



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

ELECTRICAL WORKERS REGISTRATION BOARD
ELECTRONIC SECURITY THEORY/REGULATIONS
EXAMINATION
17 June 2006
QUESTION AND ANSWER BOOKLET

Time Allowed: 3 Hours

INSTRUCTIONS – READ CAREFULLY

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

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

Answer all questions.

The pass mark for this examination is 60 marks.

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 answers 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 Act 1992 and amendments or The Electricity Act 1992 reprint dated 19 August 2005.
- The Electricity Regulations 1997 and the Electricity Amendment Regulations 1999, Electricity Amendment Regulations 2002 and the Electricity Amendment Regulations 2003; or
The Electricity Regulations Compilation 2003 and the Electricity Amendment Regulations 2003; or
The Integrated Electricity Regulations 1997 or
The Electricity Regulations 1997 reprint dated 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 – THEORY

Question 1

- (a) What is meant by the term “inverse time-current characteristic” in relation to fuses and circuit breakers?

(2 marks)

- (b) State **ONE** reason why is it essential to consider prospective-short-circuit current when choosing a fuse or circuit breaker?

(2 marks)

- (c) When connecting test instruments to measure voltage and current values of 230V live circuits, 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) _____

(turn over)

Question 1 continued

- (d) What is meant by the term **peak inverse voltage** as applied to semiconductor devices?

(2 marks)

- (e) List **TWO** hazards that can be present where high prospective short-circuit fault currents occur.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 2

(a) Sketch and label a circuit diagram of an RCD used for personal protection that includes the following components:

- Sensing coil/toroid
- Tripping device
- Test circuit (push button and resistor)
- Active, neutral and earth conductors.
- Class I equipment load

(4 marks)

(turn over)

Question 2 continued

(b) Describe the operation of the RCD circuit when there is a phase to earth fault (4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(c) Explain the following terms: (2 marks)

PRCD _____

RCBO _____

(turn over)

Question 4

- (a) (i) What does the term **current rating** mean when applied to an HRC fuse?
(2 marks)

- (ii) A HRC fuse has a gG Utilisation Category and a fusing current of 67.5 amps.
Calculate the current rating of the fuse.
(1 mark)

- (b) 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)

- (c) State **TWO** risks involved with the use of rewirable fuses.
(2 marks)

(1)

(2)

(turn over)

Question 4 continued

- (d) 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) _____

(2) _____

(3) _____

(turn over)

Question 5

(a) What is meant by the term testing when applied to electrical work?

(2 marks)

(b) You have installed a single phase socket outlet and circuit wiring for a security alarm panel. Describe in detail how each of the following tests/checks should be carried out. Include in your answer, where applicable, the type of meter used and any minimum or maximum values that apply.

(i) Protective earth continuity conductor

(2 marks)

(ii) Insulation resistance

(2 marks)

(iii) Polarity

(2 marks)

(turn over)

Question 5 continued

(iv) Visual check

(2 marks)

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) Refer to AS/NZS 3000 and state **TWO** situations where RCDs do not need to be installed after alterations, additions or repairs have been carried out in an existing domestic installation.

(2 marks)

(1) _____

(2) _____

Ref:

- (b) Refer to AS/NZS 3000 and state the colours permitted to identify the active conductor of a single-phase circuit?

(2 marks)

Ref:

- (c) Refer to AS/NZS 3000 and state the **safety** precautions that shall be taken when testing a low voltage electrical circuit?

(2 marks)

Ref:

(turn over)

Question 6 continued

- (d) Refer to the Electricity Regulations and calculate the minimum voltage permitted at the terminals of a security alarm unit, if the voltage at the main switchboard is 230 V.

(2 marks)

Ref:

- (e) Refer to the Electricity Regulations and state which of the following types of work is not prescribed electrical work.

- A. The switching of electrical installations
- B. The maintenance of electrical appliances
- C. The rewinding of armatures.
- D. The installation of conductors.

(2 marks)

Ref:

(turn over)

Question 7

Refer to AS/NZS 3000 and answer the following:

- (a) State the reason why it is necessary to carry out an insulation resistance test using test instruments on a circuit prior to livening.

(2 marks)

Ref:

- (b) State the **THREE** situations an acceptable insulation test result is designed to prevent.

(3 marks)

(1) _____

(2) _____

(3) _____

Ref:

- (c) (i) State the specified test voltage for an insulation resistance test of a low voltage circuit.

(1 mark)

Ref:

- (ii) State the performance criteria for an insulation resistance tester.

(1 mark)

Ref:

(turn over)

Question 7 continued

(d) State the **TWO** reasons for testing the continuity of a protective earthing conductor. (2 marks)

(1) _____

(2) _____

Ref:

(e) State **ONE** situation a test for correct circuit connections is designed to prevent. (1 mark)

Ref:

(turn over)

Question 8

A fundamental principal of AS/NZS 3000 is that persons and livestock shall be protected against dangers that may arise from contact with parts which are live in normal service (direct contact) or exposed conductive parts which may become live under fault conditions (indirect contact).

Refer to AS/NZS 3000 and answer the following:

- (a) State the **FOUR** permitted methods of protection against direct contact. (4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

- (b) State **TWO** minimum degrees of protection permitted when providing protection against direct contact by barriers or enclosures. (2 mark)

(1) _____

(2) _____

Ref:

- (c) Barriers or enclosures are required to be constructed so that they cannot be opened or removed unless certain conditions apply. State **THREE** alternative conditions that can be used regarding the opening or removal of barriers or enclosures. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

(turn over)

Question 8 continued

- (d) What is the minimum number of conductors required in a flexible cord supplying a Class II electrical appliance?

(1 mark)

(turn over)

Question 9

A registered security alarm installer has installed a security alarm system which included the installation of a 1.5 mm² twin and earth TPS cable between the switchboard and a new socket outlet for the alarm panel. With reference to the Electricity Regulations answer the following:

- (a) What is the name of the document the security alarm installer is required to complete. (1 mark)

Ref:

- (b) When must this document be completed? (1 mark)

Ref:

- (c) (i) To whom must a copy of this document be given? (1 mark)

Ref:

- (ii) When must the document be given to that person? (1 mark)

Ref:

- (d) (i) For how long must the security alarm installer retain a copy of this document? (1 mark)

Ref:

- (ii) What action must be taken if the security alarm installer does not wish to retain the copy of the document? (1 mark)

Ref:

(turn over)

Question 9 continued

(e) Name **ONE** other person who can issue this type of document.

(1 mark)

Ref:

(f) (i) The testing of this installation must be carried out in accordance with which section of which document?

(1 mark)

Ref:

(ii) When must this testing be carried out?

(2 marks)

Ref:

(turn over)

Question 10

- (a) Refer to the Electricity Regulations and state the Standard to which a plug-connected 230V security alarm panel may be tested following completion of repairs?

(1 mark)

Ref:

- (b) Refer to the Standard required in (a) above and complete the table by stating:

- (i) The type of instrument required for each test,
(ii) The appropriate minimum or maximum value of the test result which is acceptable to comply.

(4 marks)

Type of test	(i) Type of instrument required	(ii) Test result
Earthing continuity		
Insulation resistance test		

Ref:

(turn over)

Question 10 continued

(c) Refer to the Standard required in (a) above and briefly describe **FIVE** of the specific checks that should be carried out visually.

(5 marks)

- (1) _____

- (2) _____

- (3) _____

- (4) _____

- (5) _____

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	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		