



<b>Candidate Code No.</b>	
<b>For Board Use Only</b>	
Result	Result
Date	Date
Int	Int

# **ELECTRICAL WORKERS REGISTRATION BOARD**

## **ELECTRICAL SERVICE TECHNICIAN “A” EXAMINATION**

### **18 June 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.

**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; 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

What power is dissipated by an electrical appliance with a resistance of 50 ohms when drawing a current of 6 amps?

- a 0.3 kW
- b 15 kW
- c 1.5 kW
- d 1.8 kW

### Question 2

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

### Question 3

A circuit fuse blows when the correct fuse link is inserted. What may result if the fuse link is replaced with one of a larger current rating?

- a It could cause damage to the circuit wiring
- b The current drawn by the load will increase
- c The voltage drop in the circuit will increase
- d It could solve the problem

(turn over)

#### Question 4

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

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

#### Question 5

The main reason for carrying out an insulation resistance test on an electrical appliance is to:

- a Check that the electrical appliance will function correctly
- b Verify that the insulation of current carrying components is capable of withstanding the normal supply voltage
- c Verify that the insulation resistance does not exceed the limit of 1 Megohm
- d Verify that the insulation of current carrying components is capable of withstanding the maximum load current

#### Question 6

Which of the following three core flexible cords has the least conductor resistance?

- a 5 metres of 0.75mm<sup>2</sup> cord
- b 10 metres of 1.0mm<sup>2</sup> cord
- c 5 metres of 1.0mm<sup>2</sup> cord
- d 10 metres of 0.75mm<sup>2</sup> cord

(turn over)

### Question 7

A small electric heating element is rated at 230 volts, 100 watts.

The current drawn by this element when operating will be:

- a 2.3 A
- b 435 mA
- c 230 mA
- d 4.35 A

### Question 8

To comply with the Electricity Regulations, the maximum voltage to earth which can be used to supply a handheld electrical appliance is?

- a 250 Volts
- b 32 Volts
- c 400 Volts
- d 230 Volts

### Question 9

An HRC fuse with a Utilisation category (fusing factor) of 1.5 has a minimum fusing current of 30 amps. The current rating of this fuse is:

- a 45A
- b 31.5A
- c 20A
- d 30A

(turn over)

### Question 10

At 10 cents per unit, what will be the cost of the electrical energy consumed in 5 hours by a heater which draws 10A from the 230V mains supply?

- a 115 cents
- b \$2.30
- c 2300 cents
- d 460 cents



(turn over)

### Question 11

Briefly explain **ONE** reason for carrying out the following **tests** on an electrical appliance.

- (a) Protective earthing conductor (earth continuity conductor) resistance test (2 marks)

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- (b) Polarity test (1 mark)

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- (c) Insulation resistance test (2 marks)

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## Question 12

When inspecting a portable electrical appliance for defects a **visual** check should be carried out in addition to the prescribed electrical tests. Refer to AS/NZS 3760 and briefly describe **FIVE** of the specific checks that should be carried out visually.

(5 marks)

- (1) \_\_\_\_\_  
\_\_\_\_\_
- (2) \_\_\_\_\_  
\_\_\_\_\_
- (3) \_\_\_\_\_  
\_\_\_\_\_
- (4) \_\_\_\_\_  
\_\_\_\_\_
- (5) \_\_\_\_\_  
\_\_\_\_\_

(turn over)

### Question 13

A 230V, single phase, three-core flexible cord supplying a Class I electrical appliance is required to be replaced. In the table below, list the polarity and the colour coding acceptable for the replacement cord.

(5 marks)

<b>Existing cord conductor colours</b>	<b>Polarity</b>	<b>New Colours</b>
<b>Green</b>		
<b>Black</b>		
<b>Red</b>	<b>Phase or Active or Live</b>	

(turn over)



**Question 15**

A 230V, Class I, plug-in electrical appliance is controlled by a single pole switch. Following repairs, the internal conductors were transposed, with the neutral conductor connected to the switch instead of the phase conductor.

- (a) State **ONE** effect on the safe operation of the electrical appliance this transposition could create.

(2 marks)

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- (b) Describe **THREE** other situations that would cause the neutral to be switched instead of the phase in such an appliance.

(3 marks)

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

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

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

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**Question 16**

- (a) A fuse has blown on a switchboard circuit supplying a single plugged in appliance. The appliance has been disconnected and taken away to be tested for faults.

When the fuse is replaced and the main switch is turned on, the fuse blows again. What is the probable cause of the fault and what action should be taken to rectify it?

(2 marks)

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- (b) When replacing an HRC cartridge fuse which has blown, the replacement must have characteristics the same as the original. State **THREE** electrical characteristics to be checked for similarity.

(3 marks)

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

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

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

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**Question 17**

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

(4 marks)

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- (b) What do the letters “PRCD” stand for?

(1 mark)

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## Question 18

Following repairs to the electric motor and flexible supply cord of a concrete mixer, a test of its protective earthing conductor must be carried out.

- (a) What instrument should be used to make this test?

(1 mark)

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- (b) State the acceptable maximum resistance value for the protective earthing conductor.

(1 mark)

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- (c) Explain how a low protective earthing conductor resistance value contributes to the electrical safety of the appliance when a fault occurs between the phase and exposed metal.

(3 marks)

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## Question 19

- (a) State one type of electrical appliance controlled by a thermostat. (1 mark)

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- (b) Briefly explain the operation principles of:

- (i) An energy controller (Simmerstat). (2 marks)

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- (ii) A thermostat. (2 marks)

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## Question 20

(a) In the space below, draw and label a circuit diagram showing:

- An ammeter
- A voltmeter
- A 230V, 1500W single-phase Class I plug-in electric heater.
- The phase (active), neutral and earth conductors

Note: assume the heater is connected via a socket outlet (you do not need to draw the socket outlet).

(3 marks)

(b) Calculate the current drawn by the heater.

(2 marks)

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**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**

	<b>Questions Answered</b>	<b>Marks</b>
	<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>		