Licensed Electrical Inspector Theory (LEIT) Assessment

Sample Paper - Applicable from 1 January 2021

Candidate Surname	
Candidate Given Names	

Instructions

- Personal notepads and paper are not permitted.
- Pens only must be used. Answers in pencil may not be marked.
- Do not remove any sheets from this assessment paper or the room.
- Papers with no name or signature will not be marked.
- Units and table numbers (where required) must be shown to obtain full marks.
- Reference material listed on the following page. Reference material will be supplied. Do not mark, fold, or write on the reference material

Working Time: 3.5 hours

At the end of this time you will be asked to stop.

Candidate			
	Print name	Signature	Date

Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Mark													
Question	**13**	**14**	**15**	**16**	**17 (a&b)**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**Total**
Mark													

Paper total is 130 marks. Candidates need to obtain 75% or more (97 marks or more) to pass this assessment.

Final Percentage	**Pass/Fail**

Supervisor			
	Print name	Signature	Date
Assessor			
	Print name	Signature	Date
Reviewed by (If necessary)			
	Print name	Signature	Date

VICTORIA State Government

energysafe VICTORIA

Reference Material – to be provided to the candidate by the assessment venue:

- **AS/NZS 3000:2018 Wiring Rules**
- **AS/NZS 3001:2008 Electrical Installations – Transportable structures and vehicles including their site supplies**
- **AS/NZS 3002:2008 Electrical Installations – Shows and carnivals**
- **AS/NZS 3004.1:2014 Electrical Installations – Marinas and boats Part 1: Marinas**
- **AS/NZS 3008.1.1:2017 Electrical installations – Selection of cables**
- **AS/NZS 3010:2017 Electrical Installations – Generating Sets**
- **AS/NZS 3012:2019 Electrical installations – Demolition and Construction sites**
- **AS/NZS 5139:2019 Electrical installations – Safety of battery systems for use with power conversion equipment**
- **AS/NZS 4777.1:2016 Electrical installations – Grid connection of energy systems via inverters Part 1: Installation requirements**
- **AS/NZS 5033:2014 Installation and safety requirements for photovoltaic (PV) arrays**
- **AS/NZS 4836:2011 Safe working on or near low voltage electrical installations and equipment**
- **Electricity Safety (General) Regulations 2019**
- **Electricity Safety Act 1998**

In questions 1-16 you are required to:

- answer the question based on the relevant section, regulation or rule/clause
- write the reference document e.g. Electricity Safety Act, General Regulations, Wiring Rules and or Australian Standard number.
- write the Section, Regulation, Clause and/or Table number in the space provided
- the correct Section and Subsection, Regulation and subregulation, or Clause and Subclause must be given(e.g. 3.5.2(b)(i))
- For AS/NZS standards only, you may omit the 'AS/NZS', the year of publication and the title. You are only required to supply the number of the standard.

The correct answer to all parts must be given to obtain full marks.

Question N^{o}1.

Can an Earth Sheath Return (ESR) wiring system be installed in an area classified as hazardous?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}2.

What are the location marking requirements for a pool equipotential bonding conductor connection point?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}3.

As part of the installation of a grid connected inverter system, an RCD is to be installed to meet the mechanical cable protection requirements and isolation requirements of AS/NZS3000 for a cable running from a switchboard to the inverter energy supply. Which conductor/s shall be disconnected by this RCD?

Reference Document:

Clause Number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}4.

Consumer's mains are to be installed in a commercial building; the design engineer has specified a WS53W system be used. Identify the length of time the consumer mains must be able to maintain circuit integrity under the specified fire conditions?

Note: Your answer may be obtained from an informative part of a standard.

Reference Document:

Clause and Table numbers:

[2 + 1 + 2 = 5 Marks]

Question N^{o}5.

A switchboard is installed on a construction site. What is the minimum degree of ingress protection required for the switchboard enclosure?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}6.

How shall socket outlets installed on a caravan park service pillar be identified?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}7.

What are the labelling requirements, if any, for conduits or wiring enclosures containing direct current (d.c.) PV array cables?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}8.

Where shall an overcurrent protective device or devices ensuring protection against both overload and short-circuit current be placed?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}9.

Is it permissible to protect against electric shock by the means of placing electrical equipment out of reach when installed in a marina?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}10.

Internal combustion engine generating sets shall not be operated in locations where _____ could reach dangerous concentrations or enter either directly or indirectly any enclosed areas occupied by persons.

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}11.

In the case of an underground service line, one of the options for the installation of the protective equipment is that protective equipment must be installed at, or within _____ mm of the point at which the electricity supplier's supply cable crosses the property boundary of the property that it supplies

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}12.

If more than one permanent switchboard is installed at a carnival site, how shall each switchboard be marked for identification to distinguish it from the others?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}13.

In reference to a new electrical installation, a person who is responsible for the carrying out of prescribed electrical installation work must ensure that that work is inspected by a licensed electrical inspector in accordance with the regulations before the electrical installation is _____.

Reference Document:

Clause Number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}14.

When working on or near low-voltage electrical equipment and performing energised fault finding or testing on electrical equipment that plugs into a 3-pin flat-pin socket outlet rated at 15A, what must be used?

Reference Document:

Clause Number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}15.

When sound and intercom systems used as part of evacuation systems are used for emergency purposes, which Australian Standard shall they comply with?

Reference Document:

Clause number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}16.

When an alarm system provided for a pre-assembled integrated Battery Energy Storage System (BESS) has only an audible or a visual alarm signal, where shall the alarm signal be placed?

Reference Document:

Clause Number:

[2 + 1 + 2 = 5 Marks]

Question N^{o}17 (a). Voltage Drop

An electrical installation is supplied from a kiosk sub-station on site, the consumer's mains are two sets of four single core 95 mm² XLPE X-90 insulated and sheathed copper cables, connected in parallel to supply a three phase main switchboard.

The consumer mains are short circuit protected by a circuit breaker within the sub-station and installed laid flat touching directly in the ground at a depth of 500mm. Overload protection is provided by a circuit breaker located on the main switchboard. The length of the conductors is 15m. The loads on each phase are as follows: red phase 550A, white phase 520A, blue phase 500A.

The sub-mains are four single core 16mm^2 V90 PVC/PVC copper conductors installed in heavy duty conduit in the ground, and are protected at their origin by a circuit breaker. Cable length is 45m. The loads on each phase are as follows: red phase 56A, white phase 60A, blue phase 63A.

The final sub-circuit cable is a 2 core and earth 2.5mm^2 V75 TPS with copper conductors protected by a C20 Amp circuit breaker, connected to the white phase. It supplies a circuit of 230V socket outlets which are distributed along the length of the cable. The TPS cable is installed in heavy duty orange conduit in the ground. Cable length is 35m.

Calculate the voltage at the terminals of the final socket outlet using the conservative solution. Determine if the installation complies.

Table numbers and calculations must be shown to obtain full marks. Work all calculations to 2 decimal places.

[8 Marks]

Question N^{o}17 (b). Voltage Drop

(i) Calculate the operating temperature of a XLPE X-90 cable carrying 120 Amps with a current carrying capacity of 280 Amps. The cable is installed underground in a single conduit, in a 400/230 Volt electrical installation with an ambient soil temp is 25^{o}C.

(ii) What effect will the cable operating temperature have on the voltage drop V_c value?

[3 Marks]

Question N^{o}18. Prospective Fault Current

The main switchboard of a 400/230V industrial installation is directly supplied from a 750kVA distribution company owned transformer which has a rated impedance of 6% on the transformer nameplate.

Sub-mains supply a distribution board from the main switchboard.

The following information is known:-

Consumers mains are 70mm^2 XLPE X-90 single core with circular copper conductors buried direct in the ground at a depth of 0.5m with a soil resistivity of 1.2°C.m/W for a distance of 15m

Sub-mains are 25mm^2 PVC/PVC V-90 single core copper conductors buried in conduit at a depth of 0.5m with a soil resistivity of 1.2°C.m/W for a distance of 37m

Determine the prospective fault current at:-

(a) the transformer terminals; and

(b) the main switchboard; and

(c) the distribution board.

Work all impedances to 5 decimal places with correct rounding.

NB. For this calculation it is acceptable to use the value of R_c as the Z value and ignore the effect of X_c.

All relevant Table numbers and calculations must be shown to obtain full marks.

[11 Marks]

Question N^{o}19. Circuit Breaker Selection

A V-75 copper TPS cable, 2 core and earth, is installed in heavy duty underground conduit at 0.5m deep. Soil resistivity is 1.2^{0} Cm/W at an ambient temperature of 25^{0}C. The cable size (active & neutral) is 50mm^{2} with a 16mm^{2} copper earthing conductor. The cable runs for a distance of 160m.

If a 100amp miniature circuit breaker is selected as the protection device for both overload short-circuit, what type/s of circuit breaker may be used (Type “B”, “C” and/or “D”)?

[6 Marks]

Question N^{o}20. Clearing Time

A protective device (circuit breaker) is to be used to obtain automatic disconnection to limit, as far as practicable, the harmful effects of a switchboard internal arcing fault.

The switchboard is supplied from a 1 MVA transformer. A prospective fault current of 27kA is present at the incoming terminals of the switchboard. The switchboard has been designed with busbars rated at 1800amps. The switchboard has not been designed using internal separation to reduce the possibility of an arcing fault.

Calculate the maximum permissible clearing time of the circuit breaker main switch for this switchboard.

[4 Marks]

Question N^{o}21. Earth Size

An installation has 95mm^2 active and neutral copper conductors with XLPE X-90 insulation, protected by a circuit breaker that has a fault let through current of 7kA with a clearing time of 400ms at 7kA. The cables are installed buried direct at a depth of 500mm. Soil resistivity and ambient soil temperature is normal.

Using the calculation method, determine the size of the copper XLPE X-90 insulated earth cable required for compliance.

All relevant Table numbers and calculations must be shown to obtain full marks.

[5 Marks]

Question N^{o}22. Circuit Breaker and Fuse Ratings

A cable has a maximum current carry capacity of 133 amps in its ‘as installed’ condition. The maximum demand of the circuit is 125 amps.

To protect the electrical installation from overload current,

a) what size circuit breakers can be installed, and

b) what size HRC fuses can be installed.

c) quote the applicable AS/NZS 3000 Clause number

Note:- available sizes in circuit breakers and HRC fuses are 100A, 110A, 120A, 125A, 130A and 140A.

[4 Marks]

Question N^{o}23. Cable Selection

Two 70 mm² three core X90 insulated, sheathed and armoured copper cables, including earthing conductors, are connected in parallel to supply a three phase load.

The cables are protected by a circuit breaker and installed buried directly in the ground and spaced 0.15m from each other at a depth of 0.5m. The thermal resistivity of the soil is 1.2°C.m/W, and ambient soil temperature is 25^{o}C.

a) Neglecting voltage drop, what is the TOTAL maximum current carrying capacity of the cables which form the circuit?

b) What would be the current carrying capacity if the soil resistivity was 0.9°C.m/W?

Table numbers, calculations and units must be shown to obtain full marks.

[7 Marks]

Question No24. Discrimination

A main switch circuit breaker installed on a switchboard has an overload current rating of 600A. This supplies multiple circuits; one of the supplied circuits is protected by an adjustable setting circuit breaker with a range of overload protection between 350A and 450A.

What is the maximum permissible setting for this circuit breaker to ensure discrimination is achieved?

[2 Marks]