



Candidate Code No.	
For Board Use Only	
Result	Result
Date	Date
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ELECTRICAL WORKERS REGISTRATION BOARD
ELECTRICAL SERVICE TECHNICIAN “B” EXAMINATION
054

25 June 2005

QUESTION AND ANSWER BOOKLET

Time Allowed: Two Hours

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 in this paper.

Answer all questions.

The pass mark for this examination is 60 marks.

Use a pen for written answers. **Do not** use pencils or red pens.

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 of Practice. 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 or NZS 3019:2004; AS/NZS 3760:2001 or AS/NZS 3760:2003.
- ECP 34 and ECP 54.

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

Question 1

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

(2 marks)

- (b) A single phase 230V electrical appliance is to be connected to fixed wiring. Refer to AS/NZS 3000 and state the requirement for the colour of the phase (active) conductor as applied to fixed wiring.

(2 marks)

Ref:

- (c) A handheld electrical appliance used by a person who is partially immersed in a conductive substance must be used in conjunction with an appropriate safeguard. Refer to the Electricity Regulations and state **TWO** such safeguards.

(2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 1 continued

- (d) Calculate the current that will be drawn by a 230V electric dryer rated at 920 watts.

(2 marks)

- (e) State **ONE** reason why an HRC fuse is used in a circuit supplying a motor.

(2 marks)

(turn over)

Question 2

- (a) State **TWO** criteria which must be observed when selecting a flexible cord for a Class I single phase electrical appliance?

(2 marks)

(1) _____

(2) _____

- (b) Live conductors may be present in some fixed wired electrical appliances and/or fittings when the isolating switch is in the off position. State **FOUR** circumstances that may cause such a situation to occur.

(2 marks)

(1) _____

(2) _____

(3) _____

(4) _____

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

(2 marks)

(1) _____

(2) _____

(turn over)

Question 2 continued

- (d) What characteristic of a flexible cord determines the maximum current the cord can carry safely without overheating?

(2 marks)

- (e) 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 3

(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 do the initials **IP** stand for? (1 mark)

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) Refer to AS/NZS 3000 and state what is meant by the term damp situation. (2 marks)

Ref:

(turn over)

Question 3 continued

(c) Describe the level of protection offered by fittings rated at **IP56**.

(3 marks)

5 _____

6 _____

Ref:

(turn over)

Question 4

(a) Refer to the Electricity Regulations and state the Standard to which appliances should be tested following completion of repairs?

(1 mark)

Ref:

(b) Refer to the Standard you have stated in (a) and state:

- The **TWO** tests, using test instruments that are required to be carried out on a Class I electrical appliance.
- The type of instrument required.
- The minimum or maximum value of the test result.

(6 marks)

Test: _____

Instrument: _____

Result: _____

Ref:

Test: _____

Instrument: _____

Result: _____

Ref:

(turn over)

Question 4 continued

- (c) 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)

(turn over)

Question 5

Another electrical service technician has disconnected and repaired a 230V industrial sewing machine in a leather goods factory. You are required to:

- Reconnect the machine by connecting the flexible cord to the single phase fixed wiring at a terminal box mounted on an adjacent pillar, and
- Recommission the sewing machine.

There are no danger tags attached to the isolator controlling the terminal box.

- (a) Describe the sequence of actions you should take to ensure your own safety before recommissioning the sewing machine.

(2 marks)

- (b) Describe the tests, using instruments, you should carry out to ensure the sewing machine and flexible cord are safe to reconnect to the electricity supply. Include the type of instrument used and maximum or minimum test results.

(5 marks)

(turn over)

Question 5 continued

- (c) Describe the sequence of actions you should take to recommission the sewing machine.

(3 marks)

(turn over)

Question 6

- (a) An electrical service technician notices that an electrical fitting on a machine is damaged and if used, could endanger personnel.

Describe the actions that should be taken by the electrical service technician to ensure the safety of the machine, and of those persons working in the immediate vicinity before repairing the machine.

(4 marks)

- (b) An isolating switch supplying a 230V a.c. single phase induction motor on a portable concrete mixer 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:

- (i) The neutral and earth

(2 marks)

(turn over)

Question 6 continued

(ii) The phase and earth

(3 marks)

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

(1 mark)

(turn over)

Question 7

State **TWO** likely causes for each of the following reported faults?

- (a) A three-phase motor hums noisily but fails to rotate when started. (2 marks)

(1) _____

(2) _____

- (b) A lightly loaded three-phase motor begins to run noisily and then starts to overheat. (2 marks)

(1) _____

(2) _____

- (c) A direct on line (DOL) motor starter makes an excessive humming noise whenever the contactor is engaged. (2 marks)

(1) _____

(2) _____

(turn over)

Question 7 continued

- (d) When a start button is pushed on a direct on line (DOL) starter the contactor closes, but as soon as the start button is released the contactor drops out of circuit.

(2 marks)

(1) _____

(2) _____

- (e) A single-phase capacitor start motor hums and fails to rotate on the bench when the supply is connected. It reaches full load speed when the rotor is assisted by hand spinning.

(2 marks)

(1) _____

(2) _____

(turn over)

Question 8

- (a) (i) You are testing an electrical appliance. Give **THREE** reasons why you would not connect a voltmeter in series with the electrical appliance. (4 marks)

(1) _____

(2) _____

(3) _____

- (ii) When using the voltmeter to measure an unknown voltage in an appliance, which meter range should be selected first? (1 mark)

(turn over)

Question 8 continued

(b) You are testing an electrical appliance. State **FOUR** reasons why you would not connect an ammeter in parallel with the electrical appliance.

(5 marks)

(1) _____

(2) _____

(3) _____

(4) _____

(turn over)

Question 10

- (a) An isolating transformer is constructed with two socket outlet terminals to permit the use of two or more electrical appliances. The socket outlet earth terminals are required to be bonded together, but they must not be earthed. Explain why this bonding is necessary.

(5 marks)

- (b) Refer to the Electricity Regulations and state:

- (i) What is meant by the term **personal protective equipment**?

(1 mark)

(turn over)

Question 10 continued

- (ii) The **TWO** practical steps an employee must take when carrying out work requiring personal protective equipment. (2 marks)

(1) _____

(2) _____

- (c) List **FOUR** items of personal protective equipment an electrical service technician should have when carrying out repairs to a battery charger mounted above a set of wet-cell batteries used for a battery-powered vehicle. (2 marks)

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

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	
1		
2		
3		
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TOTAL		