

# Licensed Electricians Assessment (LEA)

Licensed Electricians Theory Assessment  
Sample Paper 1 (2020)



Candidate Surname	
Candidate Given Names	

## Reference Material

- AS/NZS 3000:2018 Wiring Rules
- AS/NZS 3012:2019 Electrical installations – Demolition and Construction sites
- AS/NZS 3008.1.1:2017 Electrical installations – Selection of cable
- Electricity Safety (General) Regulations 2019
- AS/NZS 4836:2011 Safe working on or near low voltage electrical installations and equipment

## 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 must be shown to obtain full marks.
- All calculations must be shown to 2 decimal places unless otherwise stated.

Working Time: 2 hours  
Reading Time: 15 minutes

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	13	14	15	16	17	18	Total	
Mark																				

Candidates need to obtain 75% 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

**AS/NZS 3000 WIRING RULES**

In the following **four** Wiring Rules questions:

- You are required to write the Wiring Rules Clause and/or Table number in the space provided.
- The correct Wiring Rules Clause and Subclause must be given, e.g. 3.5.2(b)(i).

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

**Question 1.** What type of work is an 'alteration'?

.....  
.....  
.....  
.....

Wiring Rules Clause Number: ..... [2 + 2 = 4 Marks]

**Question 2.** Where the presence of corrosive or polluting substances is likely to cause corrosion or deterioration, those parts of the wiring system likely to be affected shall be suitably protected or.....

.....  
.....  
.....

Wiring Rules Clause Number: ..... [2 + 2 = 4 Marks]

**Question 3.** Air-conditioning and heat pump systems incorporating a compressor shall be provided with.....?

.....  
.....  
.....  
.....

Wiring Rules Clause Number: ..... [2 + 2 = 4 Marks]

**Question 4.** When preparing conductors for connection, how much insulation may be removed?

.....  
.....

Wiring Rules Clause Number: ..... [2 + 2 = 4 Marks]

**AS/NZS 3012 CONSTRUCTION & DEMOLITION SITES**

In the following **two** AS/NZS 3012 questions:

- You are required to write the Standard's Clause number and/or Table number in the space provided.
- The correct Clause and Sub-clause number must be given. e.g. 2.10.2 (f).

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

**Question 5.** A portable luminaire is to be used on a construction site. What is the minimum degree of protection (IP rating) for this luminaire?

.....  
.....

Standard Clause Number: ..... [2 + 2 = 4 Marks]

**Question 6.** Overhead wiring is required to be run over an access way on a construction site. A flagged catenary wire is to be hung directly below this wiring to minimize the risk of vehicular contact with the wiring. How far below the wiring should the flagged catenary be hung?

.....  
.....  
.....

Standard Clause Number: ..... [2 + 2 = 4 Marks]

**ELECTRICITY SAFETY (GENERAL) REGULATIONS 2019**

In the following Regulation question, you are required to:

- write your answers on the line/s below each question
- write the complete Regulation and Sub-Regulation number, if applicable, in the space provided, e.g. 401(e)(3).

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

**Question 7.** Are consumer's mains required to be controlled by a main switch?

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Regulation Number: \_\_\_\_\_ [2 + 2 = 4 Marks]

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SAMPLE

**ELECTRIC SHOCK SURVIVAL**

**Question 8.** You are applying first aid to a person who has received an electric shock. The power is off, and the emergency services have been called. The victim is unconscious, and you have checked their airway is clear. The next step is to check if they are breathing. How do you do this?

1. \_\_\_\_\_
2. \_\_\_\_\_

[2 + 2 = 4 Marks]

SAMPLE

**CABLE SELECTION**

**Question 9.**

**TWO** four core and earth V90 insulated and sheathed copper cables, are connected in parallel to supply a three-phase distribution board with a total maximum demand of 240A.

The cables are installed in separate conduits that are buried to a depth of 0.8m and are spaced 0.3m apart. They are protected by a circuit breaker.

- (i) Neglecting voltage drop, what is the minimum cable size which can be installed for this circuit.
- (ii) If the conduits were touching instead of spaced, what is the minimum cable size which can be installed for this circuit?

**Table details and units must be shown below to obtain full marks. Part (ii) is over the page.**

Part (i)

	<b>Answer</b>		<b>Answer</b>
<b>Table 3 (_____?)</b>		<b>Item</b>	
<b>Table</b>		<b>Column</b>	<b>Answer</b>
<b>Derate/rating table</b>		<b>Column</b>	<b>Factor</b>
<b>Derate/rating table</b>		<b>Column</b>	<b>Factor</b>

Part (i) Answer.....

Question 9. Part (ii)

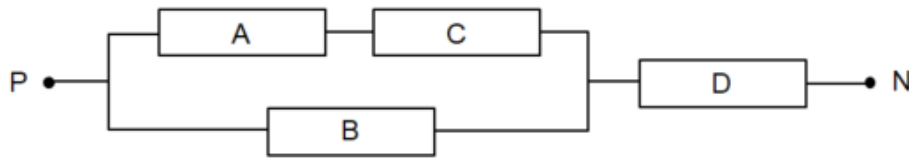
	Answer		Answer		Answer
Derate/rating table		Column		Factor	

Part (ii) Answer.....

[1+2+1+1+2+1 = 8 Marks]

**DC CIRCUITS**

**Question 10.**



The following values apply to the diagram above:

The total current in the circuit is 8A

A is  $20\Omega$  B is 4A C is 80V and D is 640W

Calculate:

- (i) the current flowing through resistor C
- (ii) the total voltage in the circuit
- (iii) the total power dissipated by the circuit

SAMPLE

**Answers:** (i) Current ..... (ii) Voltage ..... (iii) Power .....

[2+2+2 = 6 Marks]



**MAXIMUM DEMAND**

**Question 11.**

Calculate the Maximum Demand for the mains of a single phase 230V domestic residence.

The load connected to the switchboard is:

- 3 circuits of 6 - 10A double socket outlets
- 2 15A socket outlets
- 1 16A charger for an electric vehicle
- 3 circuits of 16 – LED lighting points
- 1 – 4.3kW air conditioner

All relevant table details, including table, column and load groups used. Calculations and units must be shown to obtain full marks.

Table		Column	
Equipment	Load Group	Calculation	Maximum Demand
Total Maximum Demand			

[1+1+1+1+1+2+1 = 8 Marks]

**VOLTAGE DROP**

**Question 12.**

In a 400/230V, three-phase commercial installation, a three-phase power factor corrected 17A appliance which operates continuously is supplied from a sub-circuit originating at a distribution board.

All the cables are:

- V90 copper conductors
- protected by circuit breakers
- laid flat and not installed with other cables

The circuit details are:

**Consumer Mains - Single Double Insulated**

MD current	65A
Length	25m
Size	35mm <sup>2</sup>

**Sub-mains - Single Double Insulated**

MD current	48A
Length	35m
Size	25mm <sup>2</sup>

**Final sub-circuit - multi-core cable with circular copper conductors**

Length	31m
Size	10mm <sup>2</sup>

The Consumer Mains and Sub-mains are operating at their normal operating temperatures.

The final sub-circuit cables have an operating temperature of 60°C.

Calculate the total voltage drop from the point of supply to the motor terminals.

**All relevant table details, calculations and units must be show to obtain full marks.**

Cable	Table	Column	Vc	Calculation	Vd
Consumer Mains					
Sub-mains					
Final Sub-circuit					

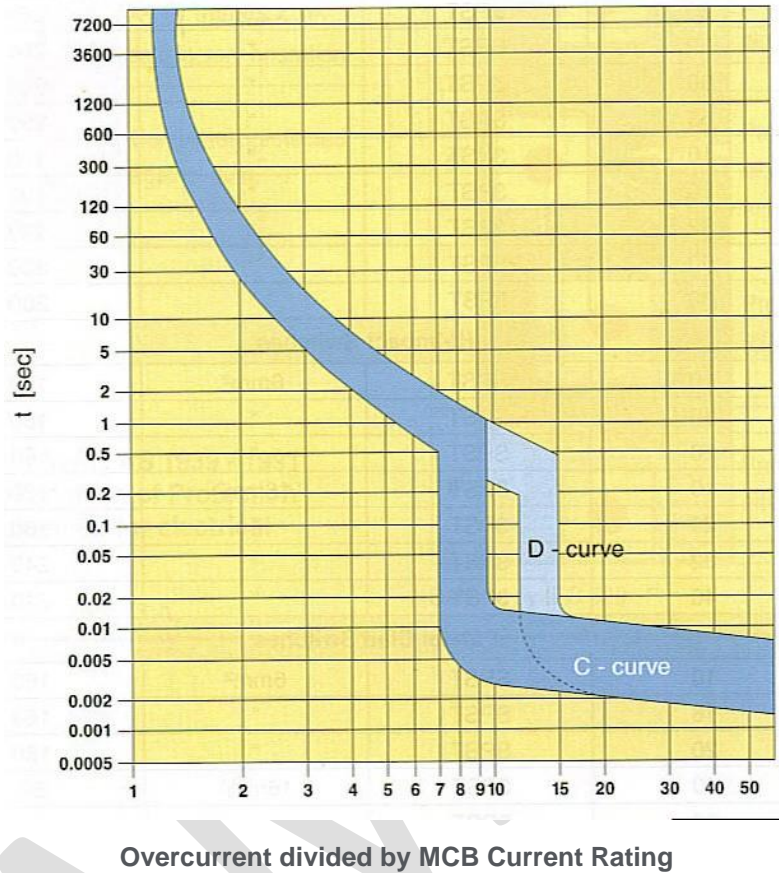
Answer Total Vd: .....

[1+1+1+1+1+1+1+1+1+1 = 10 Marks]

**OVERLOAD AND SHORT CIRCUIT CALCULATIONS**

**Question 13.**

What are the minimum and maximum tripping times for a 20A Type C miniature over-current circuit breaker which is subjected to an over-current of 80A?



Overcurrent divided by MCB current rating .....

Answer: Minimum time ..... Maximum time .....

[1+1+1 = 3 Marks]

**OVERLOAD AND SHORT CIRCUIT CALCULATIONS**

**Question 14.**

The main switchboard of a 400/230V industrial installation is directly supplied from a 500KVA transformer which has a prospective fault current of 18,850A per phase.

Submains supply a distribution board from the main switchboard.

The following information is known:

Impedance of the Consumer Mains = 0.0068Ω

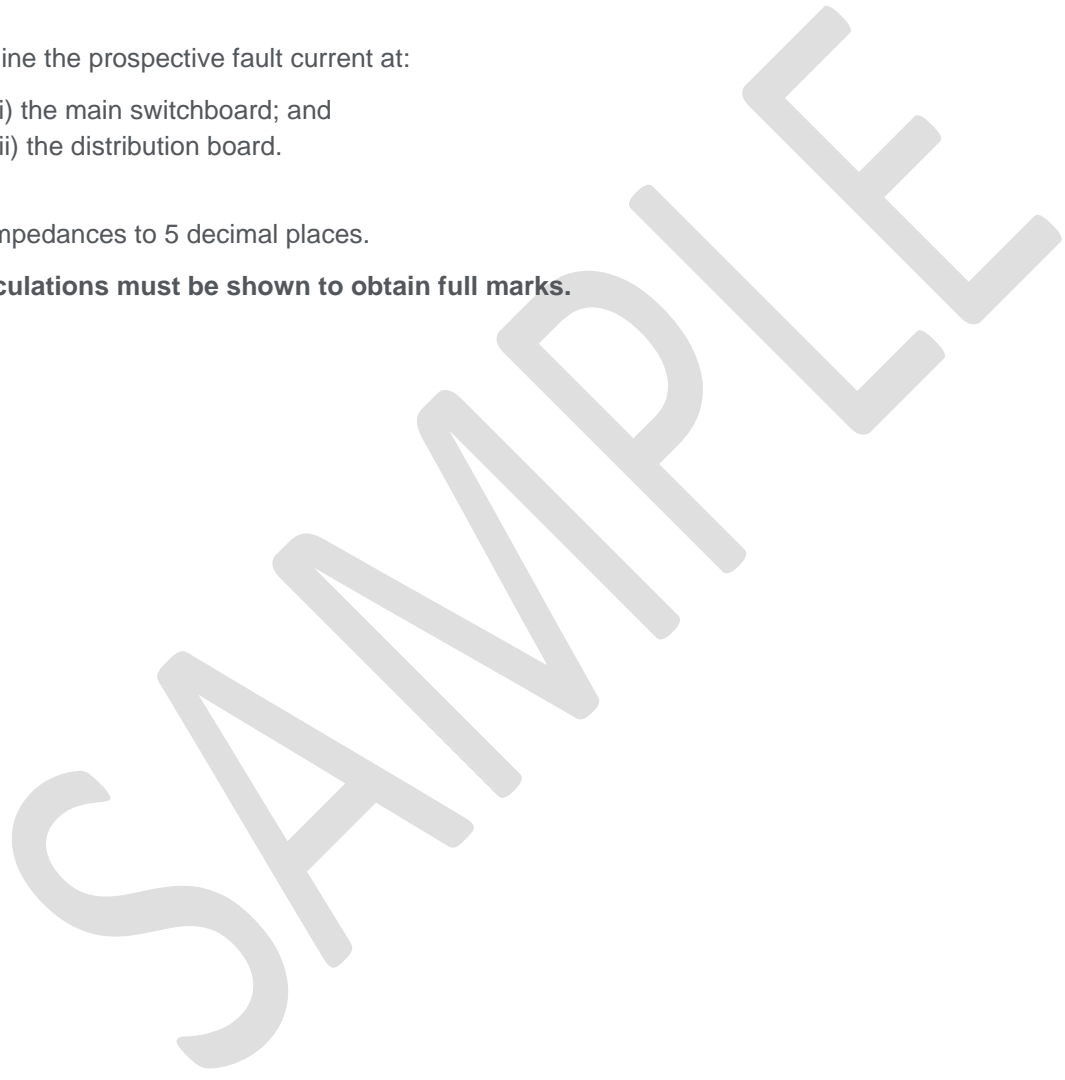
Impedance of the Submains cables = 0.037Ω

Determine the prospective fault current at:

- (i) the main switchboard; and
- (ii) the distribution board.

Work impedances to 5 decimal places.

**All calculations must be shown to obtain full marks.**



Transformer Impedance .....

MainSw/Bd .....

Dist/Bd .....

[(2+1) + (2+1) + (2+1) = 9 Marks]

**RESIDUAL CURRENT DEVICES**

**Question 15.**

A 30mA Residual Current Device is to be installed to protect three (3) circuits of 10A socket outlets with an MD of 35A. Each circuit is protected by a 16A circuit breaker.

State the minimum current rating of the Residual Current Device.

.....

Wiring Rules Clause Number: ..... [1 + 2 = 3 Marks]

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**MOTORS AND STARTERS**

**Question 16.**

**CIRCLE** the letter in front of the statement you consider to be the most correct.

On start up, a 3 phase 400V squirrel cage induction motor with an automatic star/delta starter:

- A starts on half the line voltage (200V)
- B changes to delta connection at about 80% of the motor's full rated speed
- C has a starting torque three times that of the DOL starting torque
- D has a starting current one half of the DOL current

[2 Marks]

**AS/NZS 4836:2011**

**Question 17.**

This question relates to AS/NZS 4836:2011.

The electrical equipment to be worked on, and the appropriate points of isolation and all of its energy sources shall be

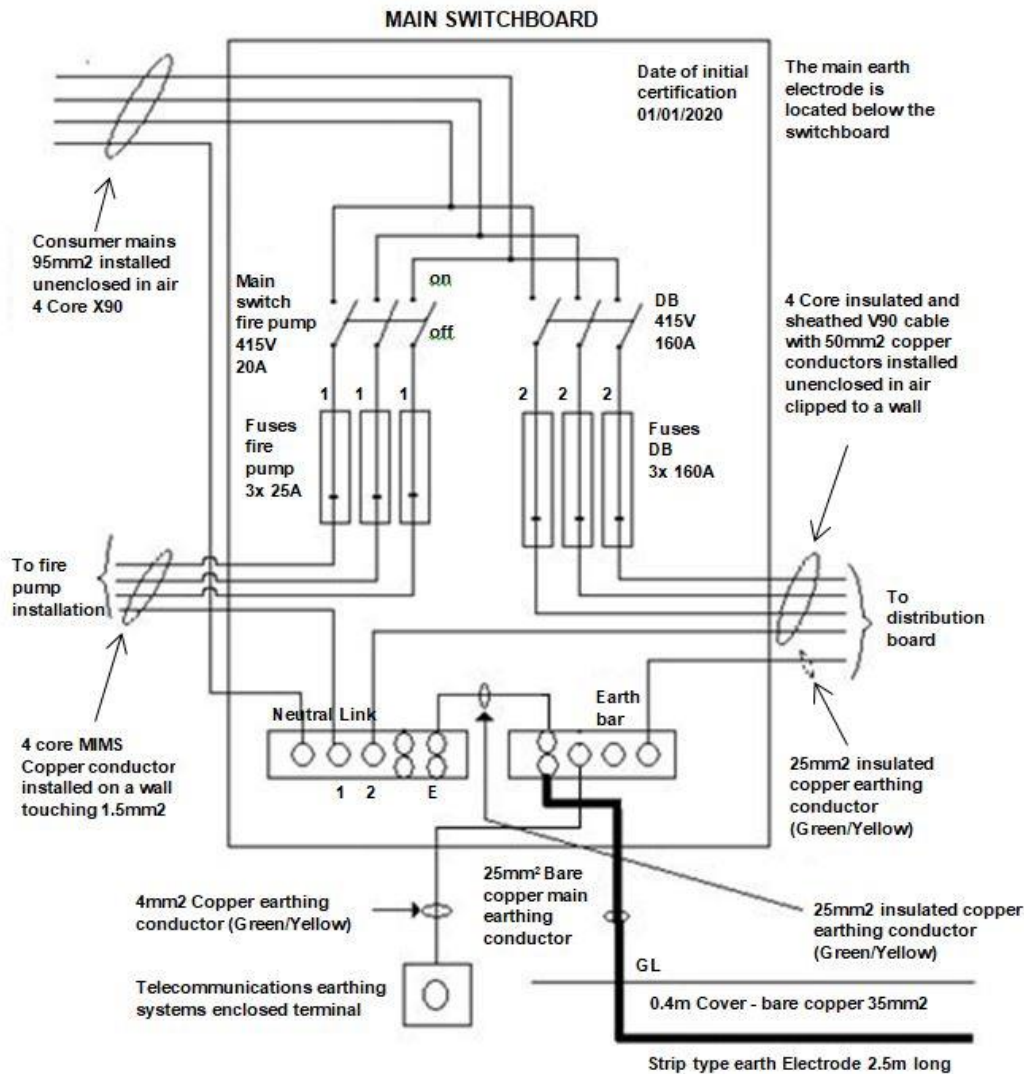
.....  
.....

Standard Clause Number: ..... [2 + 2 = 4 Marks]

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**INSTALLATION DEFECTS - NON DOMESTIC**

**Question 18.**



The drawing above shows the MAIN SWITCHBOARD of an industrial installation originating at the consumers mains and contains contraventions to the Wiring Rules.

It supplies a distribution board having a connected load with a calculated maximum demand of 160A per phase and an automatically controlled 3 phase fire pump motor having a current rating of 20A per phase. The fire pump is not required to be RCD protected.

The multi-core MIMS cables are installed spaced from the wall and are 1/1 kV cables. The supply authority has provided short circuit protection for the consumers mains.

The safety services Copper main switch and the main switch for the general electrical installation are separated by a metal partition.

All screws in bars or links are all 80% of the tunnel diameter.

Assume the MIMS cables are earthed in accordance with the Wiring Rules and are capable of maintaining supply to the equipment even when exposed to fire and mechanical damage.

All fuses shown are HRC type.

**Complete the table on the following page.**

**Question 18. Continued.**

Use the diagram on the previous page.

List **FIVE different defects** together with the contravened Wiring Rules Clause/Table number in the table provided below.

**Note: Only the first five defects will be considered.**

DEFECT DETAILS	WIRING RULE CLAUSE/TABLE No.

[5 x (2+1) = 15 Marks]



APPENDIX L  
ELECTRIC SHOCK SURVIVAL—Australia

A

EMERGENCY !—Electric shock may cause cardiac arrest.

**DANGERS**

Check for your own safety and the safety of the casualty and bystanders.

**HIGH VOLTAGE**—Wait until the power is turned off.

**LOW VOLTAGE**—Immediately switch off the power. If this is not practicable, pull or push the casualty clear of the electrical contact using material, such as wood, rope, clothing, plastic or rubber. Do not use metal or anything moist.

**RESPONSIVENESS**

Check for response (verbal and tactile stimuli), touch and talk.

**SEND/Shout FOR HELP**

Send a bystander to DIAL 000 Ambulance

If available send for Automatic External Defibrillator (AED)

If alone shout for help.

**AIRWAY** Place the casualty on his/her back.

Tilt the head back and raise the chin forward.

**BREATHING** Check for normal breathing, observe chest movement, listen and feel for breathing.

Give two initial breaths.

In the absence of normal breathing, if no one has gone for help, place casualty in recovery position and go for help.

**CIRCULATION**

Position hands on centre of the chest.

Give 30 chest compressions followed by 2 breaths. Depress breastbone 1/3 the chest depth (approx 4 cm or 5 cm) at the rate of 100 compressions a minute.

As soon as available attach AED and follow its instructions.

Continue CPR, 30 compressions: 2 breaths.

When casualty's normal breathing returns cease resuscitation and move the casualty into the **recovery** or **coma** position.

Keep a constant watch on the casualty, to ensure that they do not stop breathing again, until trained assistants take over.

This information is provided for guidance only. It is recommended that persons associated with the installation of electrical equipment or repair of electrical installations obtain Australian Resuscitation Council approved training in current resuscitation methods.