



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

## ELECTRICAL SERVICE TECHNICIAN “A” EXAMINATION

### 19 November 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 and you must get at least 25 marks in section 2.**

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 all working 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 and amendments or The Electricity Act 1992 reprint dated 19 August 2005.
- 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 or  
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; 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 question in this section is worth 5 marks. Write your answer for each question in the box provided

### Question 1

Which of the following documents specifies the tests to be carried out on an electrical appliance which is for hire or lease?

- a ECP 3
- b ECP 50
- c AS 1939:1990
- d AS/NZS 3760

### Question 2

If the resistance in a circuit is doubled and the applied voltage is increased four times, the current flow will now be:

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

### Question 3

When the medium position is selected on a three-heat switch controlling heating elements, it will connect:

- a Two elements in series with the supply
- b One element only across the supply
- c Two elements in parallel across the supply
- d One element in series with a suitable resistance

(turn over)

#### Question 4

At 8 cents per unit, what will be the cost of the energy consumed in 10 hours by a heater that draws 15A from the 230V supply?

- a \$3.45
- b 34.5c
- c \$2.76
- d \$27.60

#### Question 5

When preparing flexible cord conductors for termination in a portable electric heating oven, the insulation should be removed:

- a Just up to the terminals
- b Only far enough to prevent heat deterioration of the insulation
- c At least 10mm from the terminal post
- d And replaced by vulcanised rubber tape

#### Question 6

What is the power output of a small electric motor with a nameplate that reads:

Voltage	230
Phases	1
Horsepower	0.5
Speed	1425 r.p.m.

- a 373 watts
- b 415 watts
- c 460 watts
- d 500 watts

(turn over)

### Question 7

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 8

In a parallel circuit, the section which has the lowest resistance also has the:

- a Greatest voltage drop
- b Lowest current
- c Highest heating effect
- d Smallest voltage drop

### 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

### Question 10

A fuse blows at 25 amps and has a Utilisation category (fusing factor) of 1.25. The rated current for this fuse is:-

- a 12.5A
- b 20A
- c 10A
- d 31.25A

(turn over)

### Question 11

Meters used to test **THREE** separate resistive circuits have indicated the values stated in the table below. Using this information, calculate Values 1 and 2 and answer question (c).

Circuit	Supply Voltage	Total Ohms resistance	Current	Watts
Circuit One	230	<b>Value 1</b>	10	2300
Circuit Two	200	40 ohms	<b>Value 2</b>	<b>Value 3</b>
Circuit Three	<b>Value 4</b>	46	5	1150

(a) Value 1 (2 marks)

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(b) Value 2 (2 marks)

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(c) What type of meter would be used to measure the supply voltage. (1 mark)

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**(turn over)**

## Question 12

Meters used to test **THREE** separate resistive circuits have indicated the values stated in the table below. Using this information, calculate Values 3 and 4 and answer question (c).

Circuit	Supply Voltage	Total Ohms resistance	Current	Watts
Circuit One	230	<b>Value 1</b>	10	2300
Circuit Two	200	40 ohms	<b>Value 2</b>	<b>Value 3</b>
Circuit Three	<b>Value 4</b>	46	5	1150

(a) Value 3

(2 marks)

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(b) Value 4

(2 marks)

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(c) What type of meter would be used to measure the current.

(1 mark)

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### Question 13

- (a) Explain why the voltage at the load end of a flexible cord extension set supplying current to an electrical appliance is less than the voltage at the supply end of the cord?

(1 mark)

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- (b) State **TWO** ways in which the effect in (a) above can be reduced.

(2 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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- (c) All flexible cords are given a **current rating**. What does **current rating** mean in respect to flexible cords?

(2 marks)

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(turn over)

## Question 14

- (a) A microgap switch is rated to switch a circuit at 10 amp 230V a.c. only. State **ONE** reason why this switch would not be suitable for use on a d.c. circuit of similar current and voltage.

(2 marks)

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- (b) State **TWO** reasons why a bayonet cap adaptor must not be used to supply a Class I electrical appliance

(2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

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- (c) When connecting a flexible cord to a metal Edison type screw lampholder it is preferable to connect the neutral conductor to the outer contact. State the **ONE** reason why this precaution promotes electrical safety?

(1 mark)

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(turn over)

## Question 15

- (a) Briefly describe the actions you would take if the protective earthing conductor test on a Class I electrical appliance you have repaired is  $15\Omega$ .

(3 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(3) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

(2 marks)

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(turn over)



### Question 17

- (a) Sketch and label a circuit diagram of a single phase circuit controlled by a single pole switch and supplying three resistors connected in series.

Resistor 1 =  $150 \Omega$

Resistor 2 =  $100 \Omega$

Resistor 3 =  $70 \Omega$

Include an ammeter to measure the total circuit current.

(2 marks)

- (b) If the ammeter reads  $0.72\text{A}$ , what is the supply voltage of the circuit?

(3 marks)

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## Question 18

You have repaired the electric motor and flexible supply cord of a concrete mixer and need to carry out an insulation resistance test.

- (a) What test would you carry out to confirm that the protective earthing conductor is continuous?

(1 mark)

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- (b) You have established that the protective earthing conductor is continuous. Briefly describe how you will carry out the insulation resistance test.

(2 marks)

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- (c) (i) Name the instrument you would use to carry out the insulation resistance test?

(1 mark)

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- (ii) What test voltage would you select to carry out the insulation resistance test?

(1 mark)

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## Question 19

- (a) State **THREE** technical advantages which HRC fuses have over rewirable fuses. (3 marks)

(1) \_\_\_\_\_

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(2) \_\_\_\_\_

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(3) \_\_\_\_\_

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- (b) Briefly state **TWO** safety reasons why it is not permitted to bridge the terminals of HRC fuse carriers with fuse wire of the same current rating as the blown cartridge. (2 marks)

(1) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(turn over)

## Question 20

One of the important safety requirements of the Electricity Regulations is that electrical workers must undertake refresher courses. Refer to the Regulations and state:

(a) The **FOUR** refresher courses which must be undertaken.

(4 marks)

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

(4) \_\_\_\_\_

Ref: .....

(b) How often must these refresher courses be undertaken?

(1 mark)

\_\_\_\_\_

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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**For Examiner's Use Only**

	Questions Answered	Marks
	<b>Section 1</b>	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
<b>Total section 1</b>		
	<b>Section 2</b>	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
<b>Total section 2</b>		
<b>TOTAL MARKS</b>		