



Candidate Code No _____	
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Date	Date
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ELECTRICAL WORKERS REGISTRATION BOARD

ELECTRICAL INSPECTORS THEORY EXAMINATION

29 November 2003

QUESTION AND ANSWER BOOKLET

Time Allowed: 3 hours

INSTRUCTIONS – READ CAREFULLY

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

Write your **Candidate Code number** in the box provided above. Your name must **NOT** appear on this booklet.

The minimum pass mark for this examination is 60 marks

All questions must be attempted

Each part of question 1 is worth 1 mark – a total of 20 marks.

Questions 2 to 9 are worth 10 marks each a total of 80 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 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 2003 amendments or the Electricity Regulations Compilation 2003.

AS 1939 Supplement 1-1990; AS/NZS 3000:2000; AS/NZS 3760:2001; NZS3019 (Int):2002

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM.

(turn over)

Question 1

Each part is worth 1 mark, (total 20 marks)

- (a) Which section of the Act requires registered persons to hold a practising licence if they do prescribed electrical work for reward?

Ref:

- (b) With reference to the Electricity Act, who is authorised to issue employer licences?

Ref:

- (c) With reference to the Electricity Regulations, state the intervals at which electrical inspectors involved with **works** are required to take refresher courses in testing to ensure safety?

Ref:

- (d) With reference to the Electricity Regulations, state **TWO** of the situations where compliance with the safe approach distances detailed in NZECP 34 is not required.

Ref:

- (e) State briefly **ONE** of the safety precautions specified in the Electricity Regulations which must be complied with on a low voltage installation to safeguard against unintentional re-livening after isolation.

Ref:

(turn over)

- (f) With reference to the Electricity Regulations, for what period of time are forms for Certificates of Compliance for on-going work valid for use?

Ref:

- (g) With reference to the Electricity Regulations, what is the maximum interval allowed between safety checks for animal stunning electrical appliances?

Ref:

- (h) With reference to the Electricity Regulations, what is the maximum penalty that can be imposed for certifying non-compliant work?

Ref:

- (i) With reference to the Electricity Regulations, state the expiry date for an Electrical Warrant of Fitness for a caravan issued by an electrical inspector on 30 November 2002.

Ref:

- (j) With reference to AS/NZS 3000, state the Zones for a swimming pool or spa pool, in which it is permissible to install a switchboard.

Ref:

- (k) With reference to AS/NZS 3000, state the minimum size bonding conductor permitted for the bonding of metallic piping, cable sheaths and wiring enclosures.

Ref:

(turn over)

- (l) With reference to AS/NZS 3000, state the minimum IP rating of electrical fittings installed in a hosing down area.

Ref:

- (m) With reference to AS/NZS 3000, state the maximum voltage drop permitted in an extra-low voltage electrical installation.

Ref:

- (n) With reference to AS/NZS 3000, state **ONE** of the requirements for a SELV or PELV socket outlet.

Ref:

- (o) With reference to NZS 3019, state the minimum IP rating against the ingress of moisture for a low voltage socket outlet located in a caravan park or boat marina.

Ref:

- (p) With reference to NZS 3019, state the minimum insulation resistance test for 45m of 16mm² two core neutral screened mains cable

Ref:

(turn over)

- (q) State a situation where the earthing contact of a socket outlet shall not be earthed.

- (r) Briefly explain the basic principle of operation of a test instrument suitable for testing an RCD.

- (s) If the applied voltage and maximum current drawn by a three-phase load is known, what else needs to be known to determine its kilowatt demand?

- (t) For what practical reason is it necessary to test all three-phase socket outlets in a new installation with a phase sequence indicator.

(turn over)

Question 2

The following are extracts from AS/NZS 3008.1.2.

Table 12

CURRENT CARRYING CAPACITIES OF THREE-CORE AND FOUR-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	15	--	14	--	11	9	14	10	11	8	7	-	21	-	17	-
1.5	18	-	17	-	15	11	17	13	14	11	9	-	26	-	21	-
2.5	26	-	25	-	21	16	23	17	19	15	13	-	37	-	29	-
4	35	-	33	-	27	21	30	23	25	19	17	-	48	-	37	-
6	46	-	42	-	35	27	39	30	33	25	22	-	61	-	47	-
10	62	-	58	-	48	38	52	40	44	34	29	-	81	-	63	-
16	82	64	78	60	64	49	68	52	59	46	39	30	106	83	81	64
25	111	86	104	81	90	68	95	72	82	64	52	40	138	107	106	83
35	137	106	125	99	105	80	105	80	96	74	64	49	165	127	127	100

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 2 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	-

A PVC insulated multi-core copper cable clipped direct (touching) is to be used to supply a 60 kW, three-phase, 400 V furnace in a factory. The ambient temperature is 35 °C. The distance between the switchboard and the furnace is 45 metres, and the cable is to be protected by HRC fuses. Assume the conductor temperature to be 75 °C.

Note: To gain full marks all formulae and calculations must be shown.

Using the information provided above, answer the following:

- (a) Calculate the minimum current rating of the cable. (2 marks)

Ref:

- (b) Calculate the minimum conductor size of the cable that could be used to supply the load. (2 marks)

Ref:

(turn over)

Question 2 continued

- (c) Calculate the voltage drop that will occur in the cable under normal load conditions.

(3 marks)

Ref:

- (d) What is the maximum voltage drop permissible under the Electricity Regulations? State the reference in your answer.

(2 marks)

Ref:

- (e) A 2.5% voltage drop is permitted on the mains cable from the point of supply to the main switchboard and 2.5% volt drop from the switchboard to the furnace. Determine whether the cable you have selected in (b) above is acceptable.

(1 mark)

Ref:

(turn over)

Question 3

- (a) An electrician has relocated and replaced the mains, and main switchboard at a commercial site to cater for an increase in load. An electrical inspector is required to inspect and reconnect this installation to the supply.

With reference to the relevant Standard, list **SIX** items on the main switchboard which must be inspected and/or tested before this installation is connected to the supply by the inspector.

(6 marks)

- (1) _____

- (2) _____

- (3) _____

- (4) _____

- (5) _____

- (6) _____

Ref:

(turn over)

Question 3 continued

(b) Refer to the relevant Standard and list **FOUR** visual testing requirements for fixed-wired electrical appliances.

(4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 5

(a) Specific safety checks are required for particular types of installations. Refer to the Electricity Regulations and answer the following: (6 marks)

(i) High voltage electrical installations.

* Safety check interval: _____

* Must be carried out by: _____

Ref:

(ii) Carnival or fairgrounds.

* Safety check interval: _____

* Must be carried out by: _____

Ref:

(iii) Earthing facilities of electro-medical locations.

* Safety check interval: _____

* To which Standard: _____

Ref:

(b) With reference to the Electricity Regulations, state the **FOUR** circumstances under which an electrical inspector is NOT permitted to carry out inspections of prescribed electrical work for payment or reward. (4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 6

- (a) Describe **FOUR** electrical hazards that may be present if the impedance of a low voltage installation main neutral is of a higher value than that of the main earth.

(4 marks)

- (b) With the aid of a labelled circuit diagram, show all the paths for the fault current from one phase of a power transformer, an installation and right through to a phase to frame fault on a class I appliance supplied by a subcircuit from the MEN switchboard.

(6 marks)

(turn over)

Question 7

(a) (i) What are the two current ratings associated with distribution switchgear?

(1 mark)

(ii) State the meaning of the **TWO** current ratings that you have mentioned in (a) (i) above.

(3 marks)

(b) An electrical inspector is called to a new commercial building site and has been asked to complete tests to enable the site to be lived. The DIN type HRC fuse links for the fuse-disconnect are labelled gG.

(i) Describe the meaning of the term **gG**.

(2 marks)

(turn over)

Question 7 continued

- (ii) The air compressor circuit in the same building is protected by fuses labelled gM. State what difference in operating characteristics you would expect to fuses labelled gG.

(2 marks)

- (c) With reference to the relevant Standard, state **TWO** situations where overload protection may be omitted.

(2 marks)

(1)

(2)

Ref:

(turn over)

Question 8

With reference to the Electricity Act:

- (a) A written complaint against an electrician is received by the Registrar of the Electrical Workers Registration Board.

- (i) Who must the Registrar immediately inform about receiving the complaint?

(1 mark)

Ref:

- (ii) To whom must the Registrar refer the complaint?

(1 mark)

Ref:

- (b) Registered persons found guilty of a **disciplinary** offence by the Board can have restrictions imposed on their registration. State **TWO** of those restrictions.

(2 marks)

Ref:

- (c) List **TWO** situations where the Board may direct the Registrar to cancel the registration or the provisional licence held by any person.

(2 marks)

Ref:

(turn over)

Question 8 continued

With reference to the Electricity Act:

(d) State the meaning of the term **supervision**

(2 marks)

Ref:

(e) Under what circumstances is certification not required when connecting an electrical installation to the supply?

(2 marks)

Ref:

(turn over)

Question 9

- (a) An electrical inspector has been requested by an electricity retailer to reconnect an electrical installation that has been disconnected for 8 months.

Refer the Electricity Regulations and answer the following:

- (i) Before connecting the installation, the electrical inspector must sight a specific type of document.

(1) What is this document? (1 mark)

Ref:

(2) Who can issue this document? (1 mark)

Ref:

(3) Name the Standard and section of that Standard that details the inspections and tests that should be carried out before the issue of this document. (1 mark)

Ref:

- (ii) State the **FOUR** tests and checks that the electrical inspector is required to carry out before connecting the installation to the supply. (4 marks)

(1) _____

(2) _____

(3) _____

(4) _____

Ref:

(turn over)

Question 9 continued

- (b) The Electricity Regulations places **THREE** general requirements on any person with regard to the **testing of prescribed electrical work** on works or electrical installations. State those three requirements.

(3 marks)

(1) _____

(2) _____

(3) _____

FOR CANDIDATE'S USE

In the box, write the number of **EXTRA** pages you have used. Write **NIL** if you have not used any

FOR EXAMINER'S USE ONLY		
Questions answered	Marks	
1		
2		
3		
4		
5		
6		
7		
8		
9		
TOTAL		