



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

ELECTRONIC SECURITY **THEORY/REGULATIONS EXAMINATION**

18 November 2006

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. Show answers to TWO decimal places.

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) State **TWO** factors which affect the severity of electric shock upon the human body.

(2 marks)

(1) _____

(2) _____

- (b) An ohmmeter gives a reading of 24 ohms when used to measure the resistance of a plug-in heater designed for use on 230V/240V a.c. supply. If the heater draws 10 amps when plugged into a 240 V supply:

- (i) Will the current increase or decrease when the heater is plugged into a 230 V supply?

(1 mark)

- (ii) Will the power dissipated increase or decrease when the heater is plugged into a 230 V supply?

(1 mark)

- (c) Briefly explain why an ohmmeter should not be used when carrying out an insulation resistance test on the internal wiring of a single phase security control panel.

(2 marks)

- (d) One end of a main earthing conductor in an MEN electrical installation is connected to an earth electrode. To where must the other end be connected?

(2 marks)

(turn over)

Question 1 continued

- (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

- (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 2 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)

Question 3

- (a) (i) What is meant by the term "inverse time-current characteristic" in relation to protective devices?

(1 mark)

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

(1 mark)

- (b) Under what circumstance must back-up protection (for example, HRC fuses) be installed in addition to normal circuit protection?

(2 marks)

turn over)

Question 4

Note: Read this entire question before attempting to answer it.

A 230v single-phase 20A circuit consists of a permanent connection unit protected by a MCB. The permanent connection unit supplies a security alarm panel.

The MCB has tripped out. The supply was switched off and the MCB reset. When supply was restored to the circuit and switched on, the MCB tripped out again.

You have been requested to locate the cause of the fault and, if possible make repairs. You have established that:

- The MCB was not overloaded.
- The MCB is not faulty and is correctly rated for the circuit it protects.

Warning: *If any part of your answer is dangerous or hazardous, you will get no marks for this question.*

(a) Describe how you would ensure that the circuit is safely isolated. (4 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 4 continued

(b) There are **TWO** possible types of fault. What tests would you make to establish the cause of the fault.

(3 marks)

(1) _____

(2) _____

(c) Describe the action you would take for each of the possible faults.

(3 marks)

(1) _____

(2) _____

(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) Describe what happens when the electricity supply to a Portable Residual Current Device (PRCD) is switched off and then switched on.

(2 marks)

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) (i) 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: Refer to the Electricity Act and state what action should be taken to lodge such a complaint?

(1 mark)

Ref:

- (ii) The registered security alarm installer who did the dangerous work has been found guilty of a disciplinary offence.- Refer to the Electricity Act and state, briefly, **TWO** of the disciplinary actions that can be imposed by the appropriate authority.

(1 mark)

(1) _____

(2) _____

Ref:

- (b) Refer to the Electricity Regulations and state **TWO** methods of personal protection that can be used where a person using a portable appliance is partly immersed in a conductive substance.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 6 continued

(c) The Electricity Act permits any person (other than a registered person or a trainee) to carry out electrical work under supervision. Refer to the Act and state:

(i) Who is required to carry out the supervision? (1 mark)

Ref:

(ii) A condition under which the work must be carried out (apart from being supervised). (1 mark)

Ref:

(d) Refer to AS/NZS 3000 and list **FOUR** types of equipment or conductors that form part of an MEN earthing system. (2 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 6 continued

(e) 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:

(turn over)

Question 7

Refer to the Electricity Regulations and answer the following:

- (a) No person shall assist to carry out prescribed electrical work for the first time unless that person has satisfactorily completed safety tuition in **FOUR** specific subjects. What are those subjects?

(2 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

- (b) At what intervals must a person complete the tuition in the subjects in (a).
(2 marks)

Ref:

(turn over)

Question 7 continued

- (c) An employer may have employees who assist to carry out prescribed electrical work. What responsibility does the employer have with respect to the competency of the employees who are doing this work?

(2 marks)

Ref:

- (d) Whilst carrying out prescribed electrical work, a registered security alarm installer finds part of an installation which he/she believes on reasonable grounds, presents an immediate danger to life. In accordance with the electrical legislation, who is the security alarm installer required to advise of the danger?

(2 marks)

Ref:

- (e) Refer to the Electricity Regulations and state **TWO** details of an electrical accident that must be reported to the Secretary.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 8

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

Ref:

- (b) Refer to the Standard required in (a) above and 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
Earthing continuity		
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 checks that should be carried out visually.

(5 marks)

(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) 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)(i).

(2 marks)

Ref:

- (c) 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

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 RCCBs 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 RCCBs
(1 mark)

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

(i) **TWO** situations where RCCBs 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 RCCB does not need to be installed on a socket outlet final subcircuit in a new domestic installation.
(1 mark)

Ref:

(turn over)

Question 10 continued

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

Ref:

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

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

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		
TOTAL		