



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

ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRICAL SERVICE TECHNICIAN “A” EXAMINATION

7 May 2005

QUESTION AND ANSWER BOOKLET

Time Allowed: 1.5 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
- AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, 3 and A); NZS 3019 (Int):2002; AS/NZS 3760:2001 or AS/NZS 3760:2003

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

SECTION 1

Each part in this section is worth 5 marks. Write your answer for each question in the box provided

Question 1

If the resistance in a circuit is doubled and the current flowing is halved, the applied voltage will now be:

- (a) Halved
- (b) Doubled
- (c) Four times greater
- (d) The same

Question 2

What power is dissipated by an electrical appliance with a resistance of 20 ohms when supplied at 230V?

- (a) 4600 watts
- (b) 115 watts
- (c) 264.5 watts
- (d) 2645 watts

Question 3

A blown HRC fuse protecting a 230V subcircuit is to be replaced. The load is an electrical appliance rated at 3000W at 230V. Which of the following fuse current ratings would be most appropriate to protect the appliance subcircuit?

- (a) 20A
- (b) 6A
- (c) 16A
- (d) 10A

(turn over)

Question 4

Which of the following voltage ranges defines the **extra-low voltage** in accordance with the Electricity Regulations 1997?

- (a) 0 V to 120V a.c.
0 V to 32V ripple-free d.c.
- (b) 0 V to 50V a.c.
0 V to 120V ripple-free d.c.
- (c) 50 V to 115V a.c.
50 V to 115V d.c.
- (d) 50 V to 120 V a.c.
12 V to 50V ripple-free d.c.

Question 5

When turned to the low position, the three heat switch controlling a small domestic oven will connect the electrical supply to: -

- (a) Two elements in series
- (b) Two elements in parallel
- (c) One element only
- (d) One element in series with a suitable resistor

Question 6

An HRC fuse has a minimum fusing current of 12.5 amps and a Utilisation category (fusing factor) of 1.25. The current rating of this fuse is: -

- (a) 25A
- (b) 13.75A
- (c) 15.625
- (d) 10A

(turn over)

Question 7

When fighting a fire in live electrical equipment, which of the following fire extinguishers should *not* be used?

- (a) Vaporising liquid
- (b) Dry powder
- (c) Water - gas expelled
- (d) Carbon dioxide

Question 8

A portable isolating transformer designed for personal protection is required to be tested after a new flexible cord has been fitted. What is the minimum insulation resistance test value which would be acceptable for the transformer when measured between the supply conductors and its metal case?

- (a) 0.5 ohm
- (b) 1 Megohm
- (c) 50 Megohms
- (d) 1 ohm

Question 9

Under which of the following circuit conditions is a thermal overload specifically designed to operate (trip)?

- (a) A sustained overload
- (b) A small overload of short duration
- (c) A high motor starting current
- (d) A short circuit condition

(turn over)

Question 10

The power dissipated by an electrical appliance with a resistance of 23 ohms and supplied at 230V is: -

- (a) 10 watts
- (b) 100 watts
- (c) 2300 watts
- (d) 5290 watts



(turn over)

Question 11

A 230 Volt electrical circuit contains two heating elements, each having a resistance of 46 ohms.

(a) If the two elements are connected in series to the 230 Volt supply calculate:

(i) The current drawn from the supply (1 mark)

(ii) The total power dissipated by the elements (1 mark)

(b) If the two elements are connected in parallel to the 230 Volt supply calculate:

(i) The circuit resistance (1 mark)

(ii) The current drawn from the supply (1 mark)

(iii) The total power dissipated by the elements (1 mark)

(turn over)

Question 12

(a) Sketch a circuit diagram of a single-phase capacitor start motor.

(2 marks)

(b) Describe how the direction of rotation can be reversed for a single-phase capacitor start motor.

(2 marks)

(c) State **ONE** typical application for a single-phase capacitor start motor.

(1 mark)

(turn over)

Question 13

It is necessary to have a reliable protective earthing conductor (earth continuity conductor) for a Class I electrical appliance.

- (a) State the maximum resistance value permissible for this conductor. (1 mark)

- (b) Briefly describe how this conductor contributes to the electrical safety of the appliance. (2 marks)

- (c) Briefly describe the actions you would take if the protective earthing conductor test on a Class I electrical appliance you have repaired is 15Ω . (2 marks)

(turn over)

Question 14

Electrical appliances are often used in an "earthed situation".

- (a) Refer to AS/NZS 3000 and state ONE situation deemed to be an "earthed situation"?

(2 marks)

Ref:

- (b) Briefly describe the danger that may exist for an operator who uses an electrical appliance in a damp situation

(3 marks)

(turn over)

Question 15

- (a) You are testing an electrical appliance. Give **TWO** reasons why you would not connect a voltmeter in series with the electrical appliance.

(4 marks)

(1) _____

(2) _____

- (b) When using the voltmeter to measure an unknown voltage in an appliance, which meter range should be selected first?

(1 mark)

(turn over)

Question 16

You are testing an electrical appliance. State **FOUR** reasons why you would not connect an ammeter in parallel with the electrical appliance.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 17

- (a) Sketch the circuit diagram of a single phase circuit protected by a fuse, controlled by a double pole switch and supplying three resistors connected in parallel.

Include an ammeter to measure the total circuit current and a voltmeter to measure the voltage across the resistors.

(3 marks)

- (b) If each resistor is 150Ω and the voltmeter reads $230V$, what is:

- (i) The reading on the ammeter?

(1 mark)

- (ii) The total power dissipated by the resistors?

(1 mark)

(turn over)

Question 18

You have replaced the element and flexible cord on a Class I, two bar portable electric heater. The Electricity Regulations require certain checks and tests be carried out in accordance with a Standard before the heater is returned to service.

Refer to that Standard and, in the spaces below, state the type of checks or tests using test instruments, the type of instrument used to perform these tests, and any minimum or maximum values that apply.

(5 marks)

Test or check	Type of test instrument	Minimum or maximum values
	Any instrument with a low reading ohms scale	

Question 20

(a) What is the essential safety difference between switching an electrical appliance off and isolating an electrical appliance?

(2 marks)

(b) Describe a method of safely ensuring the continued isolation of an electrical appliance.

(1 mark)

(c) Refer to the Electricity Regulations and state what is meant by the term **personal protective equipment**?

(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
	Section 1	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
Total section 1		
	Section 2	
	11	
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	20	
Total section 2		
TOTAL MARKS		