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

TRADESPERSON ELECTRICAL WORK CERTIFICATE EXAMINATION

24 November 2007

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 will need to use some of the following documents in this examination:

- The Electricity Act 1992 reprinted at 19 August 2005.
- The Electricity Regulations 1997 reprinted at 5 September 2005.
- AS 60529 or AS 1939 supplement 1 – 1990; AS/NZS 3000:2000 (including amendments 1, 2, A and 3); 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) Describe how to measure voltage at the supply terminals of a fixed-wired single phase appliance.

(2 marks)

- (b) State what is meant by the symbol of a **square within a square** on an electrical appliance.

(2 marks)

- (c) (i) State the unit of power used by an electrical appliance.

(1 mark)

- (ii) State another common term used to describe the **phase** conductor.

(1 mark)

- (d) A Class I electrical appliance is controlled by a single-pole switch. State why safety could be affected if the switch was placed in the neutral conductor.

(2 marks)

(turn over)

Question 1 continued

- (e) Calculate the current that will be drawn by a 230/240V plug-in electrical appliance rated at 1,500W, when operating at 240v.

(2 marks)

- (f) Draw circuit symbols illustrating:

- (i) A single pole switch in the **on** position.

(1 mark)

- (ii) A double pole switch in the **off** position.

(1 mark)

- (g) State **TWO** ways of identifying a double insulated appliance.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 1 continued

(h) Explain what is meant by the term "open circuit". (2 marks)

(i) State **ONE** method of minimising the possibility of exposing basic insulation when connecting a flexible cord to an appliance. (2 marks)

(j) Refer to the Electricity Regulations and state what is meant by the term **Standard Low Voltage** for a single phase MEN system. (2 marks)

Ref::

(turn over)

Question 2

- (a) Rewireable fuses and HRC fuses may be found on switchboards. What is the main function of a fuse?

(2 marks)

- (b) State the meaning of the term **breaking capacity** for fuses or circuit breakers.

(2 marks)

- (c) When an HRC cartridge fuse is replaced, the replacement cartridge must have similar characteristics to the original.

State the **FOUR** electrical characteristics to be checked for similarity.

(4 marks)

- (1) _____
- (2) _____
- (3) _____
- (4) _____

(turn over)

Question 2 continued

- (d) State **TWO** reasons why it is important to thread the fuse wire from terminal to terminal through the **tortuous path** in the fuse carrier when reloading a rewirable fuse.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 3 continued

- (c) Briefly state **THREE** 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.

(3 marks)

(1) _____

(2) _____

(3) _____

- (d) 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

Instruments used to test **THREE** separate resistive circuits indicate the values listed in the table below. Using this information, calculate the missing values numbered 1 to 5.

| Circuit | Supply Volts | Total Ohms resistance | Current | Watts |
|----------------|---------------------|------------------------------|----------------|----------------|
| One | 230 | <i>Value 1</i> | 10 | <i>Value 2</i> |
| Two | 200 | <i>Value 4</i> | <i>Value 3</i> | 1000 |
| Three | <i>Value 5</i> | 46 | 5 | 1150 |

(a) Value 1

(2 marks)

(b) Value 2

(2 marks)

(c) Value 3

(2 marks)

(turn over)

Question 4 continued

(d) Value 4

(2 marks)

(e) Value 5

(2 marks)

(turn over)

SECTION 2 - PLUMBERS ONLY

Question 5

Before a Class I plug-in dishwasher is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

- (a) State **FOUR** visual checks that must be carried out. The visual checks **must** relate only to the Class I appliance.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 5 continued

(b) Complete the following in relation to the tests using test instruments:

Test No.1

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

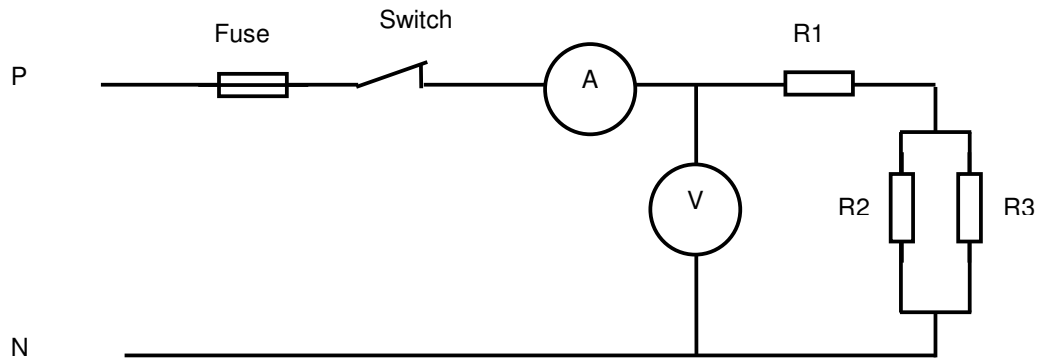
Ref:

(turn over)

Question 6

The diagram below represents three resistances connected to a 230V, single phase circuit, controlled by a single pole switch and protected by a fuse.

$$\begin{aligned} R_1 &= 40 \, \Omega \\ R_2 &= 15 \, \Omega \\ R_3 &= 15 \, \Omega \end{aligned}$$



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

(6 marks)

(turn over)

Question 6 continued

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

(2 marks)

(c) What size HRC fuse should be used to protect the circuit?

(1 mark)

(d) What is the reading on the voltmeter, with the circuit live?

(1 mark)

(turn over)

Question 7

All flexible cords are given a **current rating**.

- (a) Explain the meaning of the term **current rating**.

(2 marks)

- (b) What could happen if the flexible cord was used to supply an electrical appliance that draws a current in excess of the cord's rating?

(2 marks)

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

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 7 continued

- (d) The cores of a flexible cord are being terminated in an electrical appliance. Explain why this is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

(turn over)

Question 8

A plumber is requested to replace an existing 1500W, 230V element in storage water heater with a new 3000W, 230V element to reduce the recovery time. The permanent connection unit supplying the storage water heater is rated at 230V, 10A.

- (a) Determine, by calculation, if the permanent connection unit has an adequate current rating to supply the 3000 watt element. (3 marks)

- (b) What other considerations are necessary before the plumber installs the new 3000W element? (3 marks)

(turn over)

Question 8 continued

- (c) Refer to AS/NZS 3760 and state **THREE** visual inspections of the hot water cylinder that are required to be carried out. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

- (d) Who is responsible for checking and testing of the storage water heater for electrical safety after the replacement element is fitted? (1 mark)

(turn over)

Question 9 continued

(b) Refer to the Electricity Regulations and state **FIVE** categories of prescribed electrical work that can be carried out by a plumber who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Ref:

Section 3 – Gasfitters Only

Question 10

(a) An isolating switch supplying a 230V a.c. single phase induction motor in a gas boiler is to be replaced. In terms of the operation of the circuit and safety to the user, what would be the result if during reconnection the following conductors were accidentally interchanged at the supply terminals of the isolating switch:

(i) The phase and neutral

(2 marks)

(ii) The neutral and earth

(1 mark)

(iii) The phase and earth

(3 marks)

(turn over)

Question 10 continued

- (iv) State **TWO** tests that would detect the interchange of the phase and earth conductors?

(1 mark)

(1) _____

(2) _____

- (b) An adjacent isolating switch for a single phase, fixed wired appliance has been switched off. It is found, when testing for isolation, that some terminals on the appliance are still alive. State **THREE** reasons why the terminals may still be live.

(3 marks)

(1) _____

(2) _____

(3) _____

(turn over)

Question 11

(a) Replacement flexible cords are to be fitted to some electrical appliances:
(7 marks)

(i) What is the minimum number of cores required for a flexible cord for a Class I electrical appliance?

(ii) What is the colour coding required for the cores of a flexible cord for a Class I electrical appliance?

(iii) What is the minimum number of cores required for a flexible cord for a Class II electrical appliance?

(iv) What is the colour coding required for the cores of a flexible cord for a Class II electrical appliance?

(turn over)

Question 11 continued

(b) When a three core flexible cord is fitted to an appliance, it is recommended that the protective earthing conductor should be left longer than the phase and neutral conductors.

(i) State **ONE** reason why this is recommended.

(1 mark)

(ii) Explain what could happen if the protective earthing conductor was the same length as the phase and neutral conductors.

(2 marks)

(turn over)

Question 12

Before a Class I plug-in gas appliance is returned to service after being repaired, AS/NZS 3760 requires that it must be inspected and two tests carried out using test instruments. Refer to AS/NZS 3760 and:

- (a) State **FOUR** visual checks that must be carried out. The visual checks **must** relate only to the Class I appliance.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 12 continued

(b) Complete the following in relation to the tests using test instruments:

Test No.1

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

Test No.2

(1) Type of test (1 mark)

(2) Instrument used (1 mark)

(3) Acceptable test result (1 mark)

Ref:

(turn over)

Question 13

All flexible cords are given a **current rating**.

- (a) Explain the meaning of the term **current rating**. (2 marks)

- (b) What could happen if the flexible cord was used to supply an electrical appliance that draws a current in excess of the cord's rating? (2 marks)

- (c) A flexible cord is to be fitted to a single phase electrical appliance. List **FOUR** considerations which may influence the selection of the cord. (4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 13 continued

- (d) The cores of a flexible cord are being terminated in an electrical appliance. Explain why this is important to remove the minimum amount of basic insulation from the cores?

(2 marks)

(turn over)

Question 14 continued

- (b) Refer to the Electricity Regulations and state the **THREE** categories of prescribed electrical work that can be carried out by a gasfitter who holds a Tradespersons Electrical Work Certificate issued by the Electrical Workers Registration Board.

(3 marks)

(1) _____

(2) _____

(3) _____

- (c) Refer to the Electricity Regulations and state **TWO** subjects that must be covered in refresher courses for the holders of a Tradespersons Electrical Work Certificate.

(2 marks)

(1) _____

(2) _____

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 | |
|---------------------------------|-------|--|
| <u>Section 1</u> | | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| <u>Total Section 1</u> | | |
| <u>Section 2</u> | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| <u>Total section 2</u> | | |
| <u>Section 3</u> | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| <u>Total section 3</u> | | |
| TOTAL SECTIONS 1 & 2 | | |
| OR | | |
| TOTAL SECTIONS 1 & 3 | | |
| | | |