



Candidate Code No.	
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Result	Result
Date	Date
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TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

27 June 2009

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 3019:2004 **or** AS/NZS 3019:2007; AS/NZS 3760:2003 and Amendment 1.

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

SECTION 1 – ALL CANDIDATES

Question 1

- (a) State the permitted insulation resistance between a conductor and metal frame on a Class I electrical appliance. State whether this resistance is a minimum or maximum value

(2 marks)

- (b) The Electricity Regulations state that four subjects must be covered in refresher courses for the holders of a Tradespersons Electrical Work Certificate. Two of those subjects are CPR and basic first aid. Refer to the Electricity Regulations and state the other **TWO** subjects

(2 marks)

(1) _____

(2) _____

Ref:

- (c) Calculate the current that will be drawn by an electrical appliance rated at 1.2kW, 230V.

(2 marks)

(turn over)

Question 1 continued

- (d) When an HRC fuse cartridge is replaced, the replacement cartridge must have four characteristics similar to the original. Two of those characteristics are "voltage rating and "current rating". State the other **TWO** characteristics.

(2 marks)

(1) _____

(2) _____

- (e) State **TWO** characteristics an insulating material must possess to be suitable for use as insulation in a flexible cord.

(2 marks)

(1) _____

(2) _____

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

(2 marks)

- (g) Work is being carried out on a 230V plug-in electrical appliance. The only instrument available is an ohmmeter which gives a reading of 32 ohms when connected to the appliance's flexible cord plug.

Calculate the power (in watts) the appliance will consume.

(2 marks)

(turn over)

Question 1 continued

(h) Explain what is meant by the terms:

(i) **Closed circuit.**

(1 mark)

(ii) **Open circuit.**

(1 mark)

(i) State **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) _____

(j) State **TWO** reasons why it is important to thread the fuse wire from terminal to terminal through the **tortuous path** in the fuse carrier when reloading a rewirable fuse.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 2

- (a) A Residual Current Device (RCD) - either a portable type or permanently connected type - is live even if no load is connected to the circuit in which it is installed.

State the **main** reason why the Residual Current Device (RCD) does not trip, even though it is live.

(1 mark)

- (b) Briefly explain how a Residual Current Device (RCD) detects an earth fault and disconnects the supply from a faulty Class I electrical appliance.

(4 marks)

- (c) Why should an RCD be operationally tested?

(1 mark)

(turn over)

Question 2 continued

(d) Refer to NZS 3019 and state:

(i) The maximum time in which an RCD used for personal protection must operate at its rated residual current.

(1 mark)

Ref:

(ii) The maximum time in which an RCD used for personal protection must operate at five times its rated residual current.

(1 mark)

Ref:

(e) Briefly explain why a Portable Residual Current Device (PRCD) is "voltage dependent". That is, if the electricity supply to the device fails, the device trips.

(2 marks)

(turn over)

Question 3

- (a) A new flexible cord is to be fitted to a Class I single-phase electrical appliance. State the polarity and **ONE** set of 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 3 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 4

- (a) Draw and label the circuit diagram of a 230V, single phase, Class II electrical appliance that incorporates three resistors (R_1 , R_2 , R_3) connected in parallel. The appliance is protected by a fuse and controlled by a single-pole switch

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

(4 marks)

(turn over)

Question 4 continued

(b) The combined resistance of the parallel resistances is 50 ohms.

(i) Calculate the reading on the ammeter?

(2 marks)

(ii) Calculate the total power consumed used by the resistors.

(2 marks)

(iii) What would be the reading on the voltmeter if one of the resistors became open circuited?

(1 mark)

(iv) Single-phase electrical appliances sold in New Zealand are dual-voltage rated, that is rated for 230V or 240V. Would the power consumed increase or decrease if this appliance was supplied at 240V.

(1 mark)

(turn over)

Question 5 continued

- (ii) After completing the prove-test-prove test in (a)(i) above you find that the dishwasher is still live. Describe the procedure you would take to complete the isolation procedure before attempting to disconnect the dishwasher.

(2 marks)

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

(2 marks)

- (c) State **TWO** tests using test instruments that should be carried out on the dishwasher before it is returned to service

(2 marks)

- (1) _____
- (2) _____

(turn over)

Question 6

- (a) Electrical equipment designed for use in damp situations have 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.

(1 mark)

Ref:

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

(1 mark)

Ref:

(turn over)

Question 6 continued

(b) Refer to AS/NZS 3000 and state what is meant by the term "damp situation".

(1 mark)

Ref:

(c) 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 Class I, 230V, single phase, electrical appliance that has two control switches, has recently been serviced in a workshop. Some sections of its electronic control circuitry have been repaired and/or replaced, and are not accessible for disconnection. There are no MOV or EMI components fitted to the appliance

- (a) Before returning the appliance to service, an insulation resistance test is required to be carried out. Describe the procedure that should be followed to carry this test, the test instrument, the test voltage used and any minimum or maximum test values that may apply.

(5 marks)

- (b) Briefly explain the reason for carrying out an insulation resistance test.

(2 marks)

(turn over)

Question 7 continued

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

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 8

The Electricity Regulations require that a plug-in electrical appliance that has been repaired be checked 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 electrical appliance.**

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 8 continued

- (b) Refer to AS/NZS 3760 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 9

- (a) A single-phase fixed-wired electrical appliance is supplied from a circuit protected by an HRC fuse. When testing for isolation, it is found that there are live conductors at the terminals of the appliance after an isolating switch has been turned to the off position. State **TWO** circumstances that may cause such a situation to occur.

- Note:
1. The circuit wiring installation is not damaged
 2. The isolating switch is not damaged
 3. There is no capacitor in the circuit.

(2 marks)

(1) _____

(2) _____

- (b) A Class I, single phase plug-in electrical appliance has been repaired. There is a single pole control switch on the appliance and the repairer has mistakenly connected the neutral through this switch.

- (i) State the undesirable effect the switching of the neutral will have on the appliance.

(1 mark)

- (ii) Describe **TWO** situations (other than connecting the neutral to the switch as stated above) where an error can cause the neutral to be switched.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 9 continued

- (c) State **TWO** reasons why permanently isolating a circuit by only removing the carrier of a fuse it is not recommended.

(2 marks)

(1) _____

(2) _____

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

(3 marks)

(1) _____

(2) _____

(3) _____

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 boiler is isolated.

(2 marks)

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

(2 marks)

- (c) State **TWO** tests using test instruments that should be carried out on the boiler before it is returned to service

(2 marks)

- (1) _____
- (2) _____

(turn over)

Question 11

(a) 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)

Prove _____

Test _____

Prove _____

(turn over)

Question 11 continued

(b) State **TWO** main pieces of information that should be on a danger tag
(2 marks)

(1) _____

(2) _____

(c) Refer to the Electricity Regulations and state the **THREE** categories of 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:

(turn over)

Question 12

A Class I, 230V, single phase, electrical appliance that has two control switches, has recently been serviced in a workshop. Some sections of its electronic control circuitry have been repaired and/or replaced, and are not accessible for disconnection. There are no MOV or EMI components fitted to the appliance

- (a) Before returning the appliance to service, an insulation resistance test is required to be carried out. Describe the procedure that should be followed to carry this test, the test instrument, the test voltage used and any minimum or maximum test values that may apply.

(5 marks)

- (b) Briefly explain the reason for carrying out an insulation resistance test.

(2 marks)

(turn over)

Question 12 continued

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

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 13

The Electricity Regulations require that a plug-in electrical appliance that has been repaired be checked 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 electrical appliance.**

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 13 continued

- (b) Refer to AS/NZS 3760 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 14

- (a) A single-phase fixed-wired electrical appliance is supplied from a circuit protected by an HRC fuse. When testing for isolation, it is found that there are live conductors at the terminals of the appliance after an isolating switch has been turned to the off position. State **TWO** circumstances that may cause such a situation to occur.

- Note:
1. The circuit wiring installation is not damaged
 2. The isolating switch is not damaged
 3. There is no capacitor in the circuit.

(2 marks)

(1) _____

(2) _____

- (b) A Class I, single phase plug-in electrical appliance has been repaired. There is a single pole control switch on the appliance and the repairer has mistakenly connected the neutral through this switch.

- (i) State the undesirable effect the switching of the neutral will have on the appliance.

(1 mark)

- (ii) Describe **TWO** situations (other than connecting the neutral to the switch as stated above) where an error can cause the neutral to be switched.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 14 continued

- (c) State **TWO** reasons why permanently isolating a circuit by only removing the carrier of a fuse it is not recommended.

(2 marks)

(1) _____

(2) _____

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

(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	
<u>Section 1</u>		
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