



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

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

**20 June 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 may need to use 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 and 3 and A **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 the **TWO** factors that will determine the size of a cable used to supply a single phase security panel.

(2 marks)

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

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

- (b) (i) State **ONE** precaution that must be taken when carrying out a 500V d.c. insulation resistance test on equipment containing semi-conductor devices.

(1 mark)

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

- (ii) State **ONE** reason why this precaution is necessary.

(1 mark)

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

- (c) (i) What is the minimum insulation resistance permitted for a single-phase, 230V, final subcircuit cable?

(1 mark)

\_\_\_\_\_

- (ii) What is the minimum insulation resistance permitted for a 230V, Class I, plug-in security alarm panel?

(1 mark)

\_\_\_\_\_

**(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. What has the RCD detected that would cause it to operate?

(2 marks)

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

(2 marks)

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## Question 2

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

(2 marks)

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

(4 marks)

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

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

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AC40 \_\_\_\_\_

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

(2 marks)

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**(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)

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**(turn over)**

### Question 3

You have installed a single phase switched socket outlet for a new security alarm panel. A new cable has been run between an existing socket outlet and the new outlet – but it is not connected to the existing outlet.

Describe how each of the following tests/checks should be carried out on the new cable. Include in your answer, where applicable:

- The type of meter used.
- The test voltage
- The test result values that are acceptable.
- Whether a test result is a maximum or minimum value.

(a) **TWO** visual checks

(2 marks)

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

(b) Protective earthing conductor test

(3 marks)

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

**(turn over)**

**Question 3 continued**

(c) Insulation resistance test

(3 marks)

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(d) Correct circuit connections test (or polarity test)

(2 marks)

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**(turn over)**

## Question 4

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

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

(2 marks)

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

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

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

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

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

(2½ marks)

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

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

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

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

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

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

(½ mark)

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

**(turn over)**



## Question 5

- (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)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**(turn over)**

## Question 5 continued

- (c) You have used the prove-test-prove method to confirm that a single-phase fixed wired security alarm control panel is isolated. The panel is connected via a permanent connection unit to a circuit protected by an MCB.

State **THREE** different methods of ensuring the continued isolation of the 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)**

## SECTION 2 – SAFETY AND LEGISLATION

### Question 6

- (a) Refer to the Electricity Regulations and state the maximum permitted operating time for a Residual Current Device (RCD) installed for the protection of property.

(2 marks)

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Ref: .....

- (b) Refer to AS/NZS 3000 and state:

- (i) The colours permitted to identify the phase conductor of a single-phase circuit?

(1 mark)

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Ref: .....

- (ii) The colours permitted to identify earthing conductors?

(1 mark)

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Ref: .....

**(turn over)**

**Question 6 continued**

(c) 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: .....

(d) Refer AS/NZS 3000 and state **TWO** of the methods of providing protection against indirect contact.

(2 marks)

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

\_\_\_\_\_

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

\_\_\_\_\_

Ref: .....

(e) Refer to AS/NZS 3000 and state the requirements for flexible cords used as fixed wiring.

(2 marks)

\_\_\_\_\_

\_\_\_\_\_

Ref: .....

**(turn over)**

## Question 7

AS/NZS 3760 contains the tests and inspections that must be carried out on a Class I, 230V 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 Class I, 230V plug-in security alarm panel is effectively earthed?  
(½ mark)

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Ref: .....

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

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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)

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Ref: .....

**(turn over)**

## Question 7 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 Class I, 230V 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 7 continued**

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

(2 marks)

**Note: The visual checks must relate specifically to the flexible cord of the Class I, 230V 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 Class I, 230V plug-in security alarm panel (not the cord or plug).

(2 marks)

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

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

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

Ref: .....

**(turn over)**

## Question 8

(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: .....

(b) No security alarm installer 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: .....

**(turn over)**

**Question 8 continued**

(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: .....

**(turn over)**

## Question 9

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

(1 mark)

\_\_\_\_\_

**(turn over)**

## Question 10

Refer to AS/NZS 3000 and answer the following:

- (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.

(1 mark)

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Ref: .....

**(turn over)**

**Question 10 continued**

(d) State the performance criteria for an insulation resistance tester. (2 marks)

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Ref: .....

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

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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

For Examiner's Use Only		
Questions Answered	Marks	
1		
2		
3		
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7		
8		
9		
10		
<b>TOTAL</b>		