



<b>Candidate Code No.</b>	
<b>For Board Use Only</b>	
Result	Result
Date	Date
Int	Int

**TRADESPERSON ELECTRICAL WORK CERTIFICATE  
EXAMINATION  
30 June 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. Show all working to THREE significant numbers**

**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

Each part of this question is worth 2 marks.

(a) In a circuit where a  $30\Omega$  resistor and a  $20\Omega$  resistor are connected in parallel:

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

(1 mark)

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

(1 mark)

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(b) A Class I electrical appliance is controlled by a single-pole switch. State why safety could be affected if the switch was placed in the neutral conductor.

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

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## Question 1 continued

- (d) State **ONE** method of minimising the possibility of exposing basic insulation when connecting a flexible cord to an appliance.

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- (e) Briefly explain the purpose of a pressure switch.

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- (f) An electrical appliance has been repaired. The repair included the replacement of the flexible cord to the appliance. When the appliance is operated, the cord overheats. State **TWO** reasons why this could occur.

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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- (g) State the main characteristic that determines the maximum current a flexible cord can conduct safely.

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**(turn over)**

## Question 1 continued

(h) Briefly explain the purpose of a thermostat.

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(i) Draw circuit symbols illustrating:

(i) A single pole switch in the **on** position.

(1 mark)

(ii) A double pole switch in the **off** position.

(1 mark)

(j) Repairs have been carried out on a fixed wired electrical appliance rated at 2000W, 230V. Calculate the current drawn by the appliance.

**(turn over)**

## Question 2

- (a) Rewirable fuses and HRC fuses may be found on switchboards. What is the main function of a fuse?

(2 marks)

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- (b) State **THREE** technical advantages which HRC fuses have over rewirable fuses.

(3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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

(2 marks)

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**(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)

45 Amps \_\_\_\_\_

\_\_\_\_\_

415 Volt \_\_\_\_\_

\_\_\_\_\_

AC 46 \_\_\_\_\_

\_\_\_\_\_

**(turn over)**

### Question 3

- (a) 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?

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

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- (ii) For the Class II appliance:

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

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

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**(turn over)**

### Question 3 continued

- (b) A flexible cord is to be fitted to a single phase electrical appliance. List **THREE** considerations which may influence the selection of the cord. (3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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**(turn over)**

## Question 4

(a) In the space below, sketch a circuit diagram using all of the following electrical components connected to a 230V a.c. supply. The polarity must be shown.

- Two load resistors, one of 27 ohms and the other of 54 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.

(5 marks)

(b) Calculate the maximum power dissipated in the circuit

(2 marks)

**(turn over)**

### **Question 4 continued**

- (c) Find by calculation the most suitable rating for the fuse in above circuit.  
(3 marks)

**(turn over)**

## SECTION 2 - PLUMBERS ONLY

### Question 5

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

(4 marks)

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

(1 mark)

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- (c) Briefly explain how a residual current device will protect a user from a severe electric shock when using a faulty appliance in an outdoor situation.

(4 marks)

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### **Question 5 continued**

- (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)

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**(turn over)**

## Question 6

(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 60529 or AS/NZS 3000 and answer the following:

(i) What is an IP rating?

(2 marks)

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Ref: .....

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

(2 marks)

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Ref: .....

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

(2 marks)

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Ref: .....

(b) An electrical is labelled "**IP 23**". Refer to AS1939 or AS 60529 and state:

(i) The level of protection is specified by the number 2?

(1 mark)

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Ref: .....

**(turn over)**

## Question 6 continued

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

(1 mark)

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Ref: .....

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

(2 marks)

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Ref: .....

**(turn over)**



## Question 7 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.

(2 marks)

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

(2 marks)

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- (d) 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 8

A plumber is requested to replace an existing 1500W, 230V element in a storage water heater with a new 3000W, 230V element to reduce the recovery time. The permanent connection unit supplying the storage water heater is rated at 230V, 10A.

- (a) Determine, by calculation, if the permanent connection unit has an adequate current rating to supply the 3000 watt element.

(3 marks)

- (b) What other considerations are necessary before the plumber undertakes to install the new 3000 watt element?

(3 marks)

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## Question 8 continued

- (c) Refer to AS/NZS 3760 and state **THREE** visual inspections of the hot water cylinder that are required to be carried out.

(3 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(3) \_\_\_\_\_

\_\_\_\_\_

Ref: .....

- (d) Who is responsible for checking and testing of the storage water heater for electrical safety when a replacement element is fitted?

(1 mark)

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## Question 9

(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)

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

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(b) Briefly state **THREE** reasons why it is not permitted to bridge the terminals of HRC fuse carriers with fuse wire of the same current rating as the blown cartridge.

(3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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### Question 9 continued

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

(2 marks)

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- (d) What is the main purpose of a fuse or MCB installed on a switchboard?

(1 mark)

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## Section 3 – Gasfitters Only

### Question 10

- (a) List **THREE** possible causes of exposed basic insulation or live terminals on a gas fired boiler supplied by a TPS cable, a surface mounted switch, starter unit and flexible conduit enclosing PVC conduit wire.

(3 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(3) \_\_\_\_\_

\_\_\_\_\_

- (b) Give **TWO** reasons why the steel conduit used to supply a 230V gas heater must be securely clamped.

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

- (c) State **TWO** reasons why it is not permitted to complete a permanent isolation of a circuit by only removing the carrier of a fuse.

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

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**(turn over)**

### Question 10 continued

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

(3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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**Question 12 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.

(2 marks)

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

(2 marks)

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

(2 marks)

(1) \_\_\_\_\_

(2) \_\_\_\_\_

**(turn over)**

### Question 13

(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)

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

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(b) Briefly state **THREE** reasons why it is not permitted to bridge the terminals of HRC fuse carriers with fuse wire of the same current rating as the blown cartridge.

(3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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### **Question 13 continued**

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

(2 marks)

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- (d) What is the main purpose of a fuse or MCB installed on a switchboard?

(1 mark)

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## Question 14

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

(4 marks)

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

(1 mark)

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- (c) Briefly explain how a residual current device will protect a user from a severe electric shock when using a faulty appliance in an outdoor situation.

(4 marks)

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### **Question 14 continued**

- (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)

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## For Candidate's Use

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

<b>For Examiner's Use Only</b>		
<b>Questions Answered</b>	<b>Marks</b>	
<b><u>Section 1</u></b>		
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b><u>Total Section 1</u></b>		
<b><u>Section 2</u></b>		
<b>5</b>		
<b>6</b>		
<b>7</b>		
<b>8</b>		
<b>9</b>		
<b><u>Total section 2</u></b>		
<b><u>Section 3</u></b>		
<b>10</b>		
<b>11</b>		
<b>12</b>		
<b>13</b>		
<b>14</b>		
<b><u>Total section 3</u></b>		
<b>TOTAL SECTIONS 1 &amp; 2</b>		
<b>OR</b>		
<b>TOTAL SECTIONS 1 &amp; 3</b>		