TEWC135

ELECTRICAL WORKERS REGISTRATION BOARD

Safety • Competency

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

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

054

25 June 2005

PLUMBERS *OR* GASFITTERS

QUESTION AND ANSWER BOOKLET

Time Allowed Two hours and 30 minutes

INSTRUCTIONS – READ CAREFULLY

You have 10 minutes to read this paper but do not start writing until you are told to do so by the supervisor.

Write your Candidate Code Number in the box provided above. Your name must NOT appear anywhere on this paper

The pass mark for this examination is 60 marks.

Plumbers must attempt all questions in Sections 1 and 2.

Gasfitters must attempt all questions in Sections 1 and 3.

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 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 or NZS 3019:2004; AS/NZS 3760:2001 or AS/NZS 3760:2003.

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

SECTION 1 – ALL CANDIDATES

Question 1

(a) State **TWO** factors which affect the severity of electric shock upon the human body.

(2 marks)

_____

_____

(b) The sheath of a flexible cord supplying an electrical appliance has been damaged exposing the basic insulation.

(i) State the action that needs to be taken.

(1 mark)

_____

_____

(ii) Explain the reason why the action has been taken.

(1 mark)

_____

_____

(c) What voltage should be indicated when taking a voltage reading at a standard low voltage single phase socket outlet?

(2 marks)

_____

(d) Calculate the current that will be drawn by a water heater element rated at 1.2kW, 230V.

(2 marks)

_____

_____

(turn over)

Question 1 continued

(e) A new fuse needs to be inserted into a fuse carrier to replace a blown fuse on a switchboard. Briefly explain the **TWO** main safety reasons why the main switch should be turned off before removing the fuse carrier from, or replacing it into, the fuse base.

(2 marks)

(1) _____

_____

(2) _____

_____

(f) A circuit fuse blows every time the correct fuse link is inserted. If the fuse link is replaced with one of a higher current rating, state **TWO** undesirable effects that may occur.

(2 marks)

(1) _____

_____

(2) _____

_____

(g) A replacement flexible cord is being fitted to a single phase double insulated electrical appliance. List **TWO** technical factors that must be considered when selecting the flexible cord.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 1 continued

(h) Work is being carried out on a 230V plug-in electrical appliance. The only instrument available is an ohmmeter which gives a reading of 23 ohms when connected to the appliance's flexible cord plug. Calculate the power (in watts) the appliance will use when it is supplied at 240V.

(2 marks)

_____

_____

_____

(i) State **ONE** typical application for each of the following electrical control devices:

(i) A solenoid valve.

(1 mark)

_____

(ii) A pressure switch.

(1 mark)

_____

(j) A fuse has blown on a switchboard circuit supplying a single phase plug-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)

_____

_____

(turn over)

Question 2

(a) A replacement flexible cord is being fitted to a single phase Class I electrical appliance.

(i) How many cores must there be in the flexible cord?

(1 mark)

_____

(ii) What colour coding is required for the cores of the flexible cord?

(3 marks)

_____

_____

_____

(b) A flexible cord is to be fitted to a single phase electrical appliance. List **FIVE** considerations which may influence the selection of the cord.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(c) State **ONE** primary characteristic that determines the maximum current a flexible cord can conduct safely without overheating.

(1 mark)

_____

_____

(turn over)

Question 3

(a) When selecting a replacement cartridge for an open circuit HRC fuse, it is necessary to consider its **Utilisation category (fusing factor)**.

(i) State what is meant by **Utilisation category (fusing factor)**.

(3 marks)

_____

_____

(ii) How does the **Utilisation category (fusing factor)** influence the fuse operation?

(2 marks)

_____

_____

(b) A circuit supplies a fixed wired electrical appliance rated at 3000W, 230V. The HRC fuse protecting the circuit has blown. Show by calculation, the rating of the HRC fuse cartridge that would be purchased to replace the blown one.

(3 marks)

_____

_____

_____

_____

_____

_____

(c) State why is it important when selecting a fuse link to ensure that the correct category of duty is chosen.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 4

(a) Sketch and label the circuit diagram of a 230V, single phase circuit, controlled by a single pole switch and protected by a fuse that supplies three resistors (R_1, R_2, R_3) connected in parallel.

Include an ammeter to measure the total circuit current and a voltmeter to measure the voltage across the resistors. The correct polarity supply must be shown.

(3 marks)

(b) The combined resistance of the parallel resistances is 50 ohms.

(i) Show by calculation, the reading on the ammeter?

(2 marks)

_____

_____

_____

_____

(ii) What is the reading on the voltmeter?

(1 mark)

_____

(turn over)

Question 4 continued

(iii) Calculate the total power used by the resistors.

(2 marks)

_____

_____

_____

_____

(iv) Calculate the total power used by the resistors if the circuit voltage was 240V.

(2 marks)

_____

_____

_____

_____

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

A 230V fixed wired appliance is connected via a flexible cord to a permanent connection unit and is supplied from a fuse on a three-phase switchboard.

You have been requested by the Supervisor to disconnect the appliance from the supply and remove it for major servicing work. The flexible cord is to remain with the appliance.

You do not need to contact the Supervisor before starting the work or after finishing.

Warning: If any part of your answer is dangerous or hazardous, you will get no marks for this question.

(a) Describe how you would safely isolate the appliance.

(3 marks)

_____

_____

_____

_____

_____

_____

_____

_____

(b) What would you do to ensure that the appliance is safely isolated?

(2 marks)

_____

_____

_____

_____

(turn over)

Question 5 continued

(c) Describe the action you would take if you find that, when testing to ensure the appliance is safely isolated, the circuit is still live.

(2 marks)

_____

_____

_____

_____

(d) Describe the work the Supervisor requested you to do.

(1 mark)

_____

_____

_____

_____

(e) Describe what you would do to leave the site safe.

(2 marks)

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(turn over)

Question 6

(a) A domestic storage water heater is supplied via a TPS cable, surface mounted isolating switch and PVC conduit wire enclosed in flexible steel conduit. Describe **THREE** different situations where either live terminals or basic insulation could be exposed to touch.

(3 marks)

(1) _____

_____

(2) _____

_____

(3) _____

_____

(b) Give **TWO** reasons why the flexible steel conduit used to supply the storage water heater must be securely clamped.

(2 marks)

(1) _____

_____

(2) _____

_____

(c) The adjacent isolating switch for the water heater has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **TWO** reasons why the terminals may still be live.

(2 marks)

(1) _____

_____

(2) _____

_____

(turn over)

Question 6 continued

(d) You have replaced the element in the water heater. Refer to AS/NZS 3760 and state the **THREE** tests that must be carried out before the supply is reconnected to the water heater.

(3 marks)

(1) _____

(2) _____

(3) _____

Ref: …….

(turn over)

Question 7

(a) Electrical equipment designed for use in damp situations has an IP rating. An **IP rating** consists of the initials IP followed by two numbers. Refer to AS1939 or AS/NZS 3000 and answer the following:

(i) What is an IP rating?

(2 marks)

_____

_____

Ref: ……

(ii) Explain what the first number after the letters IP indicates.

(2 marks)

_____

_____

Ref: ……

(iii) Explain what does the second number after the letters indicates.

(2 marks)

_____

_____

Ref: ……

(b) If an electrical appliance or fitting is labelled "**IP 23**".

(i) What level of protection is specified by the number 2?

(1 mark)

_____

_____

_____

(turn over)

Question 7 continued

(ii) What level of protection is specified by the number 3?

(1 mark)

_____

_____

_____

Ref: ……

(c) In accordance with AS/NZS 3000 what is a **damp situation?**

(2 marks)

_____

_____

_____

_____

_____

_____

Ref: ……

(turn over)

Question 8

(a) Before a Class I electrical appliance is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and also tested in two ways. Refer to AS/NZS 3760 and:

(i) State the type of inspection required.

(2 marks)

_____

_____

Ref: …….

(ii) Complete the following:

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

(turn over)

Question 8 continued

(b) Refer to AS/NZS 3760 and state the **TWO** actions that must be taken if one of the tests stated in (a)(ii) is non-compliant.

(2 marks)

(1) _____

_____

(2) _____

_____

Ref: …….

(c) Describe **TWO** ways of identifying a double insulated appliance.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 9

(a) When testing a 230V storage water heater to see whether it is safe to use, the following electrical tests are carried out:

- Protective earthing conductor continuity test.
- Insulation resistance test
- Polarity test

Briefly explain the reason for carrying out each test:

(i) Protective earthing conductor continuity test

(2 marks)

_____

_____

_____

_____

(ii) Insulation resistance test.

(1 mark)

_____

_____

(iii) Polarity test.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 9 continued

(b) Explain how an insulation resistance test should be carried out on a 230V under-sink water heater. The answer must include the type of instrument used and the maximum or minimum acceptable values.

(4 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

(c) Refer to AS/NZS 3760 and state the voltage specified for carrying out an insulation resistance test on a Class I electrical appliance.

(1 mark)

_____

Section 3 – Gasfitters Only

Question 10

A 230V fixed wired appliance is connected via a flexible cord to a permanent connection unit and is supplied from a fuse on a three-phase switchboard.

You have been requested by the Supervisor to disconnect the appliance from the supply and remove it for major servicing work. The flexible cord is to remain with the appliance.

You do not need to contact the Supervisor before starting the work or after finishing.

Warning: If any part of your answer is dangerous or hazardous, you will get no marks for this question.

(a) Describe how you would safely isolate the appliance.

(5 marks)

_____

_____

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(turn over)

Question 10 continued

(b) Describe the action you would take if you find that, when testing to ensure the appliance is safely isolated, the circuit is still live.

(2 marks)

_____

_____

_____

_____

(c) Describe the work the Supervisor requested you to do.

(1 mark)

_____

_____

_____

_____

(d) Describe what you would do to leave the site safe.

(2 marks)

_____

_____

_____

_____

(turn over)

Question 11

(a) Before a Class I electrical appliance is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and also tested in two ways. Refer to AS/NZS 3760 and:

(i) State the type of inspection required.

(2 marks)

_____

_____

Ref: …….

(ii) Complete the following:

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

Name of test: _____

(½ mark)

Type of instrument: _____

(½ mark)

Acceptable test result: _____

(1 mark)

Ref: …….

(turn over)

Question 11 continued

(b) Refer to AS/NZS 3760 and state the **TWO** actions that must be taken if one of the tests stated in (a)(ii) is non-compliant.

(2 marks)

(1) _____

_____

(2) _____

_____

Ref: …….

(c) Describe **TWO** ways of identifying a double insulated appliance.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 12

An isolating switch supplying a 230V a.c. single phase induction motor in a gas boiler is to be replaced. What would be the result in terms of safety to the user and the motor's operation, if during reconnection the following conductors were accidentally interchanged at the supply side of the isolating switch: -

(a) The phase and neutral

(4 marks)

_____

_____

_____

_____

(b) The neutral and earth

(2 marks)

_____

_____

_____

_____

(c) The phase and earth

(3 marks)

_____

_____

_____

_____

(d) State **ONE** test that would detect the interchange of the phase and earth conductors?

(1 mark)

_____

(turn over)

Question 13

(a) State the advantage of using an isolating transformer with a **double insulated** appliance in an outdoor situation.

(3 marks)

_____

_____

_____

_____

_____

_____

(b) Explain the reason why it is recommended that a portable isolating transformer be placed as near as practical to the point of supply.

(2 marks)

_____

_____

_____

_____

_____

_____

(turn over)

Question 13 continued

(c) The **prove-test-prove** method is recommended for checking that isolation has been achieved. Explain how this test is carried out.

(5 marks)

(turn over)

Question 14

(a) State the electrical tests or checks you would normally carry out on a gas fired boiler before it is returned to service after a repair.

(5 marks)

(b) Explain how a protective earth continuity test should be carried out on a 230V ac plug-in Class I appliance. The answer must include the type of instrument used and the maximum or minimum acceptable values.

(5 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

For Examiner's Use Only		
Questions Answered	**Marks**	
Section 1		
1		
2		
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Total Section 1		
Section 2		
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Section 3		
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Total section 3		
TOTAL SECTIONS 1 & 2		
OR		
TOTAL SECTIONS 1 & 3		