



Candidate Code No	
For Board Use Only	
Result	Result
Date	Date
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ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRICAL SERVICE TECHNICIAN “B” EXAMINATION

6 December 2003

QUESTION AND ANSWER BOOKLET

Time Allowed: Two 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 space provided above. Your name must NOT appear.

The pass mark in this examination is 60 marks.

Attempt all the questions in this paper; each question is worth 10 marks.

Where applicable, your written answers may be a direct quote from the Act, Regulations, Code or Standards or you may summarise, in your own words, the key points from these documents. Wherever possible include the reference to the source of your answer in the space provided. However, stating a reference only will gain no marks

Drawing instruments may be used when diagrams are required. Marks are allocated on the basis of correctness. Approved calculators may be used.

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 the following documents in this examination:

The Electricity Act 1992 and amendments
 The Electricity Regulations 1997 and the 1999 and 2002 Amendments or
 The Electricity Regulations Compilation 2003
 AS 1939 supplement 1 – 1990; AS/NZS 3000:2000; AS/NZS 3001:2001; AS/NZS
 3004:2002; NZS 3019 (Int):2002; AS/NZS 3760:2001

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

Question 1

An industrial sewing machine in a leather goods factory has been repaired, and an electrical service technician is to reconnect its flexible cord to the single phase fixed wiring at a terminal box mounted on an adjacent pillar.

To ensure the work is safely completed, describe, in the correct sequence, the action that should be taken by the electrical service technician:

(a) Before connecting the machine.

(3 marks)

(b) Connecting the machine. Include tests using instruments and minimum or maximum values for the tests.

(5 marks)

(c) After connecting the machine

(2 marks)

(turn over)

Question 2

In each of the following statements write the appropriate words or figures that would correctly complete the statement:

- (a) The voltage drop along a two core flexible cord depends on the _____ and the _____
(2 marks)
- (b) When supplied at a constant voltage any decrease in the electrical resistance of any appliance will result in an increase in _____ and the _____
(2 marks)
- (c) A thermally operated overload relay is designed to protect a circuit from the effects of a _____
(1 mark)
- (d) The New Zealand low voltage ac supply operates at a frequency of _____
(1 mark)
- (e) The nominal voltage existing between a neutral conductor and earth in normal circumstances should ideally be _____
(1 mark)
- (f) A double insulated appliance may be identified by the symbol _____
(1 mark)
- (g) The minimum acceptable value for the insulation resistance between the phase windings of a three phase electric motor is _____
(1 mark)
- (h) Where the resistance and rated voltage of an appliance is known, its power rating in watts can be determined from the formula _____
(1 mark)

(turn over)

Question 3

- (a) The New Zealand Multiple Earth Neutral system of single/three phase standard low voltage distribution requires the use of four conductors. List the standard nominal voltages that exist between each of the four conductors, and from each conductor to earth.

(4 marks)

- (b) With reference to the Electricity Regulations 1997:

- (i) Explain what is meant by a **Multiple Earthed Neutral system**.

(3 marks)

Ref:

- (ii) Calculate the minimum voltage permitted at the terminals of a hot water cylinder, if the voltage at the main switchboard is 230 V.

(2 marks)

Ref:

- (b) State the Standard to which electrical appliances must be tested before they are hired or leased out.

(1 mark)

Ref:

(turn over)

Question 4

An electrical service technician is investigating a faulty printing press, driven by a three phase electric motor is supplied by PVC cables enclosed in a flexible steel conduit. The press has been operating safely for some months, but has now been reported **electrically unsafe**. The electrical service technician has isolated and safety tagged the circuit and carried out and checking procedures to identify the fault

- (a) Describe how the electrical service technician carried out a visual inspection
(2 marks)

- (b) (i) Describe how the electrical service technician carried out a protective earthing continuity test. Include the type of instrument used and the maximum acceptable test result.
(2 marks)

- (ii) Explain how an unsatisfactory test result in (b)(i) could make the printing press electrically unsafe.
(2 marks)

(turn over)

Question 4 continued

- (c) (i) Describe how the electrical service technician carried out an insulation resistance test. Include the type of instrument used and the minimum acceptable test result.

(2 marks)

- (ii) Explain how an unsatisfactory test result in (c)(i) could make the printing press electrically unsafe.

(2 marks)

(turn over)

Question 5

(a) Refer to section 6 of AS/NZS 3000 and answer the following:

(i) Section 6 lists **FOUR** mandatory checks, using test instruments that are required for the testing of a low voltage electrical installation. State **TWO** of those tests

(2 marks)

(1) _____

(2) _____

Ref:

(ii) State **ONE** reason for carrying out each of the following tests:

(1) Continuity of the earthing system

(1 mark)

(2) Insulation resistance

(1 mark)

Ref:

(iii) State the **TWO** reasons why it is necessary to carry out tests to ensure correct circuit connections.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 5 continued

(b) An electrical service technician has repaired a Class I electrical appliance.

(i) Refer to the Electricity Regulations and name the Standard that details the checking and testing to be carried out on the appliance.

(2 marks)

Ref:

(ii) Refer to the Standard you have named in (i) above and state the tests, using test instruments, that are required to be carried out and the minimum or maximum value for each test.

(2 marks)

Ref:

(turn over)

Question 6

Electrical equipment used in damp situations must have an **IP rating** which consists of the initials IP followed by two numbers.

- (a) What do the initials IP stand for? (1 mark)

- (b) What does the first number after the initials indicate? (2 marks)

- (c) What does the second number after the initials indicate? (2 marks)

- (d) What does the letter “W” indicate if it appears between IP and the numbers? (2 marks)

- (e) Describe the level of protection offered by fittings rated at IP56. (3 marks)

5

6

(turn over)

Question 7

- (a) When reloading a rewirable fuse, give **THREE** reasons why it is important to thread the fuse wire from terminal to terminal through the tortuous path in the fuse carrier in the manner intended by the fuse manufacturer.

(3 marks)

(1) _____

(2) _____

(3) _____

- (b) When selecting a replacement cartridge for a blown HRC fuse, it is necessary to consider its **Utilisation Category** (fusing factor).

- (i) What is meant by **Utilisation Category**?

(3 marks)

- (ii) How does the **Utilisation Category** influence the fuse operation?

(2 marks)

- (c) When selecting a fuse link, why is it important to ensure that the correct rupturing capacity is chosen?

(2 marks)

(turn over)

Question 8

(a) A large metal framed, single phase, a.c. mains operated electrical appliance has recently been cleaned and serviced in a workshop. Some sections of its electronic control circuitry have been repaired and/or replaced and are not accessible for disconnection. Before returning the appliance to the factory for reinstallation, an electrical service technician is to carry out a test to frame on the insulation resistance of its internal wiring.

(i) Describe in detail the procedure that should be followed to carry out this test.

(5 marks)

(ii) Give **ONE** reason for selecting the method stated in (a)(i)

(1 mark)

(iii) State any minimum or maximum test value that may apply.

(1 mark)

(turn over)

Question 8 continued

- (b) State **THREE** other checks or tests that should be carried out to ensure that the electrical appliance in (a) above is electrically safe.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 9

(a) Refer the Electricity Act and answer the following:

(i) According to the Electricity Act, every person shall on payment of the prescribed fee (if any), be entitled to be registered as an electrical service technician, if the person satisfies the Board that **FOUR** requirements have been met. State **THREE** of these requirements.

(3 marks)

(1) _____

(2) _____

(3) _____

Ref:

(ii) The Electricity Act requires that a registered person who works for payment of reward must hold an additional type of licence.

(1) What is the name of the licence?

(1 mark)

Ref:

(2) On what date in any year does the licence expire?

(1 mark)

Ref:

(3) To whom must application be made for the licence?

(1 mark)

Ref:

(turn over)

Question 9 continued

(b) Refer to the Electricity Regulations and answer the following:

(i) 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:

(ii) At what intervals must a person complete the tuition in the subjects in (b)(i).

(2 marks)

Ref:

(turn over)

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		
4		
5		
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8		
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10		
TOTAL		