



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

**ELECTRONIC SECURITY INSTALLER
THEORY/REGULATIONS EXAMINATION
5 May 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 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 reprinted as at 19 August 2005.
- The Electricity Regulations 1997 reprinted as at 5 September 2005
- AS 60529 or 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) State the **TWO** types of mechanisms employed by most miniature circuit-breakers.

(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) State **ONE** reason why you would install RCD (residual current device) protection on a circuit?

(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) State **FOUR** technical advantages which HRC fuses have over rewirable fuses.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

- (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) _____

(turn over)

Question 3 continued

(c) Explain the internal operation of a miniature circuit breaker when the following situations occur.

(i) Sustained small overload

(2 marks)

(ii) Short circuit

(2 marks)

(turn over)

Question 4

- (a) You are connecting test instruments to measure voltage and current values of a live 230V electrical appliance. When doing this work it is important to observe set procedures to ensure personal safety. Briefly describe **THREE** important electrical precautions relating to the test instruments that which will promote personal safety.

- Note:
1. All the necessary safety equipment (overalls, rubber mats etc.) is available.
 2. Set procedures are available.
 3. All conductive items (e.g., rings) have been removed.

(3 marks)

(1) _____

(2) _____

(3) _____

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

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 4 continued

- (c) What is the essential safety difference between switching off a security control panel and isolating a security control panel?

(3 marks)

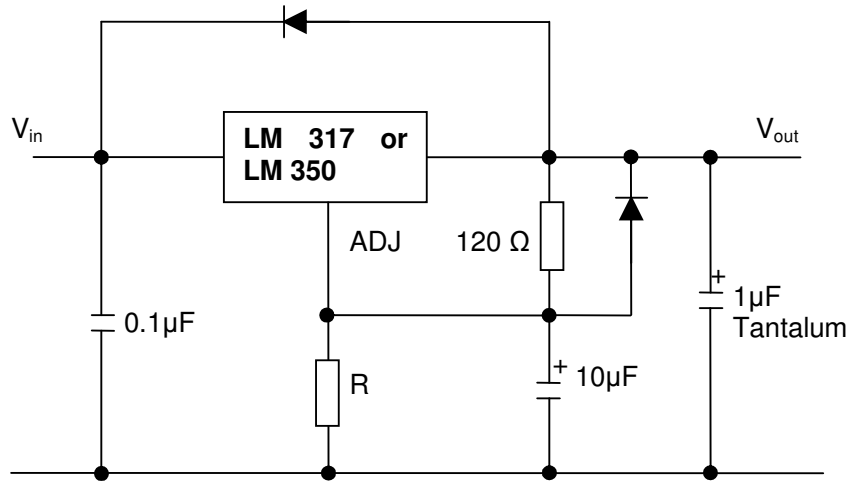
- (d) Rewireable fuses and HRC fuses may be found on switchboards. It is important to replace a blown fuse with one of the correct current rating.

What would be the overall effect on the operation of a subcircuit if you used a replacement fuse that had an under-rated current rating, compared to the fuse that had blown?

(1 mark)

(turn over)

Question 5



1. Resistor R is as follows:
 $R = (96 \times V_{out}) - 120$
 Where R is in ohms and V_{out} is in volts.
2. V_{in} should be at least 2.5 volts greater than V_{out} .
3. Capacitor voltage ratings must be chosen appropriately.
4. The protection diodes shown will be necessary if the input or output of the regulator is shorted to ground. 1 amp types should be adequate.

(a) Using the information from the sketch above:

- (i) Calculate the regulator output voltage (V_{out}) if R has been determined to be 1032Ω .

(2½ marks)

- (ii) Calculate a suitable minimum regulator input voltage (V_{in}).

(1½ marks)

(turn over)

Question 5 continued

- (iii) Select a suitable minimum voltage rating for the regulator input capacitor ($0.1\mu\text{F}$). State **ONE** reason for your selection.

(2 marks)

- (b) State **TWO** components that may be used as part of a circuit to filter a rectifier output.

(2 marks)

- (1) _____
- (2) _____

- (c) State **TWO** factors that will cause an SCR to be turned off once it has been triggered (turned on).

(2 marks)

- (1) _____
- (2) _____

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) 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:

- (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 the colours that may be used to identify the phase conductor of a single-phase circuit?

(2 marks)

Ref:

- (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 3760 and state:

- (i) The maximum resistance between exposed metal parts of Class I equipment and earth.

(1 mark)

Ref:

- (ii) The minimum insulation resistance between live supply conductors and external metal parts in Class II equipment.

(1 mark)

Ref:

(turn over)

Question 7

RCD protection is required to be installed on socket outlet and lighting final subcircuits in domestic installations.

- (a) You are required to wire a new final subcircuit for a socket outlet in a domestic residence. The switchboard has two RCDs on it; one for the socket outlets and one for the lighting.

- (i) To which neutral bar would you connect the socket outlet circuit?
(1 mark)

- (ii) What other electrical protection is required on the circuits protected by the RCDs
(1 mark)

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

- (i) **TWO** situations where RCDs do not need to be installed after alterations, additions or repairs have been carried out in domestic installations.
(2 marks)

(1) _____

(2) _____

Ref:

- (ii) The **ONE** situation where an RCD does not need to be installed on a socket outlet final subcircuit in a new domestic installation.
(1 mark)

Ref:

(turn over)

Question 7 continued

- (iii) The maximum rated residual current of an RCD installed to protect socket outlet and lighting final subcircuits in domestic installations.
(1 mark)

Ref:

- (c) When an HRC fuse is replaced, the replacement must have similar characteristics to the original. State **FOUR** electrical characteristics to be checked for similarity.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(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 to live parts 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 8 continued

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

(1 mark)

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

(1 mark)

Ref:

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

(2 marks)

Ref:

- (c) The protective earthing (earth continuity) test result is 15Ω . 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

(d) 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:

(e) 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 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 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

For Examiner's Use Only		
Questions Answered	Marks	
1		
2		
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TOTAL		