



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

ELECTRONIC SECURITY **THEORY/REGULATIONS EXAMINATION**

22 September 2007

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:

- 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); 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) Briefly describe how earthing the metal frame of a Class I electrical appliance minimises shock hazards under fault conditions. (2 marks)

- (b) When connecting test instruments to measure voltage and current values of 230V electrical appliances it is important to observe set procedures to ensure personal safety. Briefly describe **TWO** safety precautions relating to the test instruments that will promote personal safety. Assume the following:

- All necessary personal protective equipment is available.
- You are wearing no metallic objects.
- Set work procedures are available.
- All instruments are working correctly

(2 marks)

(1) _____

(2) _____

- (c) Why is it important that a portable RCD is tripped before every use? (2 marks)

(turn over)

Question 1 continued

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

(2 marks)

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

(2 marks)

(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

(5 marks)

(turn over)

Question 2 continued

- (b) Describe the operation of the RCD circuit when there is a phase to earth fault exceeding 30 mA

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

- (c) Explain what the term "RCBO" means.

(1 mark)

(turn over)

Question 3

- (a) A single-phase fixed wired security alarm panel is to be removed for repair. You have disconnected the flexible cable from the panel and proved that the circuit is isolated at the permanent connection unit using the prove-test-prove method. The flexible cable is still connected to the permanent connection unit.

State **FOUR** precautions that must be taken to ensure the safety of persons and prevent damage to property before leaving the work site

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 3 continued

(b) What does it mean when:

(i) A security control panel has been switched off.

(1 mark)

(ii) A security control panel has been isolated.

(2 marks)

(c) Describe **THREE** different ways of safely ensuring the continued isolation of a security control panel.

(3 marks)

(turn over)

Question 4

A 20A HRC fuse protects a circuit consisting of two socket outlets supplying various operating electrical appliances including a security alarm panel. The fuse has blown.

The fuse is correctly rated and is not faulty.

(a) State the **THREE** possible causes of the fuse blowing. (3 marks)

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

(b) For each of the possible causes you have stated in (a), state:

- What action you would take to establish that this is the cause.
 - The action you would take to fix the problem.
- (7 marks)

(i) Possible cause (1)

Action taken to establish that this is the cause.

Remedial action taken or recommended

(turn over)

Question 4 continued

(ii) Possible cause (2)

Action taken to establish that this is the cause.

Remedial action taken or recommended

(iii) Possible cause (3)

Action taken to establish that this is the cause.

Remedial action taken or recommended

(turn over)

Question 5

- (a) (i) State **ONE** reason for carrying out an earth fault loop impedance test on a single-phase socket outlet circuit.

(1 mark)

- (ii) Describe how the earth fault loop impedance tester is connected.

(1 mark)

- (b) (i) State the reason for carrying out an RCD test on a single-phase portable RCD.

(1 mark)

- (ii) Describe how the RCD tester is connected.

(1 mark)

- (c) Identify which of the tests in (a) and (b) above are carried out on live circuits.

(1 mark)

(turn over)

Question 5 continued

- (d) (i) Describe how the **prove test prove** method of testing for isolation is carried out

(3 marks)

- (ii) Why is it important to use the **prove test prove** method before working on electrical equipment?

(2 marks)

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) The Electricity Act lists **SEVEN** classes of person who may do, or assist in doing prescribed electrical work. Two of these classes are registered electrician and registered electrical inspector. Refer to the Electricity Act and state **TWO** other classes of person.

(2 marks)

(1) _____

(2) _____

Ref:

- (b) 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:.....

(turn over)

Question 6 continued

- (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:.....

- (d) Refer to AS/NZS 3000 and state the colours permitted to identify the active conductor of a single-phase circuit? (2 marks)

Ref:

- (e) Refer to AS/NZS 3000 and state **TWO** alternative protection methods for the protection of wiring systems that are located within 50 mm from the underside of any roofing material. (2 marks)

(1) _____

(2) _____

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 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:

(turn over)

Question 8 continued

(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:

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

(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 **ONE** reason why the resistance of the protective earthing conductor must be no greater than the value stated in (a)(i)

(2 marks)

Ref:

(iii) Briefly describe the corrective action or procedure you would take to ensure the resistance of the earthing of the security alarm panel complies with AS/NZS 3760.

(3 marks)

(turn over)

Question 9 continued

(b) 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:

(c) What is the minimum number of conductors required in a flexible cord supplying a Class I security alarm panel?

(1 mark)

(turn over)

Question 10

Refer to the Electricity Act and answer the following:

- (a) A registered security alarm installer finds that dangerous work has been carried out by another registered security alarm installer 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 the 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 10 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:

(d) What is defined as serious injury? (2 marks)

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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5		
6		
7		
8		
9		
10		
TOTAL		