



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

## **ELECTRONIC SECURITY** **THEORY/REGULATIONS EXAMINATION**

**21 November 2009**

### **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.**

**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:**

- Electricity Act 1992 reprint dated 19 August 2005
- Electricity Regulations 1997 reprint dated 2 September 2005
- AS/NZS 3000:2000 and Amendments 1, 2, A and 3 **or** AS/NZS 3000:2007
- AS/NZS 3760:2003 and Amendment 1
- NZS 3019:2004 **or** AS/NZS 3019:2007

**PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM**

**(turn over)**

## SECTION 1 – THEORY

### Question 1

- (a) State **TWO** advantages that HRC fuses have when compared to rewirable fuses.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

- (b) (i) Under what circuit conditions is the electro-magnetic mechanism of an MCB specifically designed to operate (trip)?

(1 mark)

\_\_\_\_\_

- (ii) Under what circuit conditions is the thermal mechanism of an MCB specifically designed to operate (trip)?

(1 mark)

\_\_\_\_\_

- (c) One method of identifying a double insulated appliance is by the words "double insulated" on the appliance name plate. State **TWO** other methods that are used to identify a double insulated appliance.

(2 marks)

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

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

**(turn over)**

## Question 1 continued

- (d) A residual current device (RCD) has operated. The RCD protects a circuit and a fixed-wired Class I security alarm panel. State **ONE** reason why the RCD has operated.

(2 marks)

---

---

---

- (e) Briefly describe how earthing the metal frame of a Class I electrical appliance prevents electric shock hazards under fault conditions.

(2 marks)

---

---

---

**(turn over)**

## Question 2

You have to fit a new three-pin plug to a three-core PVC sheathed flexible cord supplying a Class I security alarm panel. The flexible cord is the correct size.

- (a) Briefly state the main sequence of actions involved in fitting the three-pin plug to the flexible cord.

(2 marks)

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

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

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

(4) \_\_\_\_\_

- (b) State **FIVE** visual inspections you would make **before** fitting the cover to the plug.

(2½ marks)

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

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

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

(4) \_\_\_\_\_

(5) \_\_\_\_\_

- (c) State **ONE** visual inspection you would make **after** fitting the cover to the plug.

(½ mark)

\_\_\_\_\_  
\_\_\_\_\_

**(turn over)**



### Question 3

- (a) You need to take a fixed wired security alarm panel away for repair. You have isolated the panel and have disconnected the flexible cord. The flexible cord is still connected to the permanent connection unit.

State **TWO** precautions which must be taken to ensure the safety of persons and property **after** you have completed the isolation and disconnection

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

- (b) How is "isolating" a security alarm control panel different from just "switching off" the panel?

(3 marks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(turn over)**

### Question 3 continued

- (c) Describe **THREE** different methods of safely ensuring the **continued isolation** of a fixed wired security alarm control panel.

(3 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

- (d) State the **TWO** reasons why the prove test prove method of testing for isolation is used.

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

**(turn over)**

## Question 4

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

(2 marks)

---

---

---

---

- (b) An HRC fuse is marked 60A - 440V - 80kA. What is the meaning of these three sets of figures and letters?

(3 marks)

60A \_\_\_\_\_

---

---

440V \_\_\_\_\_

---

---

80kA \_\_\_\_\_

---

---

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

(2 marks)

---

---

---

---

**(turn over)**

### Question 4 continued

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

(1 mark)

---

---

---

---

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

(2 marks)

**(turn over)**

## Question 5

- (a) New flexible cords are to be fitted to two different single-phase plug-in security alarm panels.

(7½ marks)

- (i) For a Class I (earthed) security alarm panel:

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

---

- (B) State **ONE** set of colours for the conductors. For each colour, state the polarity.

Note: To gain marks you must state the colours and polarity accurately.

---

---

---

- (C) Refer to AS/NZS 3760 and state the test or tests required to be carried out using test instruments?

---

---

- (ii) Complete the following for a Class II (double insulated) security alarm panel:

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

---

**(turn over)**

## Question 5 continued

- (B) State **ONE** set of colours for the conductors. For each colour, state the polarity.

Note: To gain marks you must state the colours and polarity accurately.

---

---

---

- (C) Refer to AS/NZS 3760 and state the test or tests required to be carried out using test instruments?

---

---

- (b) Explain why the voltage at the load end of a flexible cord extension set supplying current to an electrical appliance is less than that at the supply end of the cord?

(1½ marks)

---

---

---

---

- (c) All flexible cords are given a **current rating**. What does **current rating** mean?

(1 mark)

---

---

**(turn over)**

## SECTION 2 – SAFETY AND LEGISLATION

### Question 6

**Answer all parts of this question by referring to the Electricity Regulations**

- (a) A trainee may assist in prescribed electrical work subject to supervision. Refer to the Electricity Regulations and state **ONE** category of person who can provide this supervision.

(2 marks)

---

---

---

Ref: .....

- (b) Refer to the Electricity Regulations and state **TWO** practical steps relating to personal protective equipment that **an employee** must take before work and when carrying out work.

(2 marks)

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

---

---

---

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

---

---

---

Ref: .....

**(turn over)**

**Question 6 continued**

(c) Refer to the Electricity Regulation and state:

(i) For how long a security alarm installer must retain a copy of a Certificate of Compliance.

(1 mark)

\_\_\_\_\_

Ref: .....

(ii) What the security alarm installer must do with the copy if she/he does not wish to retain it.

(1 mark)

\_\_\_\_\_

Ref: .....

(d) Refer to the Electricity Regulations and state **TWO** circumstances where a security alarm installer can connect newly installed wiring to the supply without the work being certificated on a certificate of compliance.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

Ref: .....

**(turn over)**

## Question 6 continued

- (e) Refer to the Electricity Regulations and state **TWO** situations where "fittings" are deemed not to be electrically safe (that is they do not comply with Regulation 69(1)).

(2 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

Ref: .....

**(turn over)**

## Question 7

Answer all parts of this question by referring to AS/NZS 3000.

- (a) 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:

- (i) State the **FOUR** permitted methods of protection against direct contact.

(4 marks)

- (1) \_\_\_\_\_  
(2) \_\_\_\_\_  
(3) \_\_\_\_\_  
(4) \_\_\_\_\_

Ref: .....

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

(2 mark)

- (1) \_\_\_\_\_  
(2) \_\_\_\_\_

Ref: .....

**(turn over)**

## Question 7 continued

- (iii) 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: .....

- (b) Refer to AS/NZS 3000 and state the meaning of the term **obstacle**.

(1 mark)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(turn over)**

## Question 8

Answer all parts of this question by referring to AS/NZS 3000.

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

(2 marks)

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

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

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

(4) \_\_\_\_\_

Ref: .....

- (b) State the primary reason for carrying out **insulation resistance tests** on electrical work carried out in a low voltage electrical installation

(2 marks)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ref: .....

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

(2 marks)

\_\_\_\_\_

Ref: .....

**(turn over)**

**Question 8 continued**

(d) State **TWO** reasons why it is necessary to ensure **correct circuit connections**.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

Ref: .....

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

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

Ref: .....

**(turn over)**

## Question 9

**Answer all parts of this question by referring to AS/NZS 3760.**

AS/NZS 3760 contains the tests and inspections that must be carried out on a 230V, Class I, plug-in security alarm panel after it has been repaired.

(a) Refer to AS/NZS 3760 and answer the following:

- (i) State the type of test that is carried out to check whether the 230V, Class I, plug-in security alarm panel is effectively earthed? (½ mark)

---

Ref: .....

- (ii) What type of instrument would you use to carry out the test you have stated in (a)(i) (½ mark)

---

Ref: .....

- (iii) What is the acceptable test result for the test you have stated in (a)(i). State whether the result is a minimum or maximum value. (1 mark)

---

Ref: .....

**(turn over)**

## Question 9 continued

(b) Refer to AS/NZS 3760 and answer the following:

- (i) State the **TWO** types to tests, either of which can be carried out to test the integrity of the insulation of the 230V, Class I, plug-in security alarm panel.

(1 mark)

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

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

Ref: .....

- (ii) For the test you have stated in (b)(i)(1) above state:

- (1) The type of instrument you would use to carry out the test  
(½ mark)

\_\_\_\_\_

Ref: .....

- (2) The acceptable test result for the test. State whether the result is a minimum or maximum value.

(1 mark)

\_\_\_\_\_

Ref: .....

- (iii) For the test you have stated in (b)(i)(2) above state:

- (1) The type of instrument you would use to carry out the test  
(½ mark)

\_\_\_\_\_

Ref: .....

- (2) The acceptable test result for the test. State whether the result is a minimum or maximum value.

(1 mark)

\_\_\_\_\_

Ref: .....

**(turn over)**

**Question 9 continued**

- (c) Refer AS/NZS 3760 and state **TWO** specific visual checks (inspections) that should be carried out on the flexible cord of the 230V, Class I, plug-in security alarm panel.

(2 marks)

**Note: The visual checks must relate specifically to the flexible cord of the 230V, Class I, plug-in security alarm panel.**

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

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

Ref: .....

- (d) Refer AS/NZS 3760 and state **TWO** specific visual checks (inspections) that should be carried out on the 230V, Class I, plug-in security alarm panel (not the cord or plug).

(2 marks)

**Note: The visual checks must relate specifically to the 230V, Class I, plug-in security alarm panel.**

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

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

Ref: .....

**(turn over)**

## Question 10

**Answer part (a) of this question by referring to the Electricity Act**

(a) The Electricity Act requires that a registered electrical service technician who works for payment of reward must hold an additional type of licence. Refer to the Act and state:

(i) The name of the licence?

(1 mark)

---

Ref: .....

(ii) The date in any year the licence expires?

(1 mark)

---

Ref: .....

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

(1 mark)

---

Ref: .....

**(turn over)**

## Question 10 continued

**Answer parts (b) and (c) of this question by referring to the Electricity Regulations.**

- (b) No electrical service technician shall assist to carry out prescribed electrical work unless they have refresher courses in **FOUR** specific subjects within the previous 24 months. Refer to the Electricity Regulations and state those **FOUR** subjects.

(4 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

(4) \_\_\_\_\_

\_\_\_\_\_

Ref: .....

- (c) Refer to the Electricity Regulations and state **THREE** details of an electrical accident that must included in a report to the Secretary.

(3 marks)

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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		
<b>TOTAL</b>		