



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

ELECTRONIC SECURITY
THEORY/REGULATIONS EXAMINATION
13 September 2008
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:

- The Electricity Act 1992 reprint dated 19 August 2005.
- 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) or AS/NZS 3000:2007; 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 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) _____

- (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)

(turn over)

Question 1 continued

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

(2 marks)

- (e) State **ONE** reason why it is important to consider the value of prospective short circuit current when selecting an MCB to protect a circuit supplying a new electronic security system.

(2 marks)

(turn over)

Question 2

- (a) Describe what happens in an electrical installation when a fault occurs and there is "discrimination" between protective devices.

(2 marks)

- (b) An HRC fuse is marked with the terms "10A", "440V" and "AC40". What is the meaning of each of these terms?

10A

(1 mark)

440V

(1 mark)

AC40

(2 marks)

- (c) State **TWO** principles of operation employed by most miniature circuit-breakers.

(1 mark)

(1) _____

(2) _____

(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) Draw and label 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) A 230 volt, Class I security alarm panel has recently been serviced in a workshop. Some sections of the electronic control circuitry have been repaired and/or replaced and are not accessible for disconnection.

Before returning the panel into service an insulation resistance test is required to be carried out.

- Describe the procedure that should be followed to carry out this test
- State the test instrument which should be used
- State the minimum permitted test value.

(4 marks)

(turn over)

Question 3 continued

- (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 4

(a) You are required to carry out a protective earthing conductor test on a 230V, Class I plug-in security alarm panel.

(i) State the instrument that should be used for this test. (1 mark)

(ii) Briefly explain how the test should be carried out. (2 marks)

(iii) (1) What is the permitted resistance for this test? (1 mark)

(2) Is this resistance a minimum or maximum value? (1 mark)

(b) Briefly explain why an ohmmeter is not the correct instrument to carry out an insulation resistance test on a security alarm panel. (2 marks)

(turn over)

Question 4 continued

- (c) You are using an ammeter to measure the current drawn by a security alarm panel. Describe what would happen if you connected the ammeter in parallel with that panel.

(3 marks)

(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) In accordance with AS/NZS 3760:

- (i) State the maximum resistance between exposed metal parts of a Class I electrical appliance and earth.

(1 mark)

Ref:

- (ii) State the minimum insulation resistance between the supply conductors and external metal parts in a Class II electrical appliance.

(1 mark)

Ref:

(b) Refer to the Electricity Regulations and state the voltage restriction that applies to 3-pin flat pin socket outlets that comply with AS/NZS 3112.

(2 marks)

Ref:

(turn over)

Question 6 continued

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

(i) Isolated

(1 mark)

Ref:

(ii) Mains

(1 mark)

Ref:

(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:

(turn over)

Question 6 continued

(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

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 an existing socket outlet and a new socket outlet for the alarm panel. With reference to the Electricity Regulations answer the following:

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

Ref:

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

Ref:

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

Ref:

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

Ref:

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

Ref:

(turn over)

Question 7 continued

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

(1 mark)

Ref:

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

(1 mark)

Ref:

(b) (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 8

- (a) Refer to the Electricity Regulations and state the Standard to which a plug-in Class I, 230V, security alarm panel must be tested following completion of repairs?

(1 mark)

Ref:

- (b) Refer to the Standard required in (a) above and, in relation to testing the plug-in Class I, 230V, security alarm panel using test instruments, 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
Protective earthing conductor		
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 visual checks (inspections) that should be carried out. (5 marks)

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

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Ref:

(turn over)

Question 9

You have repaired a Class I plug-in security alarm panel. You have carried out a protective earthing (earth continuity) test and the result is 15Ω .

(a) Refer to AS/NZS 3760 and:

- (i) State the maximum resistance value permissible for the protective earthing conductor of a Class I plug-in security alarm panel.

(1 mark)

Ref:

- (ii) State the reason why the resistance of the protective earthing conductor must be no greater than the value stated in (a)(i).

(2 marks)

Ref:

- (b) Briefly describe the corrective action or procedure you would take to ensure the resistance of the protective earthing conductor complies with AS/NZS 3760.

(3 marks)

(turn over)

Question 9 continued

(c) The flexible cord has been replaced on a single phase 230V Class I, plug-in security alarm panel. State the colour coding which applies to the cord conductors.

(3 marks)

(i) Phase (Active) _____

(ii) Neutral _____

(iii) Earth _____

Ref:

(d) 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 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 the main reason for carrying out an insulation resistance test in an electrical installation.

(2 marks)

Ref:

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

(1 mark)

Ref:

(turn over)

Question 10 continued

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

Ref:

(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		
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7		
8		
9		
10		
TOTAL		