



Candidate Code No.	
For Board Use Only	
Result	Result
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**ELECTRICAL WORKERS REGISTRATION BOARD
TRADESPERSON ELECTRICAL WORK CERTIFICATE
EXAMINATION**

24 June 2006

**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. Show all working to TWO decimal places

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 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) Calculate the resistance of an electrical appliance with a rating of 2300 watts when it is supplied at 230V.

(2 marks)

- (b) State **ONE** primary characteristic that determines the maximum current a flexible cord can conduct safely without overheating.

(2 marks)

- (c) What is the minimum output voltage required from an insulation resistance tester for use on 230V electric appliances?

(2 marks)

- (d) State **ONE** typical application for each of the following electrical control devices:

- (i) A solenoid valve.

(1 mark)

- (ii) A pressure switch.

(1 mark)

(turn over)

Question 1 continued

- (e) When test instruments are being used to measure voltage and current values of 230V electrical appliances, it is important to follow set procedures to ensure personal safety. Briefly describe **TWO** important precautions which will promote personal safety. (2 marks)

(1) _____

(2) _____

- (f) An electric drill is being used in an earthed situation. List **TWO** methods of ensuring protection from the dangers of electric shock. (2 marks)

(1) _____

(2) _____

- (g) State **TWO** ways of identifying a double insulated appliance. (2 marks)

(1) _____

(2) _____

- (h) Explain what is meant by the term "**Closed circuit**". (2 marks)

(turn over)

Question 1 continued

(i) In a circuit where a 30Ω resistor and a 20Ω resistor are connected in parallel:

(i) Which branch will have the highest heating effect?

(1 mark)

(ii) Which branch will have the lowest current flow?

(1 mark)

(j) Explain the reason why it is recommended that a portable isolating transformer be placed as near as practical to the point of supply.

(2 marks)

(turn over)

Question 2

- (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)

- (c) State the meaning of the term **breaking capacity** for fuses or circuit breakers.

(2 marks)

(turn over)

Question 2 continued

(d) Each HRC cartridge fuse carries a label bearing information about its manufacture and operating characteristics. A new fuse carries the following information:

- 45 Amps.
- 415 Volt.
- AC 46.

Briefly describe the meaning of each of these items of information.

(3 marks)

(turn over)

Question 3

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

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

(1 mark)

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

(2 marks)

(1) _____

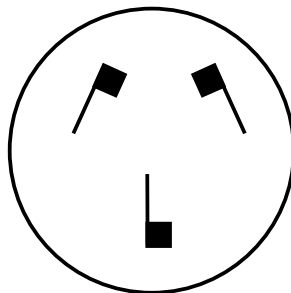
(2) _____

(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 **rear** 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 3 continued

(d) List **TWO** examples of what could be an **earthed situation**.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 4

(a) When using a multimeter 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 4 continued

(b) A new fuse needs to be inserted into a fuse carrier to replace a blown fuse on a switchboard.

(i) Briefly explain the **TWO** main safety reasons why the main switch should be turned off before removing the fuse carrier from, or replacing it into, the fuse base.

(2 marks)

(1) _____

(2) _____

(ii) When it is not practical to turn off the switch that supplies the fuses, what precautions should be taken before and during the replacement of a fuse carrier in its fuse base?

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

- (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 would be purchased to replace the blown one.

(3 marks)

(turn over)

Question 5 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 6

- (a) 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.

Describe how you would safely isolate the appliance.

(5 marks)

- (1) _____

- (2) _____

- (3) _____

- (4) _____

(turn over)

Question 6 continued

- (b) Refer to the Electricity Regulations and state **FIVE** categories of prescribed electrical work that can be carried out by a plumber who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Ref:

(turn over)

Question 7

(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 AS1939 or AS/NZS 3000 and answer the following:

(i) What do the letters "IP" stand for?

(2 marks)

Ref:

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

(2 marks)

Ref:

(iii) What does the second number after the letters indicates.

(2 marks)

Ref:

(turn over)

Question 7 continued

(b) If an electrical appliance or fitting is labelled “**IP 34**”.

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

(1 mark)

Ref:

(ii) What 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:

(turn over)

Question 8

- (a) Which Standard contains the tests for electrical appliances after they have been repaired?

(1 mark)

- (b) The Standard required in (a) above, details protective earthing conductor tests and insulation resistance tests. Refer to that Standard and state:

- (i) For the protective earthing conductor test:

- (I) The type of instrument required.

(1 mark)

- (II) The minimum or maximum value of the test result.

(1 mark)

- (ii) For the insulation resistance test:

- (I) The type of instrument required.

(1 mark)

- (II) The minimum or maximum value of the test result.

(1 mark)

(turn over)

Question 8 continued

(c) Refer to the Standard you have stated in (a) above and list **FIVE** visual checks on an electrical appliance that must be made **after** it has been repaired and **before** it is returned to service.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Ref:

(turn over)

Question 9

(a) A protective earthing conductor test is being carried out on the exposed metal parts of an electrical appliance with a multimeter. State:

(i) Why it is necessary to select the appropriate ohms range?

(1 mark)

(ii) Why it is necessary to first touch the meter probes together?

(2 marks)

(iii) What may occur if the incorrect range is selected on the multimeter?

(2 marks)

(turn over)

Question 9 continued

- (b) Explain how a protective earthing conductor (earth continuity) test should be carried out on a 230V plug-in Class I electrical appliance. The answer must include the type of meter used and the maximum or minimum acceptable values.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Section 3 – Gasfitters Only

Question 10

- (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)

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

(1 mark)

(1) _____

(2) _____

(turn over)

Question 10 continued

- (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) _____

(turn over)

Question 11

(a) Draw and label a circuit diagram using all of the following electrical components connected to a 230V a.c. supply.

- Two load resistors, one of 15 ohms and the other of 60 ohms.
- A two-position selector switch to connect the supply to either of the load resistors.
- A fuse that protects the whole circuit.
- A single-pole switch that controls the circuit.

(6 marks)

(turn over)

Question 11 continued

(b) Show by calculation the minimum current drawn by the above circuit.

(2 marks)

(c) Show by calculation the maximum current drawn by the above circuit.

(2 marks)

(turn over)

Question 12

(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 would be purchased to replace the blown one.

(3 marks)

(turn over)

Question 12 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 13

- (a) Which Standard contains the tests for electrical appliances after they have been repaired?

(1 mark)

- (b) The Standard required in (a) above, details protective earthing conductor tests and insulation resistance tests. Refer to that Standard and state:

- (i) For the protective earthing conductor test:

- (I) The type of instrument required.

(1 mark)

- (II) The minimum or maximum value of the test result.

(1 mark)

- (ii) For the insulation resistance test:

- (I) The type of instrument required.

(1 mark)

- (II) The minimum or maximum value of the test result.

(1 mark)

(turn over)

Question 13 continued

(c) Refer to the Standard you have stated in (a) above and list **FIVE** visual checks on an electrical appliance that must be made **after** it has been repaired and **before** it is returned to service.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Ref:

(turn over)

Question 14

- (a) Explain how an insulation resistance test should be carried out on a 230V gas appliance. The answer must include the type of meter used and the maximum or minimum acceptable values.

(4 marks)

- (b) State **ONE** reason for carrying out an insulation resistance test on an electrical appliance before it is returned to service.

(1 mark)

(turn over)

Question 14 continued

- (c) Refer to the Electricity Regulations and state the prescribed electrical work that can be carried out by a gasfitter who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(3 marks)

(1) _____

(2) _____

(3) _____

Ref:

- (d) A gasfitter who holds a Tradespersons Electrical Work Certificate must complete refresher courses at intervals not exceeding 24 months. Refer to the Electricity Regulations and state **TWO** of the subject matter that must be included in a refresher course.

(2 marks)

(1) _____

(2) _____

Ref:

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 & 2		
OR		
TOTAL SECTIONS 1 & 3		