



Candidate Code No _____	
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ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRICIAN'S REGULATIONS EXAMINATION

29 NOVEMBER 2003
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.

The minimum pass mark for this examination is 60 marks. All questions must be attempted

Each question in section 1 is worth 2 marks – a total of 34 marks

Each question in section 2 is worth 6 marks – a total of 66 marks

Your written answers may be a direct quote from the Act, Regulations, Code or Standards or you may summarise, in your own words, the key points from these documents. Wherever possible include the reference to the source of your answer in the space provided. However, stating a reference only will gain no marks

Use a pen for writing your answer. You may use a pencil for diagrams. Do not use correcting fluid or correcting tape.

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; AS/NZS 3001:2001; NZS 3019 (Int): 2002; AS/NZS 3760:2001

NZCEP 34:2001.

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

Refer to the Electricity Act and list **TWO** disciplinary actions that can be taken by the Electrical Workers Registration Board if it finds that registered electrician, who did the dangerous work – guilty of a disciplinary offence.

- (1) _____

- (2) _____

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

An electrician has installed a new fitting in an existing domestic residence. Refer to the Electricity Regulations and state **TWO** circumstances where the electrician can connect the fitting to the supply, without the work being inspected by an electrical inspector.

(1) _____

(2) _____

Ref:

Question 5

With reference to the Electricity Regulations, state the acceptable minimum and maximum values at the point of supply for the voltage to a standard low voltage, single-phase installation.

Voltage

minimum _____ V

maximum _____ V

Ref:

Question 6

Refer to the Electricity Regulations and calculate the minimum voltage permitted at the terminals of a hot water cylinder, if the voltage at the main switchboard is 230 V.

Ref:

(turn over)

Question 7

Refer to the Electricity Regulations and state:

- (a) The voltage restriction that applies to a 3-pin flat pin socket outlets that comply 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:

Question 8

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:

(turn over)

Question 9

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:

Question 10

Refer to clause 1 of AS/NZS 3000 and state **TWO** of the methods of providing protection against indirect contact.

- (1) _____

- (2) _____

Ref:

Question 11

Refer to clause 1 of AS/NZS 3000 and state the **TWO** basic requirements for the arrangements of circuits in the **design** of an electrical installation.

Ref:

(turn over)

Question 12

Refer to clause 3.9.8 of AS/NZS 3000 and state **TWO** situations where MIMS cables are to be protected by a suitable serving.

(1) _____

(2) _____

Ref:

Question 13

Refer to clause 5.5 of AS/NZS 3000 and state the minimum size of protective earthing conductor that would **generally** be required for a twin and earth 4 mm² copper TPS cable

Ref:

Question 14

Refer to clause 5.5 of AS/NZS 3000 and state the restriction placed on the use of the screen of a neutral screened cable.

Ref:

Question 15

Refer to clause 7.7 of AS/NZS 3000 and state the **TWO** types of systems permitted for an extra-low voltage installation.

(1) _____

(2) _____

Ref:

(turn over)

Question 16

Refer to clause 7.9 of AS/NZ 3000 and state **TWO** types of recognised hazardous areas.

(1) _____

(2) _____

Ref:

Question 17

Refer to clause 3.6 of AS/NZS 3001 and state the **TWO** requirements for mounting a socket outlet on the exterior of a caravan.

(1) _____

(2) _____

Ref:

Section 2

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

Question 18

- (a) According to the Electricity Act, every person shall on payment of the prescribed fee (if any), be entitled to be registered as an electrician, if the person satisfies the Board that **FOUR** requirements have been met. State **THREE** of these requirements.

(3 marks)

(1) _____

(2) _____

(3) _____

Ref:

- (b) The Electricity Act requires that a registered person who works for payment of reward must hold an additional type of licence.

- (i) What is the name of the licence?

(1 mark)

Ref:

- (ii) On what date in any year does the licence expire?

(1 mark)

Ref:

- (iii) To whom must application be made for the licence?

(1 mark)

Ref:

(turn over)

Question 19

An electrical supply system is being installed in a caravan park. Refer to section 2 of AS/NZS 3001 and answer the following.

- (a) Describe the earthing arrangement for a service pillar and switchboard providing site supply within a caravan park. (2 marks)

Ref:

- (b) State **TWO** of the requirements for the control of socket outlets in a service pillar. (2 marks)

Ref:

- (c) State **TWO** of the requirements for providing RCD protection for socket outlets in a service pillar. (2 marks)

Ref:

(turn over)

Question 20

A 4 mm² two core neutral-screened cable is to be installed between two buildings. The cable is to be buried direct (unenclosed) in the ground in an unpaved area. Refer to clause 3.11 of AS/NZS 3000 and state:

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

(1) _____

(2) _____

Ref:

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

Ref:

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

Ref:

(d) **ONE** type of cable that, when buried, requires no additional protection. (1 mark)

Ref:

(turn over)

Question 21

- (a) The Electricity Regulations state specific requirements that apply to supplying electricity to connectable installations at standard low voltage. Who is responsible for checking that the connectable installation has a current Warrant of Electrical Fitness or a Certificate of Compliance that is less than 4 years old? (1 mark)

Ref:

- (b) With reference to the Electricity Regulations:

- (i) Is there an offence provision that applies to the supply of electricity to a connectable installation? (1 mark)

Ref:

- (ii) Validate your answer (2 marks)

- (c) With reference to the Electricity Regulations:

- (i) For what period of time are Warrants of Electrical Fitness issued for a connectable installation valid? (1 mark)

Ref:

- (ii) Who are permitted to issue a Warrant of Electrical Fitness? (2 marks)

(1) _____

(2) _____

Ref:

(turn over)

Question 23

- (a) An electrician is reconnecting an existing electrical installation to the electricity supply. Prescribed electrical work involving new mains and a new switchboard has been carried out on the installation by another electrician and the work has been inspected by an electrical inspector.

Refer to the Electricity Regulations and state **FOUR** of the requirements the electrician must meet at the time of doing the reconnection.

(4 marks)

- (1) _____

- (2) _____

- (3) _____

- (4) _____

Ref:

- (b) A 350 kVA, 400 V three-phase transformer has an impedance of 6%. Calculate the prospective short circuit current that would flow if a short circuit of negligible impedance occurs across the transformer output terminals.

(2 marks)

- _____
- _____
- _____
- _____
- _____
- _____
- _____

Ref:

(turn over)

Question 24

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					
	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al
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 24 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

It is proposed to use 20 metres of 2.5 mm² flat twin and earth TPS cable to supply 21 A to a single phase oven. The cable is clipped direct (touching) and is operating at an ambient temperature of 35 °C. The voltage at the switchboard is 230 V. Assume the conductor temperature to be 75 °C

Using the information provided above:

- (a) Calculate the voltage drop.

(2 marks)

- (b) It is required that the voltage drop from the switchboard to the oven must not exceed 2.5% of standard low voltage. Does the voltage drop calculated in (a) satisfy this requirement? Give a reason for your answer.

(1 mark)

(turn over)

Question 24 continued

(c) Calculate the maximum current rating in installed conditions.

(1 mark)

(d) Does the calculated value satisfy the load requirements? Give a reason for your answer

(1 mark)

(e) Is the cable suitable for this installation? Give a reason for your answer.

(1 mark)

(turn over)

Question 25

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 26

With reference to NZECP 34, answer the following:

- (a) State **TWO** means of restricting access to the conductor of an overhead electric line.

(2 marks)

(1) _____

(2) _____

Ref:

- (b) Metal poles for floodlights are being erected by a crane along a boundary fence of a sports field. There is an 11 kV overhead electric line supported by towers running parallel to and directly above the boundary fence.

- (i) State the closest distance that the crane, and the crane's load (a metal pole), can be manoeuvred to the conductors of the 11 kV line:

- (1) **without** the consent of the owner of the 11 kV line.

(1 mark)

Ref:

- (2) **with** the consent of the owner of the 11 kV line.

(1 mark)

Ref:

(turn over)

Question 26 continued

(ii) Supply and control cables for the floodlight poles are to be buried along the boundary fence line: State:

(1) How close to the base of the 11 kV overhead line towers can the cable trench be excavated without the consent of the owner of the 11 kV line?

(1 mark)

Ref:

(2) The factor regarding ground stability that must be taken into consideration while excavating the trench.

(1 mark)

Ref:

(turn over)

Question 27

- (a) With reference to clause 7.6 of AS/NZS 3000, 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 that includes:

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

With reference to clause 7.2 of AS/NZS 3000:

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

(1 mark)

Ref:

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

(3 marks)

(1) _____

(2) _____

(3) _____

Ref:

(turn over)

Question 28

(a) An electrician has completed the installation of a lighting circuit, a 10 A socket outlet, relocated the main switchboard and replaced the 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 state 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 given as the answer in (b)(i) 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:

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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