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| Candidate Code No. | |
| For Board Use Only | |
| Result | Result |
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ELECTRICAL WORKERS REGISTRATION BOARD
ELECTRONIC SECURITY THEORY/REGULATIONS
EXAMINATION
18 June 2005
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 and amendments.
- The Electricity Regulations 1997 and the Electricity Amendment Regulations 1999, Electricity Amendment Regulations 2002 and the Electricity Amendment Regulations 2003; or
The Electricity Regulations Compilation 2003 and the Electricity Amendment Regulations 2003; or
The Integrated Electricity Regulations 1997 and the Electricity Amendment Regulations 2003.
- 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) An HRC fuse with a Utilisation category (fusing factor) of 1.5 has a rating of 20 amps. Calculate the fusing current of this fuse.

(2 marks)

- (b) What is the residual current rating of an RCD used for personal protection?

(2 marks)

- (c) What do the figures “AC 80” mean on an HRC fuse cartridge?

(2 marks)

- (d) Name **TWO** components that are used to smooth the DC output of a rectifier.

(2 marks)

(1) _____

(2) _____

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

(2 marks)

(turn over)

Question 2

(a) Rewireable fuses and HRC cartridge fuses may be found on switchboards. What would be the overall effect on a subcircuit when the protection device operates and the circuit is protected by:-

(i) An under-rated fuse?

(1 mark)

(ii) An over-rated fuse?

(1 mark)

(b) State **FOUR** technical advantages which HRC cartridge fuses have over rewireable fuses.

(4 marks)

(1)

(2)

(3)

(4)

(turn over)

Question 2 continued

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

(2 marks)

- (d) A miniature circuit breaker has both thermal and electromagnetic current-sensor functions. Briefly explain the operation of **ONE** function.

(2 marks)

(turn over)

Question 3

- (a) State **FOUR** precautions which must be taken to ensure the safety of persons, animals and property when disconnecting the conductors supplying a fixed-wired security control panel.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

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

(3 marks)

(turn over)

Question 3 continued




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

(3 marks)

(turn over)

Question 4

- (a) Complete the following table to show the output waveform and the ripple frequency of the stated single-phase rectifiers supplied at 230 V, 50 Hz:
(3 marks)

| | Single-phase half-wave rectifier | Centre-tapped full-wave rectifier | Single-phase full-wave bridge rectifier |
|------------------|---|---|---|
| Output waveform |  |  |  |
| Ripple frequency | | | |

- (b) Draw a circuit diagram and label EACH component to show:
- (i) How a triac may control a 230 V ac incandescent lamp. Include a simple control circuit.
(3 marks)

(turn over)

Question 4 continued

- (ii) How a single diode may be used as a stand-by supply for a soldering iron.
(2 marks)

- (iii) A 24 V, full-wave, centre-tapped rectifier circuit, with a resistive load, supplied from a 230/24 V transformer.
(2 marks)

(turn over)

Question 5

- (a) What is meant by the term testing when applied to electrical work? (2 marks)

- (b) A single phase socket outlet and circuit wiring has been installed. Describe in detail how each of the following tests/checks should be carried out. Include in your answer, where applicable, the type of meter used and any minimum or maximum values that are acceptable.

- (i) Protective earth continuity (3 marks)

- (ii) Insulation resistance (3 marks)

(turn over)

Question 5 continued

(iii) Polarity

(1 mark)

(iv) Visual check

(1 mark)

(turn over)

SECTION 2 – SAFETY AND LEGISLATION

Question 6

- (a) Refer to the Electricity Act and state **TWO** limitations the Board may set to the work that may be undertaken by a registered person.

(2 marks)

(1) _____

(2) _____

Ref:

- (b) 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 6 continued

- (c) Refer to AS/NZS 3000 and state **TWO** requirements for the segregation of fire and smoke control wiring installed in the same enclosure as security alarm wiring.

(2 marks)

(1) _____

(2) _____

Ref:

- (d) 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 6 continued

- (e) 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 7

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

(i) **TWO** types of electrical installations in which some final subcircuits are required to be protected by an RCD.

(1 mark)

(1) _____

(2) _____

Ref:

(ii) The **TWO** types of final subcircuits which are required to be protected by an RCD.

(1 mark)

(1) _____

(2) _____

Ref:

(b) Briefly explain how a Residual Current Device (RCD) disconnects the supply from an electrical appliance when an earth fault occurs.

(4 marks)

(turn over)

Question 7 continued

- (c) When an HRC cartridge fuse is replaced, the replacement cartridge 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

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 8 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) How many conductors are there in a flexible cord supplying a Class II electrical appliance?

(1 mark)

(turn over)

Question 9

A registered security alarm installer has completed the installation of a security alarm system which included the installation of a 1.5 mm² twin and earth TPS cable between the switchboard and the security alarm control panel. With reference to the Electricity Regulations answer the following:

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

(1 mark)

Ref:

- (b) When must this document be completed?

(1 mark)

Ref:

- (c) (i) To whom must a copy of this document be given?

(1 mark)

Ref:

- (ii) When must the document be given to that person?

(1 mark)

Ref:

- (d) (i) How long must the security alarm installer retain a copy of this document?

(1 mark)

Ref:

(turn over)

Question 9 continued

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

(1 mark)

Ref:

- (e) Name **ONE** other person who can issue this type of document.

(1 mark)

Ref:

- (f) (i) The testing of this work 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 10

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 10 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:

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 | |
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