



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

ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRONIC SECURITY THEORY/REGULATIONS

EXAMINATION

19 November 2005

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 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, 3 and A); 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) State **ONE** reason why the neutral conductor is earthed in an MEN system. (2 marks)

- (b) One end of a main earthing conductor in an MEN electrical installation is connected to an earth electrode. To where must the other end be connected? (2 marks)

- (c) 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)

- (d) Rewirable fuses and HRC cartridge fuses may be found on switchboards. What is the main purpose of a fuse? (2 marks)

- (e) What type of document is required to be issued by a security alarm installer after the completion and testing of the wiring for a new electronic security system? (2 marks)

(turn over)

Question 2

- (a) Explain the meaning of the term **discrimination** as applied to protective devices. (2 marks)

- (b) An HRC fuse is marked 60A - 440V - AC40. What is the meaning of these **THREE** sets of figures and letters? (3 marks)

60A _____

440V _____

AC40 _____

- (c) Under what circumstance must back-up protection be installed in addition to normal circuit protection? (2 marks)

(turn over)

Question 2 continued

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

(2 marks)

- (e) Sketch a typical inverse time-current characteristic as applied to fuses.

(1 mark)

(turn over)

Question 3

- (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) 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 3 continued

- (d) State **TWO** technical advantages which HRC fuses have over rewirable fuses. (2 marks)

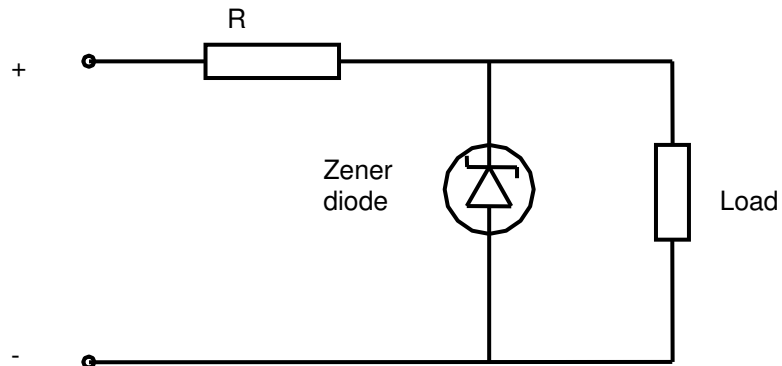
(1) _____

(2) _____

(turn over)

Question 4

(a) The figure below shows a shunt regulator supplied by a rectified d.c. supply.



(i) What is the purpose of the Zener diode?

(1 mark)

(ii) What main advantage does a Zener diode have over a normal rectifier diode?

(1 mark)

(turn over)

Question 5 continued

- (d) If a Residual Current Circuit Breaker (RCCB) is installed in a single-phase circuit, why is it necessary to also have overcurrent protection?

(1 mark)

- (e) Are Portable Residual Current Devices (PRCDs) used in New Zealand required to be voltage dependent? State a reason for your answer.

(2 marks)

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) Refer to the Electricity Regulations and state briefly what is meant by each of the following terms.

(i) Earthed

(1 mark)

(ii) Isolated

(1 mark)

Ref:

- (b) Refer to the Electricity Regulations and calculate the maximum voltage drop allowed between the point of supply and any fixed wired appliance or socket outlet within any electrical installation operating at:

(2 marks)

(i) Standard Low Voltage Single Phase

(ii) Standard Low Voltage Multiple Phase.

Ref:

- (c) Refer to AS/NZS 3000 and state **TWO** situations where the protection disconnection time for a final subcircuit **must not** exceed 0.4 seconds.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 6 continued

- (d) Refer to AS/NZS 3000 and state **ONE** situation where the protection disconnection time for a final subcircuit can exceed 0.4 seconds.

(2 marks)

Ref:

- (e) Refer to AS/NZS 3000 and state the colours that may be used to identify the phase conductor of a single-phase circuit?

(2 marks)

Ref:

(turn over)

Question 7

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 7 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 8

- (a) Refer to the Electricity Regulations and state the Standard to which a 230V plug-in security alarm panel must 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 8 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:

(turn over)

Question 9

Refer to the Electricity Act and answer the following:

- (a) A registered service alarm installer finds that dangerous work has been carried out by registered electrician and wishes to lodge a complaint against that person. What action needs to be taken to lodge the complaint?

(2 marks)

Ref:

- (b) List, briefly, **TWO** disciplinary actions that can be taken by the Electrical Workers Registration Board if it finds that registered security alarm installer, who did the dangerous work – guilty of a disciplinary offence.

(2 marks)

(1) _____

(2) _____

Ref:

- (c) The Act requires that a registered person who works for payment and reward must also hold a licence.

- (i) What is the name of this licence?

(1 mark)

Ref:

(turn over)

Question 9 continued

(ii) To whom must application be made for the licence?

(1 mark)

Ref:

(iii) When may the EWRB direct that a person return their practising licence?

(2 marks)

Ref:

(c) What is defined as serious injury?

(2 marks)

Ref:

(turn over)

Question 10

Refer to section 6 of AS/NZS 3000 and answer the following:

- (a) List **FOUR** mandatory checks using test instruments that are required for the testing of electrical work carried out on a low voltage electrical installation

(2 marks)

- (1) _____
(2) _____
(3) _____
(4) _____

Ref:

- (b) State **TWO** reasons for carrying out insulation resistance tests in an electrical installation.

(2 marks)

- (1) _____

(2) _____

Ref:

- (c) State the required voltage of the insulation resistance tester when testing a low voltage electrical installation.

(1 mark)

Ref:

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

(2 marks)

Ref:

(turn over)

Question 10 continued

- (e) State **ONE** reason why it is necessary to ensure correct circuit connections. (1 mark)

Ref:

- (f) State the **TWO** reasons for testing the continuity of a protective earthing conductor. (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

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Questions Answered	Marks	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		