



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

ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRICIAN'S REGULATIONS EXAMINATION

26 June 2004

QUESTION AND ANSWER BOOKLET

Time Allowed: Three 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 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 Compilation Regulations 2003

AS 1939 supplement 1: 1990; AS/NZS 3000:2000 (including amendments 1 and 2); AS/NZS 3001:2001; NZS 3019 (Int): 2002; AS/NZS 3760:2001

NZCEP 34:2001; NZCEP 54:2001

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

SECTION 1

Answer all questions in this section. Each is worth 2 marks.

Question 1

The Electricity Act lists **SEVEN** classes of person who may do, or assist in doing prescribed electrical work. List **FOUR** of these classes.

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

Ref:

Question 2

Under what circumstances does the Electricity Act permit an electrical installation to be connected to the electricity supply before it has been tested, inspected or certified?

Ref:

Question 3

A trainee may assist in prescribed electrical work subject to supervision. Briefly state the requirements of the Electricity Regulations for ONE category of person who can provide this supervision.

Ref:

(turn over)

Question 4

With reference to the Electricity Regulations regarding the testing of prescribed electrical work, state **TWO** requirements a person must ensure that they carry out when they have completed prescribed electrical work.

(1) _____

(2) _____

Ref:

Question 5

A domestic hot water cylinder is located 12 metres from the MEN switchboard and the voltage at the point of supply is 230 V. Refer to the Electricity Regulations and calculate the minimum voltage permitted at the terminals of the hot water cylinder.

Ref:

Question 6

Refer to the Electricity Regulations and state:

(a) The voltage restriction that applies to the use of 3-pin flat pin socket outlets complying with AS/NZS 3112. (1 mark)

Ref:

(b) The Standard to which electrical appliances must be tested before they are hired or leased out. (1 mark)

Ref:

(turn over)

Question 7

A handheld electrical appliance used on a building or structure under construction must be used in conjunction with an appropriate safeguard. Refer to the Electricity Regulations and state **TWO** such safeguards.

(1) _____

(2) _____

Ref:

Question 8

Refer to the Electricity Regulations and state the **TWO** circumstances where metal must be earthed or connected to earth by a bonding system.

(1) _____

(2) _____

Ref:

(turn over)

Question 9

A caravan that is to be hired or leased out must comply with the Electricity Regulations. Name the **TWO** types of certificates that are issued to confirm that the caravan is electrically safe.

(1) _____

(2) _____

Ref:

Question 10

With reference to the Electricity Regulations, state the **TWO** requirements for socket outlets for the supply of electricity at standard low voltage in a caravan park.

(1) _____

(2) _____

Ref:

Question 11

Refer to the Electricity Regulations and state **TWO** details of an electrical accident that must be reported to the Secretary.

(1) _____

(2) _____

Ref:

Question 12

Refer to AS/NZS 3000 and state the **TWO** situations where RCD protection is required in a domestic electrical installation

(1) _____

(2) _____

Ref:

(turn over)

Question 13

Refer to AS/NZS 3000 and state **TWO** protection methods for the mechanical protection of wiring systems.

(1) _____

(2) _____

Ref:

Question 14

Refer to AS/NZS 3000 and state **TWO** situations where MIMS cables are to be protected by a suitable serving.

(1) _____

(2) _____

Ref:

Question 15

Refer to AS/NZS 3000 and state **TWO** *general* aspects that must be visually inspected when testing an electrical installation.

(1) _____

(2) _____

Ref:

(turn over)

Question 16

Refer to AS/NZS 3000 and state the **TWO** measures against electrical shock that are not permitted to be used in a bathroom

(1) _____

(2) _____

Ref:

Question 17

If an electrical appliance or fitting is labelled “**IP 23**”.

(a) What level of protection is specified by the number 2? (1 mark)

(b) What level of protection is specified by the number 3? (1 mark)

Ref:

(turn over)

Section 2

Answer **ALL** questions in this section. Each question is worth 6 marks.

Question 18

An electrician is installing the electrical installation in a high-rise apartment block. The installation consists of a main MEN switchboard and a switchboard in each apartment. Refer to AS/NZS 3000 and answer the following:

- (a) State the **TWO** general requirements for the location of the main switchboard. (2 marks)

(1) _____

(2) _____

Ref:

- (b) The main switchboard is to be located in a storage cupboard. State **THREE** requirements for locating the switchboard in such an area. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

- (c) State the minimum dimensions of the storage cupboard doorway that permits access to the switchboard. (1 mark)

Ref:

(turn over)

Question 19

A new rectangular bath has been installed in the corner of a square bathroom. The customer now requires the electrician to install the following:

- 1 230 V heated towel rail with adjacent control switch
- 1 230 V socket outlet (not incorporated in a shaver unit)
- 1 Flush wall switch with no IP rating that controls a ceiling light

Refer to clause 7.1 of AS/NZS 3000 and answer the following:

(a) The heated towel rail and adjacent control switch, both with the required degree of protection, can be installed in Zone 2. State:

(i) The minimum IP rating of the heated towel rail. (1 mark)

(i) The minimum IP rating of the control switch. (1 mark)

Ref:

(b) State the **TWO** requirements for installing the socket outlet in Zone 2. (2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 19 continued

(c) (i) In which zone is it permissible to install the flush wall switch. (1 mark)

(ii) What is the minimum height from the floor that the switch can be installed? (1 mark)

Ref:

(turn over)

Question 20

Refer to AS/NZS 3000 and answer the following:

Extra-low voltage electrical installations have particular requirements.

(a) State the **TWO** types of systems that are permitted in the installation. (1 mark)

(1) _____

(2) _____

Ref:

(b) State the **TWO** situations where it is permissible for the voltage drop of an extra-low voltage installation to exceed 10% of the nominal value. (2 marks)

(1) _____

(2) _____

Ref:

(c) State the **THREE** requirements for plugs and socket outlets used in SELV or PELV systems. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

(turn over)

Question 21

A three-phase oven is to be installed in a bakery. The electrician, using the following information has determined that a 4 mm² cable can be used.

- The oven is supplied by a 4-core neutral screened copper cable, 20 metres in length.
- The load is 15 kW
- The cable is fixed directly (touching).
- The ambient temperature of 35 °C.
- The voltage at the switchboard is 400 V.
- The required voltage drop from the switchboard to the oven must not exceed 2.5% of standard low voltage.
- The conductor temperature is assumed to be 75 °C

Using this information and the information in the following tables, confirm that this cable is suitable by calculating:

(a) The line current

(1½ marks)

(b) The maximum loading for this cable

(1½ marks)

(turn over)

Question 21 continued

The following are extracts from AS/NZS 3008.1.2.

Table 9

CURRENT CARRYING CAPACITIES OF TWO-CORE 0.6/1 kV INSULATED AND SHEATHED (INCLUDING NEUTRAL SCREENED) CABLES WITH OR WITHOUT EARTH CONDUCTOR, ARMoured OR NON-ARMoured CABLES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Conductor size	Current carrying capacity A															
	Unenclosed				Enclosed								Buried Direct		Underground non-metallic wiring enclosure	
	Spaced		Touching		Non-metallic wiring enclosures in air – round cable		Non-metallic wiring enclosures in air – flat cable		In non-metallic wiring enclosures or unenclosed partially surrounded by thermal insulation		Completely surrounded by thermal insulation					
	mm ²	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
1	17	--	16	--	13	10	15	11	11	9	8	-	24	-	19	-
1.5	22	-	21	-	16	13	19	15	15	11	10	-	31	-	24	-
2.5	31	-	30	-	23	17	25	19	21	16	15	-	44	-	34	-
4	42	-	39	-	30	23	33	25	27	22	19	-	57	-	44	-
6	52	-	50	-	39	30	42	32	35	27	25	-	72	-	56	-
10	73	-	68	-	54	41	57	43	49	38	34	-	96	-	75	-
16	97	75	91	71	72	55	75	57	65	50	46	35	127	97	97	75
25	131	100	120	95	100	76	101	76	90	71	60	47	160	127	127	98
35	160	125	148	114	120	89	120	89	105	82	74	58	198	154	154	121

Table 27(1)

RATING FACTORS FOR VARIATIONS IN AMBIENT TEMPERATURE FOR CABLES IN AIR OR HEATED CONCRETE SLABS AND FOR CABLES BURIED DIRECT IN THE GROUND OR IN UNDERGROUND WIRING ENCLOSURES – AIR AND CONCRETE SLAB TEMPERATURES

1	2	3	4	5	6	7	8	9	10	11
Conductor temperature °C	Rating Factor									
	Ambient temperature									
	15	20	25	30	35	40	45	50	55	60
150	1.07	1.05	1.03	1.00	0.98	0.96	0.94	0.91	0.89	0.87
110	1.08	1.06	1.03	1.00	0.97	0.93	0.90	0.87	0.83	0.79
90	1.15	1.09	1.05	1.00	0.95	0.91	0.85	0.80	0.74	0.66
80	1.17	1.12	1.06	1.00	0.95	0.89	0.82	0.75	0.68	0.59
75	1.18	1.12	1.06	1.00	0.94	0.88	0.80	0.72	0.63	0.53

(turn over)

Question 21 continued

Table 42

THREE-PHASE VOLTAGE DROP AT 50Hz OF MULTICORE CABLES WITH CIRCULAR COPPER CONDUCTORS

Conductor size mm ²	Three-phase voltage drop at 50 Hz, mV/A.m									
	Conductor temperature, °C									
	45		60		75		90		110	
	Max.	0.8 p.f.	Max.	0.8 p.f.	Max.	0.8 p.f.	Max.	0.8 p.f.	Max.	0.8 p.f.
1	40.3	-	42.5	-	44.7	-	46.8	-	49.7	-
1.5	25.9	-	27.3	-	28.6	-	30.0	-	31.9	-
2.5	14.1	-	14.9	-	15.6	-	16.4	-	17.4	-
4	8.77	-	9.24	-	9.71	-	10.2	-	10.8	-
6	5.86	-	6.18	-	6.49	-	6.80	-	7.22	-
10	3.49	-	3.67	-	3.86	-	4.05	-	4.29	-
16	2.19	-	2.31	-	2.43	-	2.55	-	2.70	-
25	1.39	-	1.47	-	1.54	-	1.61	-	1.71	-
35	1.01	-	1.06	-	1.11	-	1.17	-	1.24	-

Note: To convert to single-phase values multiply the three-phase value by 1.155

(turn over)

Question 22

Refer to AS/NZS 3000 and state:

- **THREE** mandatory checks, using test instruments that are required for the testing of a low voltage electrical installation
- **ONE** reason for carrying out each of the tests

(6 marks)

Test _____

Reason _____

Ref:

Test _____

Reason _____

Ref:

(turn over)

Question 22 continued

Test _____

Reason _____

Ref:

(turn over)

Question 23

(a) An electrician has completed the installation of a lighting circuit, a 10 A socket outlet, relocated the main switchboard and replaced the main earthing lead with one of a larger size. Refer to the Electricity Regulations and answer the following:

(i) State the document that is required to be completed by the electrician and when it must be completed. (1 mark)

Ref:

(ii) Determine which part of this work requires inspection and give a reason for your answer. (2 marks)

Ref:

(b) An electrician has repaired a Class I electrical appliance.

(i) Refer to the Electricity Regulations and name the Standard that details the checking and testing to be carried out on the appliance. (1 mark)

Ref:

(ii) Refer to the Standard you have named in (i) above and state the tests, using test instruments, that are required to be carried out and the minimum or maximum value for each test. (2 marks)

Ref:

(turn over)

Question 24

Refer to the Electricity Regulations and answer the following:

- (a) No person shall assist to carry out prescribed electrical work for the first time unless that person has satisfactorily completed safety tuition in **FOUR** specific subjects. What are those subjects?

(2 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

- (b) At what intervals must a person complete the tuition in the subjects in (a) if they continue to carry out work on the construction or maintenance of works.

(2 marks)

Ref:

- (c) An employer may have employees who assist to carry out prescribed electrical work. What responsibility does the employer have with respect to the competency of the employees who are doing this work?

(2 marks)

Ref:

(turn over)

Question 25

(a) A 4mm² two core neutral-screened submain cable is to be run between two buildings. It is to be buried direct (unenclosed) in the ground in an unpaved area. Refer to AS/NZS 3000 and state:

(i) The **TWO** requirements for indicating the position of the buried cable. (2 marks)

(1) _____

(2) _____

Ref:

(ii) The minimum depth to which the cable must be buried. (1 mark)

(iii) The requirements for bedding the cable in the ground. (2 marks)

Ref:

(b) Refer to AS/NZS 3000 and state **ONE** type of cable that, when buried, requires no additional protection. (1 mark)

Ref:

(turn over)

Question 28

- (a) Refer to AS/NZS 3000 and state **TWO** of the permitted methods of supplying electrical equipment in a fountain that protect against electric shock. (2 marks)

(1) _____

(2) _____

Ref:

- (b) An electrician is carrying out the installation of a swimming pool and has been requested to install:

- A bare overhead low voltage sub-main, passing over the swimming pool, to a shed.
- Luminaires located inside the pool.

Refer to AS/NZS 3000 and:

- (i) State the restriction is placed on the location of the bare overhead low voltage sub-main? (1 mark)

Ref:

- (ii) State the **THREE** requirements for the installation of the luminaries. (3 marks)

(1) _____

(2) _____

(3) _____

Ref:

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	
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