) State **TWO** factors which affect the severity of electric shock upon the human body.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 2

(a) It is necessary to have a reliable protective earthing conductor on a Class I portable electrical appliance.

(i) State the maximum resistance value for the protective earthing conductor as required by AS/NZS 3760.

(1 mark)

_____

(ii) Describe the **TWO** ways that the protective earthing conductor contributes to the electrical safety of the appliance.

(2 marks)

(1) _____

_____

_____

(2) _____

_____

_____

(b) Explain why the earth pin of a standard New Zealand 3 pin 10 amp plug is longer than the phase and neutral pins.

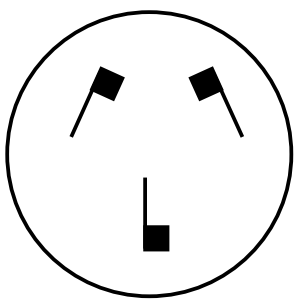
(2 marks)

_____

_____

(c) The figure below represents the **<u>rear</u>** of an appliance plug after the cover has been removed. Indicate on the figure the active (phase), neutral and earth terminals.

(3 marks)



(turn over)

Question 2 continued

(d) Refer to the Electricity Regulations and state what is meant by the term **Standard Low Voltage** for a single phase MEN system.

(2 marks)

_____

_____

_____

(turn over)

Question 3

(a) Briefly explain how a Residual Current Device (RCD) disconnects the supply from an electrical appliance when an earth leakage fault occurs.

(4 marks)

(b) Why should an RCD be operationally tested?

(1 mark)

(turn over)

Question 3 continued

(c) Briefly explain how a RCD (Residual Current Device) protects a user from a severe electric shock when using a faulty appliance in an outdoor situation.
(4 marks)

(d) Refer to NZS 3019 and state the maximum permissible residual tripping current (in mA) of an RCD when it is used to provide personal protection?
(1 mark)

(turn over)

Question 4

(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.

R_1 = 100Ω – this resistor is in series with the supply
R_2 = 50, R_3 = 75Ω – these resistors are in parallel with the supply

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 4 continued

(b) Calculate the reading on the ammeter.

(5 marks)

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

(2 marks)

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

(a) The cores of a flexible cord are being terminated in an electrical appliance:

(i) How much of basic insulation should be removed from the cores?

(1 mark)

_____

_____

(ii) State **TWO** reasons why this is important.

(2 marks)

(1) _____

_____

(2) _____

_____

(b) Replacement flexible cords are being fitted to a single phase Class I electrical appliance and a Class II electrical appliance.

(7 marks)

(i) For the Class I appliance:

(A) What is the minimum number of cores required in the flexible cord?

_____

(B) What colour coding is required for the cores of the flexible cord? State the polarity for each core.

_____

_____

_____

(turn over)

Question 5 continued

(ii) For the Class II appliance:

(A) What is the minimum number of cores required in the flexible cord?

_____

(B) What colour coding is required for the cores of the flexible cord? State the polarity for each core.

_____

_____

_____

(turn over)

Question 6

Read the entire of the question before attempting to answer parts (a), (b), (c) and (d).

A 230V fixed wired appliance is connected via a flexible cord to a permanent connection unit and is supplied from a fuse on a three-phase switchboard.

You have been requested by the Supervisor to disconnect the appliance from the supply and remove it for major servicing work. The flexible cord is to remain with the appliance.

You do not need to contact the Supervisor before starting the work or after finishing.

Warning: If any part of your answer is dangerous or hazardous, you will get no marks for this question.

(a) Describe how you would safely isolate the appliance.

(5 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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_____

(turn over)

Question 6 continued

(b) Describe the action you would take if you find that, when testing to ensure the appliance is safely isolated, the circuit is still live.

(3 marks)

_____

_____

_____

_____

_____

_____

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

(2 marks)

_____

_____

_____

_____

(turn over)

Question 7

(a) Before a Class I dishwasher is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

(i) State the type of inspection required and how it should be carried out.
(2 marks)

_____

_____

Ref: .....

(ii) Complete the following in relation to the tests using test instruments:

Test No.1

(1) Type of test
(1 mark)

_____

(2) Instrument used
(1 mark)

_____

(3) Acceptable test result – state whether the result is a minimum or maximum value
(1 mark)

_____

Ref: .....

(turn over)

Question 7 continued

Test No.2

(1) Type of test

(1 mark)

_____

(2) Instrument used

(1 mark)

_____

(3) Acceptable test result – state whether the result is a minimum or maximum value

(1 mark)

_____

Ref: .....

(b) Refer to AS/NZS 3760 and state the **TWO** actions that must be taken if one of the tests stated in (a)(ii) is non-compliant.

(2 marks)

(1) _____

_____

(2) _____

_____

Ref: .....

(turn over)

Question 8

A 230V, single phase, plug-in dishwasher has recently been serviced in a workshop.

Describe the checks you will carry out using test instruments to ensure the appliance is safe to connect to the supply. Your answer must:

- Clearly state which test is to be carried out first and why.
- State the test instruments used.
- Detail voltage applied during each test – where applicable.
- Detail acceptable test result for each test.
- State whether each test result is a maximum or minimum value.

(10 marks)

(turn over)

Question 9

(a) Electrical equipment designed for use in damp situations has an IP rating. An **IP rating** consists of the initials IP followed by two numbers. Refer to AS 60529, AS1939 or AS/NZS 3000 and answer the following:

(i) What is an 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 indicates.

(2 marks)

_____

_____

Ref: ……

(b) An electrical appliance or fitting is labelled "**IP 34**". Refer to AS1939 or AS 60529 and state:

(i) The level of protection is specified by the number 3

(1 mark)

_____

_____

_____

(turn over)

Question 9 continued

(ii) The level of protection is specified by the number 4.

(1 mark)

_____

_____

_____

Ref: ……

(c) In accordance with AS/NZS 3000 what is a **damp situation?**

(2 marks)

_____

_____

_____

Ref: ……

Section 3 – Gasfitters Only

Question 10

(a) The cores of a flexible cord are being terminated in an electrical appliance:

(i) How much of basic insulation should be removed from the cores?

(1 mark)

_____

_____

(ii) State **TWO** reasons why this is important.

(2 marks)

(1) _____

_____

(2) _____

_____

(b) Replacement flexible cords are being fitted to a single phase Class I electrical appliance and a Class II electrical appliance.

(7 marks)

(i) For the Class I appliance:

(A) What is the minimum number of cores required in the flexible cord?

_____

(B) What colour coding is required for the cores of the flexible cord? State the polarity for each core.

_____

_____

_____

(turn over)

Question 10 continued

(ii) For the Class II appliance:

(A) What is the minimum number of cores required in the flexible cord?

_____

(B) What colour coding is required for the cores of the flexible cord? State the polarity for each core.

_____

_____

_____

(turn over)

Question 11

(a) Before a Class I dishwasher is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

(i) State the type of inspection required and how it should be carried out.
(2 marks)

_____

_____

Ref: .....

(ii) Complete the following in relation to the tests using test instruments:

Test No.1

(1) Type of test
(1 mark)

_____

(2) Instrument used
(1 mark)

_____

(3) Acceptable test result – state whether the result is a minimum or maximum value
(1 mark)

_____

Ref: .....

(turn over)

Question 11 continued

Test No.2

(1) Type of test

(1 mark)

_____

(2) Instrument used

(1 mark)

_____

(3) Acceptable test result – state whether the result is a minimum or maximum value

(1 mark)

_____

Ref: .....

(b) Refer to AS/NZS 3760 and state the **TWO** actions that must be taken if one of the tests stated in (a)(ii) is non-compliant.

(2 marks)

(1) _____

_____

(2) _____

_____

Ref: .....

(turn over)

Question 12

A 230V, single phase, plug-in dishwasher has recently been serviced in a workshop.

Describe the checks you will carry out using test instruments to ensure the appliance is safe to connect to the supply. Your answer must:

- Clearly state which test is to be carried out first and why.
- State the test instruments used.
- Detail voltage applied during each test – where applicable.
- Detail acceptable test result for each test.
- State whether each test result is a maximum or minimum value.

(10 marks)

(turn over)

Question 13

(a) (i) Explain the purpose of the Safety Tag system.

(2 marks)

_____

_____

_____

_____

(ii) Explain how a "Danger Tag" system operates.

(3 marks)

_____

_____

_____

_____

_____

_____

(turn over)

Question 13 continued

(c) When using a test instrument to check the isolation of a circuit, the **prove-test-prove** safety rule should be observed.

(i) List **TWO** checks that are done by this method.

(2 marks)

(1) _____

_____

(2) _____

_____

(ii) How is the rule applied?

(3 marks)

_____

_____

_____

_____

_____

_____

(turn over)

Question 14

(a) An isolating switch supplying a 230V a.c. single phase induction motor in a gas boiler is to be replaced. In terms of the operation of the circuit and safety to the user, what would be the result if during reconnection the following conductors were accidentally interchanged at the supply terminals of the isolating switch:

(i) The phase and neutral

(2 marks)

_____

_____

_____

_____

(ii) The neutral and earth

(1 mark)

_____

_____

(iii) The phase and earth

(3 marks)

_____

_____

_____

_____

_____

_____

_____

_____

(turn over)

Question 14 continued

(iv) State **TWO** tests that would detect the interchange of the phase and earth conductors?

(1 mark)

(1) _____

(2) _____

(b) An adjacent isolating switch for a single phase, fixed wired appliance has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **THREE** reasons why the terminals may still be live.

(3 marks)

(1) _____

_____

(2) _____

_____

(3) _____

_____

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**	
Section 1		
1		
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Total Section 1		
Section 2		
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Section 3		
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Total section 3		
TOTAL SECTIONS 1 & 2		
OR		
TOTAL SECTIONS 1 & 3		