



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

ELECTRICAL SERVICE TECHNICIAN “A” EXAMINATION

18 September 2004

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 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 (including amendments 1 and 2); 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

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

Voltage	230
Phases	1
Horsepower	0.75
Speed	1425 r.p.m.

- a 373.3 watts
- b 375.5 watts
- c 559.5 watts
- d 750.3 watts

Question 2

The electrical energy consumed in 8 hours by an electric heater that draws 4A from the 230V mains supply is -

- a 9.2 kWh
- b 7.36 kWh
- c 3.68 kWh
- d 0.46 kWh

Question 3

An HRC fuse that protects a final subcircuit supplying a fixed wired electrical appliance rated at 1500W at 230V has blown. The rating of the original fuse is unknown.

From the following HRC fuses, select the minimum current rating which would allow this appliance to operate.

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

(turn over)

Question 4

The maximum current a flexible cord can carry safely without overheating depends mainly on:

- a The type of supply, a.c. or d.c.
- b The cross-sectional area of the flexible cord conductors
- c The length of flexible cord used
- d The number of cores in the flexible cord

Question 5

To comply with AS/NZS 3760, the insulation resistance test of a repaired electrical appliance must not be not less than:

- a 500 ohms
- b 0.5 ohms
- c 1 Megohm
- d 0.5 Megohms

Question 6

An analogue multimeter is being used to check the 230V single phase supply connected to a heating element which is in good condition.

Directly following the successful voltage test, the meter probes are reconnected in series with the element to measure the current. However, by mistake neither the meter jack plugs nor the range switch have been altered from the previous (voltage) setting.

When the circuit is switched on, the meter will:

- a burn out
- b indicate zero volts
- c cause the circuit fuse to blow
- d reduce the expected current flow through the element and indicate 230V

(turn over)

Question 7

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)

Question 8

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 9

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

(turn over)

Question 10

The symbol of a *square within a square* found on many electrical appliances is used to indicate: -

- a An extra-low voltage electrical appliance
- b A New Zealand Standard approved electrical appliance
- c A double insulated electrical appliance
- d An electrical appliance to be supplied from an isolating transformer



(turn over)

Question 12

The table below represents the characteristics for three HRC fuses.

Complete the table by filling in the spaces with the appropriate information as required.

(5 marks)

Current rating	Utilisation category (fusing factor)	Minimum fusing current	Class
15 amps	1.5		
	1.25	25 amps	Q1
16 amps		32 amps	

(turn over)

Question 13

(a) A 25 metre three core flexible extension cord has been wound on a cable drum to provide a convenient means of storage.

(i) State the **TWO** operational precautions, either of which could be taken to prevent **insulation failure** when the cord is in use.

(2 marks)

(1) _____

(2) _____

(ii) Describe how the cord might fail if one of the precautions you have stated in (a)(i) was not taken?

(1 mark)

(b) 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 **TWO** reasons why this precaution promotes electrical safety?

(2 marks)

(1) _____

(2) _____

(turn over)

Question 14

- (a) Single-phase plug-in electrical appliances normally operate at standard low voltage. Refer to the Electricity Regulations and define the term standard low voltage as it applies to single-phase plug-in electrical appliances.

(1 mark)

Ref:

- (b) New flexible cords are to be fitted to two different single-phase plug-in electrical appliances. Complete the following table.

(4 marks)

Type of appliance	Active (Phase) colour	Neutral colour	Earth colour	No. of cores required
Earthed electrical appliance				
Double insulated electrical appliance				

(turn over)

Question 15

- (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)

- (b) State **ONE** reason why it is recommended that the protective earth conductor should be left longer than the phase and neutral conductors when fitting a three core flexible cord to an appliance.

(1 mark)

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

(2 marks)

(1) _____

(2) _____

(turn over)

Question 16

(a) A 230 V plug-in electrical appliance has MOV surge protection fitted. You have repaired the appliance and need to carry out an insulation resistance test. Refer to AS/NZS 3760 and answer the following:

(i) State insulation test voltage that should be applied. (1 mark)

Ref:

(ii) State the **TWO** reasons why the test voltage you have stated in (i) is applied.

(1) _____

(2) _____

Ref:

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

(2 marks)

(1) _____

(2) _____

(turn over)

Question 17

- (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. What important points will this polarity test confirm? (3 marks)

- (b) (i) What type of test instrument would you use to test for polarity? (1 mark)

- (ii) What range would you select on the test instrument? (1 mark)

(turn over)

Question 18

(a) When carrying out a protective earthing conductor (earth continuity) resistance test to the exposed metal parts of an electrical appliance, why is it necessary to:

(i) First touch the meter probes together

(2 marks)

(ii) Select the appropriate ohms range

(2 marks)

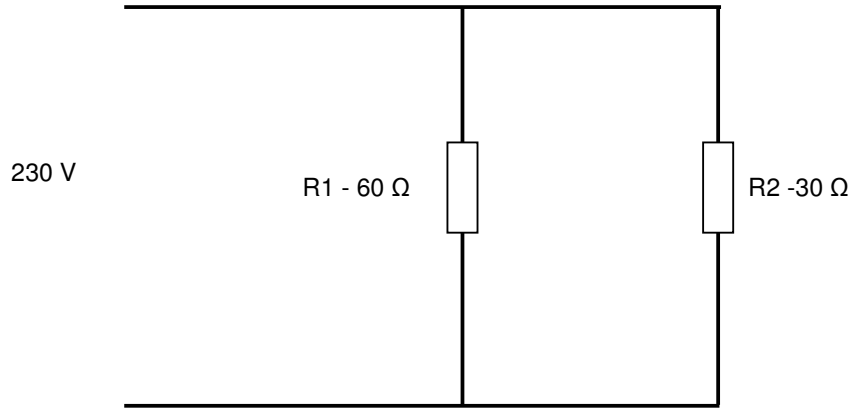
(b) Refer to AS/NZS 3760 and state the maximum resistance value for the protective earthing conductor of a Class I electrical appliance.

(1 mark)

(turn over)

Question 19

This figure shows a 230 volt circuit with a 60 ohm and 30 ohm resistance connected in parallel.



- (a) Calculate the current flowing in R1 (2 marks)

- (b) Calculate the current flowing in R2 (2 marks)

- (c) Calculate the total current flowing. (1 mark)

(turn over)

Question 20

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

(2 marks)

- (b) State **TWO** typical applications for a Universal (series) motor

(2 marks)

(1) _____

(2) _____

- (c) State **ONE** typical application for a shaded pole motor

(1 mark)

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		
Questions Answered	Marks	
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