



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

ELECTRICAL WORKERS REGISTRATION BOARD
ELECTRICAL SERVICE TECHNICIAN “A” EXAMINATION
10 September 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

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

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

Question 2

A registered electrical service technician is requested by a neighbour to check and test an electrical concrete mixer to ensure it is safe to use after carrying out repairs.

Which document details the specific tests which must be carried out after fitting a new flexible cord and plug to the mixers electric motor?

- a AS/NZS 3760
- b AS: 6370
- c AS/NZS 3019
- d AS/NZS: 3016

Question 3

If a Class I portable electrical 230V appliance with a phase to framework fault and broken protective earthing conductor (earth continuity conductor) is being used outdoors, which of the following protection devices will prevent the passage of an electric current through the operator's body?

- a An HRC fuse
- b A 230/230 volt isolating transformer
- c An overload relay
- d A Residual Current Device (RCD)

(turn over)

Question 4

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 5

To carry out mouth to mouth rescue breathing it is necessary to tilt the patient's head backwards and lift the chin. This action ensures:

- a A quick changeover between two rescuers
- b A clear airway to the patients lungs
- c An unrestricted path for blood to flow to the patients brain
- d A clear view of the patients chest rise and fall

Question 6

It is recommended that not more than one portable electrical appliance is used at any one time from an isolating transformer. The reason for this is to:

- a Prevent transformer overloading.
- b Minimise the possibility of electric shock.
- c Minimise the problem of excessive voltage drop.
- d Prevent polarity interchange.

Question 7

Before carrying out repairs on a single phase plug-in electrical appliance, which of the following actions would be the most effective in ensuring personal safety?

- a Tag the electrical appliance as unsafe
- b Turn off the main switch at the switchboard
- c Withdraw the appliance flexible cord plug from the socket
- d Remove the fuse that protects the plug socket

(turn over)

Question 8

The maximum permitted resistance of the protective earthing conductor (earth continuity conductor) when measured between the earth pin of the supply plug and the metal framework of a Class I electrical appliance is?

- a 1 Megohm
- b 1.25 ohms
- c 1.5 ohms
- d 1 ohm

Question 9

Select from the single core flexible cords listed below, the cord which would have the most electrical resistance.

- a 10 metres of 1.0mm² cord
- b 3 metres of 1.0mm² cord
- c 10 metres of 0.75mm² cord
- d 3 metres of 0.75mm² cord

Question 10

In a series circuit, the section which has the highest resistance also has the:

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

(turn over)

Question 11

- (a) How is the start winding in a single-phase capacitor start motor disconnected when the motor is up to speed?

(1 mark)

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

(2 marks)

- (c) Describe how the direction of rotation can be reversed in a Universal (series) motor

(2 marks)

(turn over)

Question 12

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

(5 marks)

Existing cord conductor colours	Acceptable Colours in New Zealand	Polarity
Green		
Black		
Red		Phase or Active or Live

(turn over)

Question 13

- (a) Draw and label a circuit diagram showing an ammeter connected to measure the current supplied to a 230 V Class II, single phase electric heater. (3 marks)

You must show:

- The polarity of the supply.
- The heater and element, controlled by an internal switch.
- The ammeter
- A fuse protecting the circuit.

- (b) If the reading on the ammeter is 8.7 A, calculate the resistance of the heater. (2 marks)

(turn over)

Question 14

The test report for a Class I, 230 V single phase fan heater states that the protective earthing conductor (earth continuity conductor) has a resistance of 17.8Ω . There is a phase to frame fault of negligible resistance on the heater.

The heater is plugged into a live socket outlet. The socket outlet is protected by a 15A HRC fuse with a 1.25 Utilisation category (fusing factor).

- (a) Calculate the current flowing in the protective earthing (earth continuity) conductor. (2 marks)

- (b) Calculate the power dissipated in the protective earthing (earth continuity) conductor. (2 marks)

- (c) Would the fuse operate? Give ONE reason to support your answer. (1 mark)

(turn over)

Question 15

- (a) In accordance with which Standard must a portable electric water heater be tested following completion of repairs?

(1 mark)

- (b) Refer to the Standard required in (a) above and complete the table by stating:

- (i) The type of instrument required for each test,
(ii) The appropriate minimum or maximum value of the test result which is acceptable to comply.

(4 marks)

Type of test	(i) Type of instrument required	(ii) Test result
Earthing continuity		
Insulation resistance test		

(turn over)

Question 16

- (a) A polarity test should be carried out on a Class I electrical appliance after a replacement flexible cord has been fitted. The appliance is controlled by a single-pole switch. Detail the **FOUR** important points this polarity test will confirm?

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

- (b) (i) What type of test instrument would you use to test for polarity?

(½ mark)

- (ii) What range would you select on the test instrument?

(½ mark)

(turn over)

Question 17

Rewirable fuses and HRC fuses may be found on switchboards.

(a) It is important to replace a blown fuse with one of the correct current rating. What would be the overall effect on a subcircuit if you used a replacement fuse that had:

(i) An under-rated current rating, compared to the fuse that had blown? (1 mark)

(ii) An over-rated current rating, compared to the fuse that had blown? (1 mark)

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

(1)

(2)

(3)

(turn over)

Question 18

Briefly state **FIVE** 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.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(turn over)

Question 19

In order to determine the current that will be drawn by an appliance, the values of the supply voltage and appliance resistance are both required.

An ohmmeter is to be used to measure the resistance of a plug-in heater designed for use on 230V supply. When correctly connected to the heater's flexible cord plug-top the ohmmeter gives a reading of 21.8 ohms.

- (a) Calculate the current the heater would draw when it is turned on? (2 marks)

- (b) Calculate the power (watts) the heater will dissipate. (2 marks)

- (c) Would the power the heater dissipates change if the supply voltage was 240 V? Give **ONE** reason to support your answer. (1 mark)

(turn over)

Question 20

A 230V electric blanket has two elements controlled by a three-heat switch. Each element has a resistance of 46 ohms.

- (a) If the blanket switch is set in the “low” position, calculate the power dissipated in the blanket.

(2 marks)

- (b) If the blanket switch is set in the “high” position, calculate the current drawn from the supply

(3 marks)

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		