June 2016 Examinations

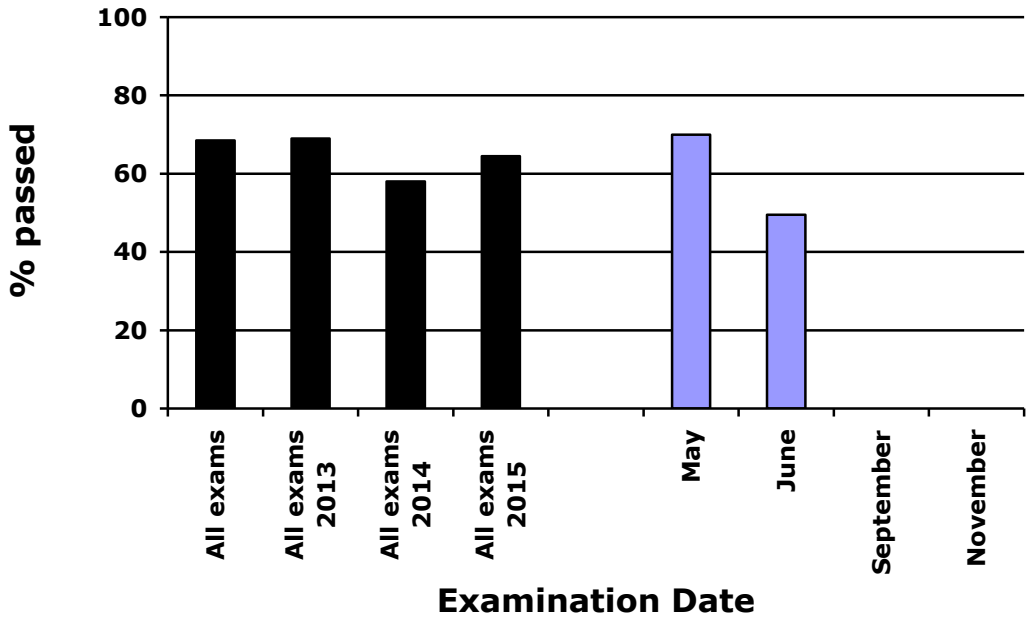
Electrical Workers Registration Board.

1. Summary of Examinations

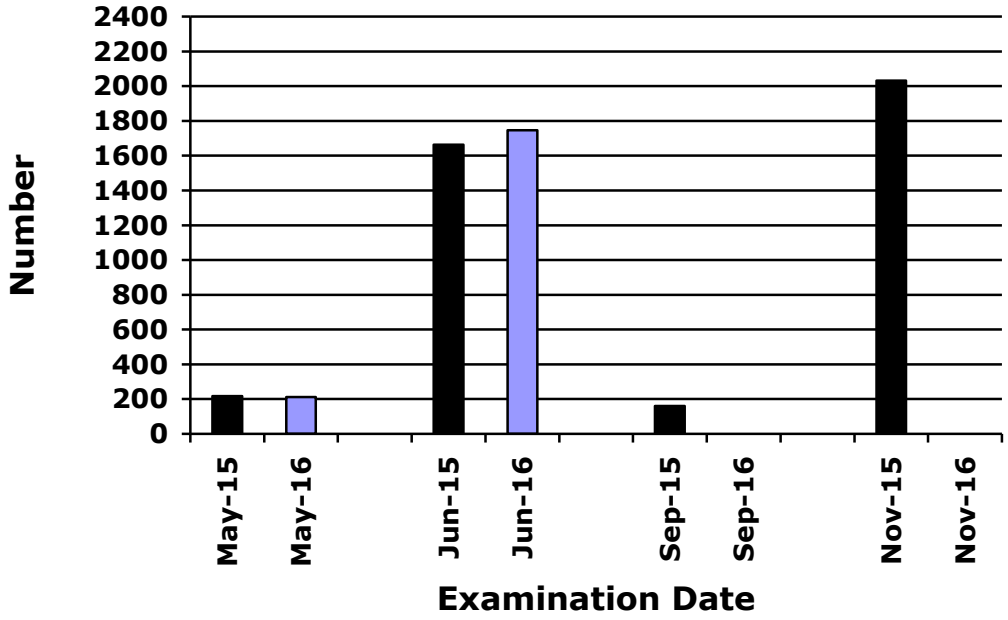
Pass rates:

	Number of candidates	**Number of candidates who passed**	**Percentage passed**
EAS	58	44	76
EASQ	27	22	81.5
EST	125	93	74.5
Elec. Regulations	860	445	52
Elec. Theory	622	223	36
Elec. Inspector	52	33	63.5
Elec. Installer	2	1	50
AT			
ESAI			
June 2016	**1746**	**861**	**49.5**

Pass Rates - All Examinations - 2016



Candidate Numbers - All Examinations - 2016



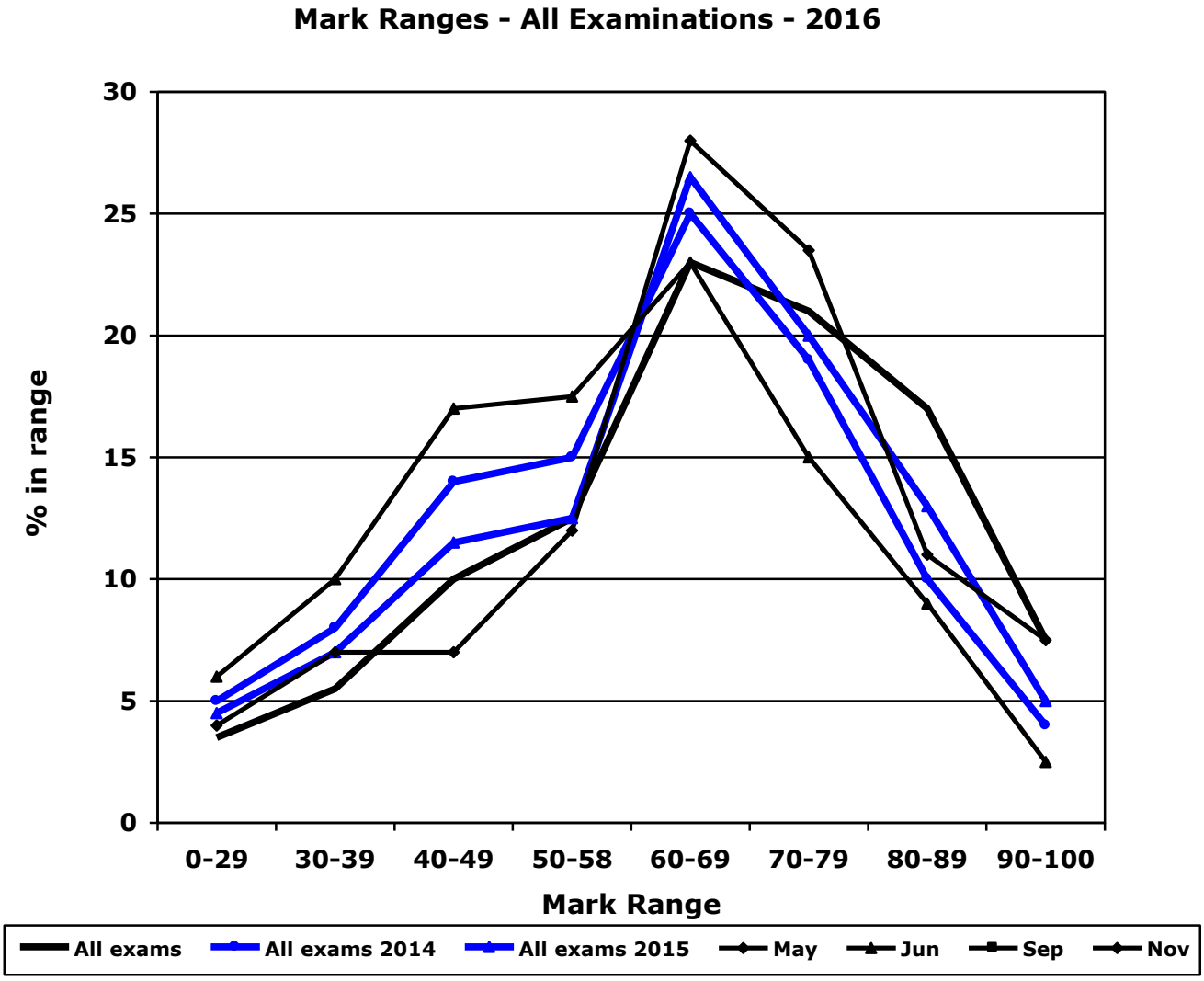
Mark Ranges

Number of candidates

Range	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	**June 2016**
										Total Candidates
90 – 100	6	8	4	12	10	0	0			**40**
80 – 89	17	5	28	68	37	5	1			**161**
70 – 79	11	5	26	143	70	9	0			**264**
60 – 69	10	4	35	222	106	19	0			**396**
50 – 58	6	4	13	168	115	4	0			**310**
40 – 49	4	0	9	140	130	10	1			**294**
30 – 39	3	0	4	73	95	1	0			**176**
0 – 29	1	1	6	34	59	4	0			**105**
	58	**27**	**125**	**860**	**622**	**52**	**2**			**1746**

% of candidates

Range	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	**June 2016**
										% of Candidates
90 – 100	10.5	29.5	3	1	1.5	0	0			**2.5**
80 – 89	29.5	18.5	22.5	8	6	9.5	50			**9**
70 – 79	19	18.5	21	17	11.5	17.5	0			**15**
60 – 69	17	15	28	26	17	36.5	0			**23**
50 – 58	10.5	15	10.5	19.5	18.5	7.5	0			**17.5**
40 – 49	7	0	7	16	21	19.5	50			**17**
30 – 39	5	0	3	8.5	15	2	0			**10**
0 – 29	1.5	3.5	5	4	9.5	7.5	0			**6**


Mark Ranges - All Examinations - 2016
30
25
20
15
10
5
0
% in range
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90-100
Mark Range
All exams
All exams 2014
All exams 2015
May
Jun
Sep
Nov

2. General Comments

The overall pass rate of 49.5% is much lower than is usual due to the very low pass rate for the Electrician Theory examination. With the Electrician Theory result removed the pass rate rises to 57% with is consistent with past results.

2.2 Candidates Numbers

There were 83 more candidates than the number of candidates that sat the corresponding June examinations in 2015. The candidate numbers for the June 2016 examination are the highest for June examinations since 2010.

The candidate numbers for the Electrician Regulations examination are the 2nd highest for this type of examination in June since 2010.

The candidate numbers for June examinations are as follows:

	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	Total
2004	385		131	485	335					**1336**
2005	282		123	622	564			10		**1601**
2006	254		122	575	696			6		**1653**
2007	299		70	910	363				1	**1643**
2008	300		88	513	824	43				**1786**
2009	292		85	803	695	57				**1932**
2010	348		89	848	561	45				**1891**
2011	159		114	704	489	40	2		3	**1511**
2012	133	29	101	571	532	45	1	1		**1413**
2013	106	24	84	623	507	29	2			**1375**
2014	81	13	84	634	551	56	1			**1420**
2015	58	31	178	825	524	44	3			**1663**
2016	58	27	125	860	622	52	2			**1746**

2.3 Electrician Regulations examinations

In June 2015, markers commented that a significant number of candidates appear to run out of time. Similar comments were made by markers for this examination. One markers comments are the most pertinent. These were:

> *"This paper was far too long. There were 88 bullet points to answer in 180 minutes. By calculation this means there were only 2 minutes for each and every bullet point to be answered, whether it was a one-line answer or a six-line answer. To read the question, search the standards book and find the correct answer, and then write it into the answer sheet was an almost impossible task.*
>
> *An examination paper with about 50 bullet points should be the limit. The allocation of half marks to a question is a bit rich as time taken to find the answer and copy the answer onto paper is time consuming and if a question is worth asking it should be worth at least one mark. Judging by the number of unanswered questions a large percentage of candidates ran out of time to complete their paper."*

Strenuous efforts continue to be made through moderation to ensure that candidates have sufficient time to complete this examination with attention being given to reducing the amount of writing required. However, the markers comments do raise issues that will be addressed at the next moderation.

I still remain concerned that many candidates continue to display a poor examination technique by commencing a paper at the beginning and attempting to work through it the end. For most candidates, taking this approach will make it more difficult to pass the examination.

Given that the Electrician teaching guidelines are broad it is not expected that each candidate will have a sound knowledge of every topic covered. Therefore, for this examination, a candidate needed to, initially, select those questions within the 75 presented of which they do have a sound knowledge **and do those first** – regardless of where they appear in the paper. By doing this, a candidate should be able to gain about 25-30 marks within the first hour of the examination.

I recommend that training providers be advised that they emphasise to candidates that they, the candidates, be selective in the questions they attempt **first** regardless of where the question appears in a paper.

Note that this applies to all examinations.

2.4 Electrician Theory examination

The very low pass mark for this examination prompted much discussion from markers with many concerned that the majority of candidates are sitting this examination with little knowledge or poor tuition or both. They consider that the present system does not provide for trainees to revise unit standards once they have been completed, so knowledge gained is not reinforced. An example of this is that many candidates cannot apply Ohms Law in practical situations.

The issue of having an intermediate examination for Electrician Theory candidates was again discussed. Markers thought that having this type of examination would better prepare candidates for what they would face in the main examination. Many thought that a multi-choice type examination would be all that is needed.

There was also discussion on whether the Electrician Theory examination should be an open book examination. Markers thought that this had some merit although which texts should be cited might be problematic.

2.5 Teaching Guidelines

With the Electrical Service Technician examination, concern was raised by a candidate, an examination supervisor and a marker as to whether part of a question asked was, in fact, within the scope of the relevant teaching guidelines. This was question 8(a) which required candidates to draw a 230V control circuit for a star/delta starter.

Within the Electrical Service Technician Teaching Guidelines this topic is covered by 8.19.1 – three-phase induction motors and 8.19.2 – three-phase induction motor starters. Part 8.19.1 specifically covers the connection of motors in a star/delta configuration. However, part 8.19.2 is not specific as to the type or types of starters

being referred to. I am of the view that star/delta starter control circuits are included but this is arguable.

This has highlighted the need to have all teaching guidelines reviewed and up-dated. They are often not clear as to what is (or was) intended or are simply out-of-date.

There are a number of topics which are not presently covered that now need to be included. These include:

- The use of LED lighting as replacement for a large portion of existing types of lighting.
- Electric car charging systems
- Motors and motor starters – the use of variable speed drives and soft starters
- Solar PV installations – the theory behind the systems and hardware/knowledge of the practical aspects of installations.
- Medical electrical installations
- Conductive thermal insulation

It needs to highlighted that the above topics (motors and starters aside) all have an impact on (or will eventually impact upon) the design, installation and maintenance of low voltage domestic electrical installations – let alone commercial and industrial installations.

In addition, the up-dated legislation needs to be incorporated in all the guidelines.

Rather than review the entire Guidelines at once, my view is that the Board engage people to review and rewrite specific parts of the Electrician Teaching Guidelines. This has the advantage of being quicker to arrive at a revamped version of draft Guidelines. When completed, these guidelines can be adapted to form guidelines for the other examination classes.

I recommend the Board engage people to review and update specific parts of the Teaching Guidelines.

3. Moderation

The moderation went well with all moderators having valuable input.

4. Marking

All markers participated fully in the marking process.

5. Examination Centre Performance – June 2016

The pass rates for each examination centre for June 2016 are:

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
A	61	23	37.5
B	193	91	47
C	194	111	57
D	0	0	
E	0	0	
F	0	0	
G	0	0	
H	36	18	50
J	38	21	55
K	104	45	43
L	73	34	46.5
M	63	33	52.5
N	84	54	64
O	51	24	47
P	79	50	63
Q	9	9	100
R	281	144	51
S	55	40	72.5
T	77	27	35
U	288	115	40
V	0	0	
W	56	21	37.5
X	0	0	
Y	0	0	
Z	4	1	25
Total	**1746**	**861**	**49.5**

6. Electrical Appliance Serviceperson Performance – June 2016

6.1 Examination centre pass rates for the Electrical Appliance Serviceperson Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
B	3	3	100
C	14	10	71.5
J	5	5	100
P	13	11	84.5
R	13	8	61.5
S	3	2	66.5
U	7	5	71.5
Total	**58**	**44**	**76**

Examination centres not shown did not have candidates sit this examination

6.2 Candidate performance in Electrical Appliance Serviceperson Examinations

The pass rate of 76% is in line with past results for Electrical Appliance Serviceperson examinations. Candidate numbers for this examination were the same as for June 2015.

Candidates generally did well in all questions except question 7. In question 1, 45% of candidates gained 15 or more marks while 48% of candidates were able to gain between 10 and 14 marks. For questions 2, 3, 4, 5, 6, 8 and 9 between 52% and 79.5% of candidates gained 7.5 marks or more.

- Question 4 related to RCDs. Candidates had difficulty in identifying types of RCDs commonly in use and in stating the requirements for RCD detailed in the Electricity (Safety) Regulations 2010. Only 15% of candidates could gain 7.5 marks or more for this question, while 50% could not gain at least 5 marks.

7. Electrical Appliance Serviceperson (Qualified) Performance – June 2016

7.1 Examination centre pass rates for the Electrical Appliance Serviceperson (Qualified) Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
B	9	8	89
L	6	4	66.5
T	12	10	83.5
Total	**27**	**22**	**81.5**

Examination centres not shown did not have candidates sit this examination

7.2 Candidate performance in Electrical Appliance Serviceperson (Qualified) Examinations

Of the 27 candidates who sat this examination, 22 passed.

8. Electrical Service Technician Performance – June 2016

8.1 Examination centre pass rates for the Electrical Service Technician Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
B	2	2	100
C	13	12	92
H	7	5	71.5
J	1	1	100
M	15	8	53
P	12	10	83
R	20	17	85
S	12	12	100
T	5	3	60
U	37	22	59.5
W	1	1	100
Total	**125**	**93**	**74.5**

Examination centres not shown did not have candidates sit this examination

8.2 Candidate performance in Electrical Service Technician Examinations

The pass rate of 74.5% is consistent with examinations of this type. While candidate numbers were 53 less than for the corresponding examination in 2015, they are still the 3rd highest for the last 12 years.

Candidates generally did well in questions 1, 2, 3, 6, 7 and 9. In question 1, 59% of candidates gained 15 or more marks. For questions 2, 3, 6, 7 and 9 between 49% and 74.5% of candidates gained 7.5 marks or more.

Candidates had difficulty with the following questions:

- Question 4 related to electrical protection. This question included fundamental concepts such as discrimination, markings on fuses and inverse-time characteristics. Most candidates had difficulty with each part. Only 25% of candidates could gain 7.5 marks or more for this question, while 50% could not gain at least 5 marks.

- Question 5 related to the use of test instruments. The parts that cause most problems for candidates related to the effect of connecting an ammeter in parallel and a voltmeter is series. Only 26.5% of candidates could gain 7.5 marks or more for this question, while 34.5% could not gain at least 5 marks.

- Question 8 related to three-phase motor starters. Half of the marks for this question were allocated to the drawing of a control circuit for a star/delta starter. Nearly all candidates could not complete this part.

  The teaching guidelines are not specific as to the type or types of control circuits that candidates are require to be knowledgeable about. It could well be that this topic is not covered in depth by training providers.

  Only 13% of candidates could gain 7.5 marks or more for this question, while 70% could not gain at least 5 marks.

9. Electrician Regulations Performance – June 2016

9.1 Examination centre pass rates for the Electrician Regulations Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
A	47	21	44.5
B	135	65	48
C	57	38	66.5
H	10	5	50
J	23	11	48
K	50	24	48
L	32	21	65.5
M	38	24	63
N	39	28	72
O	30	17	56.5
P	39	21	54
Q	8	8	100
R	136	74	54.5
S	23	17	74
T	27	6	22
U	121	46	38
W	43	18	42
Z	2	1	50
Total	**860**	**445**	**52**

Examination centres not shown did not have candidates sit this examination

9.2 Candidate performance in Electrician Regulations Examinations

There were three moderated Electrician Regulations examination papers in the June period although one paper had only one candidate.

The main examination (ER 77) had 852 candidates, while the earlier Jun examination (ER 76) had 2 candidates and the July examination (ER 78) had 6 candidates.

The pass rate of 52% is average for this examination.

ER 77 - 25 June

Candidates generally did well in questions 1, 2, 3, 4, and 6. In question 1 47% of candidates gained 15 or more marks. For questions 2, 3, 4, and 6, between 34.5 and 57% of candidates gained 7.5 marks or more.

Candidates had difficulty with the following questions:

- Question 5 related to switchboards. This question related to a modular switchboard with fittings included and various cables that were required to be connected within the switchboard and which circuits require protection with an RCBO. Markers made the point that the use of RCBOs is not common and that the more usual combination is RCCBs and MCBs combined.

  From my perspective, this highlights a lack of tuition in this area. The term "RCD" is a generic term that, in itself, does not indicate the type of RCD that can be used. For example, a socket outlet in Zone 2 of a bathroom must have RCD protection. In reality that protection is normally provided by an RCCB or an RCBO or an SRCD. Only 23% of candidates could gain 7.5 marks or more for this question, while 56.5% could not gain at least 5 marks.

- Question 7 related to switchboard and switchrooms. Candidates seems to be familiar with general requirements for switchboards but had difficulty with the requirements relating to switchrooms. While only 18.5% of candidates could gain 7.5 marks or more for this question, 53.5% of candidates gained between 5 and 7 marks.

- Question 8 related to RCD protection for final subcircuits in new parts of a hotel and parts of a hotel that had been converted to living units. As with question 5, candidate knowledge relating to RCDs other than RCCBs is very basic. Only 7.5% of candidates could gain 7.5 marks or more for this question, while 69.5% could not gain at least 5 marks.

- Question 9 related to MEN systems. Around 16% of candidates failed to gain any marks for this question which may indicate that these candidates may have had time issues. Only 26% of candidates could gain 7.5 marks or more for this question, while 48% could not gain at least 5 marks.

10. Electrician Theory Performance – June 2016

10.1 Examination centre pass rates for the Electrician Theory Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
A	13	2	15
B	41	12	29
C	106	50	47
H	19	8	42
J	9	4	44.5
K	54	21	39
L	32	7	22
M	9	1	11
N	44	26	59
O	21	7	33
P	15	8	53
Q	1	1	100
R	107	40	37.5
S	15	8	53
T	29	7	24
U	93	19	20.5
W	12	2	16.5
Z	2	0	0
Total	**622**	**223**	**36**

Examination centres not shown did not have candidates sit this examination

10.2 Candidate performance in Electrician Theory Examinations

The pass rate of 36% is a very poor result, even for an examination where pass rates are relatively lower than other for other examination types.

In the context of the pass rate, candidates generally did well in questions 1, 4, 8 and 9.

- Question 1 - 39% of candidates gained 15 or more marks and 37% of candidates were able to gain 10 or more marks.
- Question 4 - 50% of candidates were able to gain 7.5 marks or more and 34.5% of candidates were able to gain between 5 and 7 marks.
- Question 8 – 28.5% of candidates were able to gain 7.5 marks or more and 48% of candidates were able to gain between 5 and 7 marks.
- Question 9 – 33.5% of candidates were able to gain 7.5 marks or more and 45% of candidates were able to gain between 5 and 7 marks.

Candidates had difficulty with the following questions:

- Question 2 related to single-phase motor theory. Very few candidates had any knowledge of how a rotating magnetic field is created in a single-phase induction motor, nor of the role of various components in creating those fields. Only 14% of candidates could gain 7.5 marks or more for this question, while 65% could not gain at least 5 marks.

  The result for this question mirrors that for question 7 – three-phase motor starters.

- Question 3 related to transformers. This question was deliberately structured so candidates were required to calculate the line current for an installation at a given power factor, **then** calculate primary current of the transformer supplying the installation. Most had little idea of what was required. Only 21% of candidates could gain 7.5 marks or more for this question, while 65% could not gain at least 5 marks.

- Question 5 related a fault on one phase of an oven with a high resistance protective earthing conductor. How to apply Ohms Law to an electrical fault comprising, effectively, basic series and parallel circuits is a continuing mystery to most candidates. In addition, three-phase systems seem to confuse candidates because many attempted to apply three-phase calculations to a single-phase problem. Only 17% of candidates could gain 7.5 marks or more for this question, while 65% could not gain at least 5 marks.

- Question 6 related to determining the installation kVA and power factor for an installation with inductive loads with differing power factors. The introduction of power factor into a question seems to confuse most candidates. Only 26.5% of candidates could gain 7.5 marks or more for this question, while 66% could not gain at least 5 marks.

- Question 7 related to three-phase motor starters. This question required candidates to draw the power circuit for a star/delta start and to carry out various tests on the motor windings. As with question 2 relating to single-phase motors candidates had little knowledge of motor theory and application. Only 5% of candidates could gain 7.5 marks or more for this question, while 70.5% could not gain at least 5 marks.

11. Electrical Inspector Performance – June 2016

11.1 Examination centre pass rates for the Electrical Inspector Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
A	1	0	0
B	3	1	33
C	4	1	25
L	3	2	66.5
M	1	0	0
N	1	0	0
R	5	5	100
T	4	1	25
U	30	23	76.5
Total	**52**	**33**	**63.5**

Examination centres not shown did not have candidates sit this examination.

11.2 Candidate performance in Electrical Inspector Examinations

The pass rate of 63.5% is consistent with results for this type of examination.

Candidates generally did well in questions 1, 2, 3, 5, 6, 7, and 9. In question 1, 48% of candidates gained 15 or more marks while 36.5% of candidates were able to gain between 10 and 14.5 marks. For questions 2, 3, 5, 6, 7, and 9 between 34.5% and 59.5% of candidates were able to gain 7.5 marks or more.

Candidates had difficulty with the following questions:

- Question 4 related to electrical installations. Candidates were required to determine why an installation did not comply with AS/NZS 3000 and to detail he changes required to ensure it complied. The majority of candidates had difficulty it determining why the installation did not comply, therefore they were unable to offer sound solutions. Only 23% of candidates could gain 7.5 marks or more for this question, while 50% could not gain at least 5 marks.

- Question 8 related to determining the heaviest loaded phase on a three-phase residential property with a common area. Nearly all candidates had very little knowledge of this topic. Most candidates seem to struggle with three-phase maximum demand questions regardless of how the question is presented. Only 4% of candidates could gain 7.5 marks or more for this question, while 65% could not gain at least 5 marks.

12. Electrical Installer Performance – June 2016

12.1 Examination centre pass rates for the Electrical Installer Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
S	2	1	50
Total	**1**	**2**	**50**

Examination centres not shown did not have candidates sit this examination

12.2 Candidate performance in Electrical Installer Examinations

Two candidates sat this examination and one passed.

13. Associated Tradesperson Performance – June 2016

13.1 Examination centre pass rates for the Associated Tradesperson Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
Total			

Examination centres not shown did not have candidates sit this examination

13.2 Candidate performance in Associated Tradesperson Examinations

There was no Associated Tradesperson examination in June 2016.

Appendix 1

Electrical Appliance Serviceperson Examinations

18 June 2016

EAS 1079, a moderated paper, was used for the examination of 18 June 2016.

A1.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EAS 1079	58	44	76
June 2016	**58**	**44**	**76**

EAS 1079

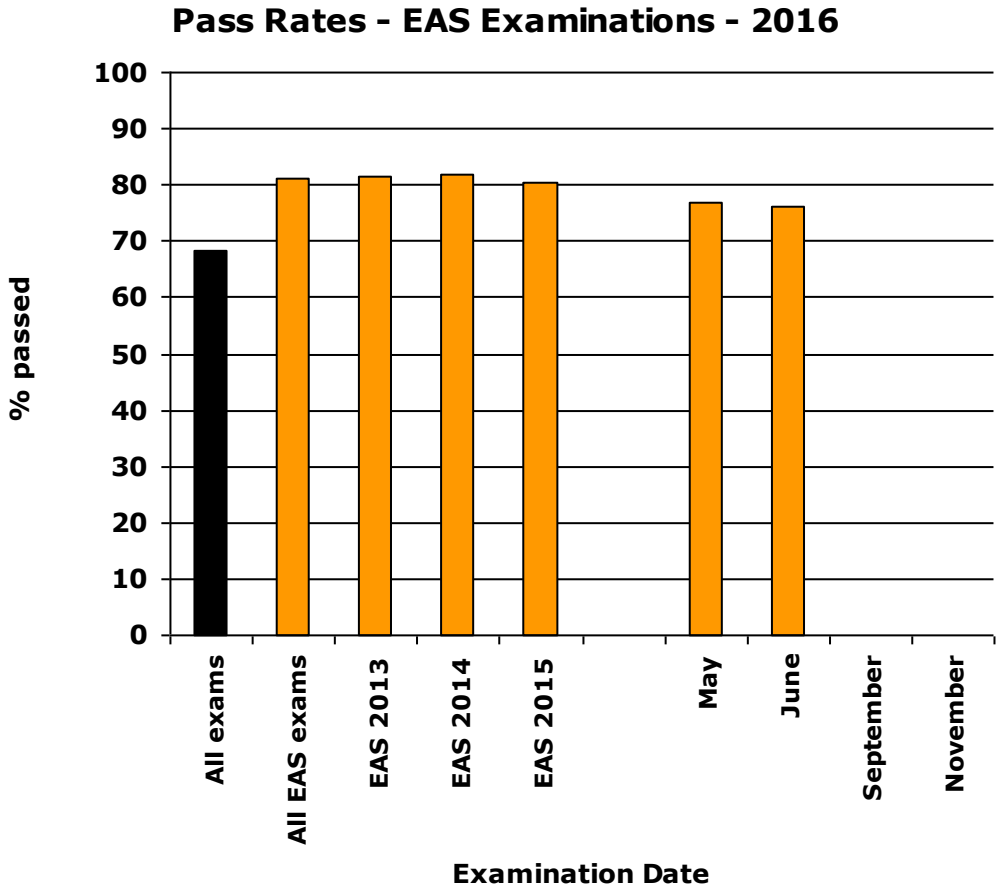
All candidates

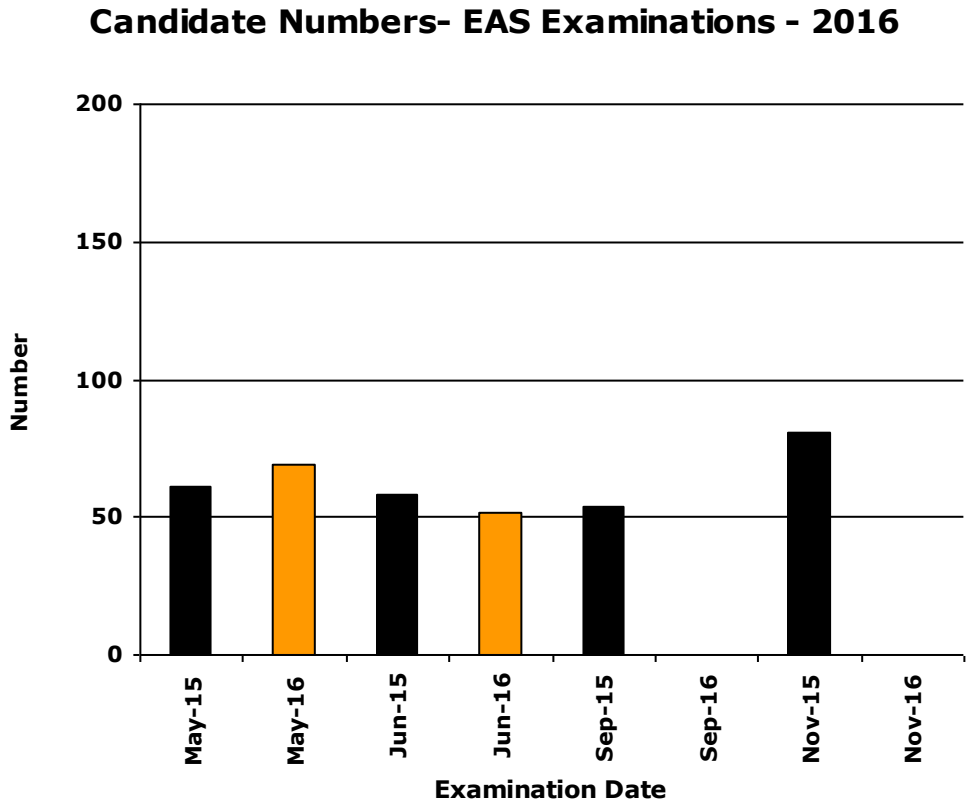
Average pass mark 71 %
Median mark 74

Those who passed

Average pass mark 79.5 %
Median mark 83

5 candidates gained 95 marks or more


Pass Rates - EAS Examinations - 2016
100
90
80
70
60
50
40
30
20
10
0
% passed
All exams
All EAS exams
EAS 2013
EAS 2014
EAS 2015
May
June
September
November
Examination Date


Candidate Numbers- EAS Examinations - 2016
200
150
100
50
0
Number
May-15
May-16
Jun-15
Jun-16
Sep-15
Sep-16
Nov-15
Nov-16
Examination Date

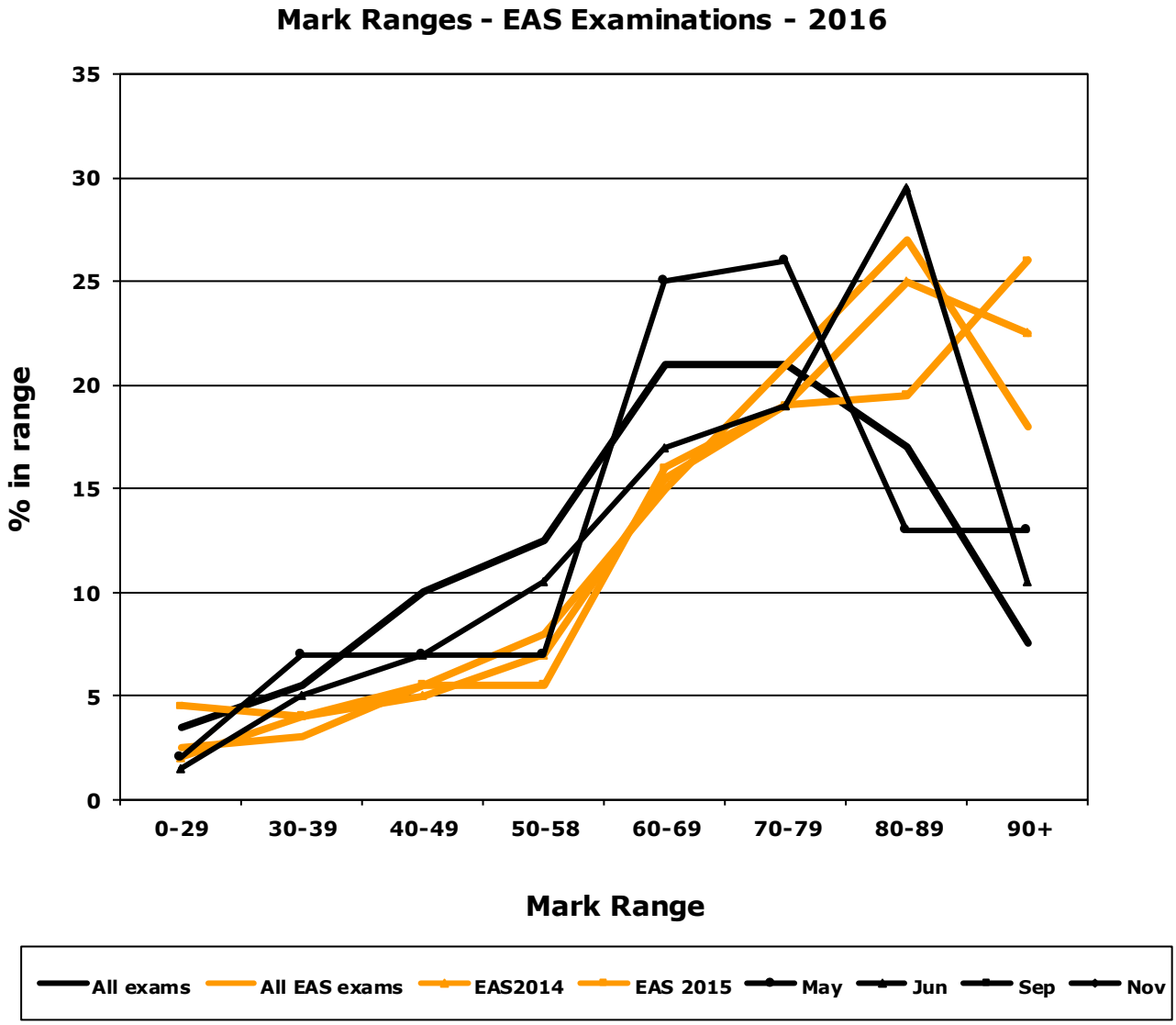
Mark Ranges

Number of candidates

Range	EAS 1079				**June 2016**	
90 – 100	6				**6**	**candidates**
80 – 89	17				**17**	**candidates**
70 – 79	11				**11**	**candidates**
60 – 69	10				**10**	**candidates**
50 – 58	6				**6**	**candidates**
40 – 49	4				**4**	**candidates**
30 – 39	3				**3**	**candidates**
0 – 29	1				**1**	**candidates**
	58				**58**	

% of candidates

Range	EAS 1079				**June 2016**	
90 – 100	10.5				**10.5**	**% of candidates**
80 – 89	29.5				**29.5**	**% of candidates**
70 – 79	19				**19**	**% of candidates**
60 – 69	17				**17**	**% of candidates**
50 – 58	10.5				**10.5**	**% of candidates**
40 – 49	7				**7**	**% of candidates**
30 – 39	5				**5**	**% of candidates**
0 – 29	1.5				**1.5**	**% of candidates**


Mark Ranges - EAS Examinations - 2016
% in range
35
30
25
20
15
10
5
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
All exams
All EAS exams
EAS2014
EAS 2015
May
Jun
Sep
Nov

A1.2 - Overall Marking Analysis

Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with some similar questions from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 1	**-**	**10, 2 mark questions**				**35**	**48**	**17**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 2	**J8.17**	**Electrical appliance testing**			**Testing of a Class I portable oven with MIMS elements. Visual inspections of oven. Testing of Class II electric drill.**	**79.5**	**12**	**8.5**
			Nov 2014	4	Ohmmeter used for test – which test, how test is carried out; expected results; and reason for test. Two tests to test integrity of insulation.	72	20	8
			Jun 2015	3	Visual inspections of a Class I heater. Requirements for a socket outlet in an installation. Two reasons for an earth continuity test	55	38	7
			Jun 2015	6	What polarity testing confirms. Earth continuity testing. Insulation resistance testing.	74	21	5
			Sep 2015	3	Explain how earth continuity test is carried out on a Class I appliance. Why ohmmeter is not used for an IR test. Dangers in live voltage testing of an appliance.	63	26	11
			Nov 2015	9	IR testing of Class I appliance with MOVs incorporated. Testing integrity of insulation of live Class I appliance	48	21.5	30.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 3	**D8.18.1**	**Motor operation**			**Draw circuit diagram of single-phase split-phase motor – how to reverse; how start winding disconnected. Effect of open-circuited centrifugal switch. How to reverse a universal motor. Effect of open-circuited run winding of capacitor-start motor.**	**57**	**15.5**	**27.5**
			Jun 2007	8	Circuit diagram of split-phase motor, reversing direction, how start winding disconnected, reversing universal motor applications for universal motors	29	35.5	35.5
			May 2008	8	Name parts of diagram of 230V induction motor. How to reverse motor. Effect on motor if various parts were faulty.	28	41	31
			May 2011	2	Circuit diagram of single-phase induction motor – state type shown, name parts of diagram; how to reverse motor. Effect if parts became disconnected	65.5	24.5	10

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q.4	**C8.9**	**Systems of Supply**			**Define Hertz. Draw sine wave. Remedy for appliance with high PEC resistance. How PEC contributes to electrical safety.**	**58.5**	**33**	**8.5**
			Sep 2008	9	Name parts of sine wave, define Hertz. Danger if appliances used in earthed situation. PEC effect on safety, PEC testing	25	56	19
			Sep 2009	9	Define Hertz, draw and label sine wave. How PEC contributes to safety, testing faulty PEC	50	33	17
			Nov 2009	9	Define Hertz, draw and label sine wave. How PEC contributes to safety, testing faulty PEC	53	28	19
			Nov 2010	2	Define Hertz, draw and label sine wave. Testing faulty PEC. How PEC contributes to safety,	43	29	28
			Sep 2013	2	Draw sine wave. Define Hertz. Remedy for appliance with high PEC resistance. How PEC contributes to electrical safety.	53.5	24.5	22

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 5	**G8.19**	**Commission and decommission electrical appliances**			**Class I fan heater with high PEC resistance and short circuit fault – calculate fault current; power dissipated in the fault. Transpositions in appliances. How damp conditions affect operation of Class I appliance.**	**64**	**26**	**10**
			Jun 2015	5	Define Class II equipment. Why earth pin is longer on three-pin plug. Why micro-gap switch not suitable for d.c. Why neutral must be connected to out contact of Edison screw lampholder	60.5	24	15.5
			May 2016	6	Dishwasher with high PEC resistance and short circuit fault – calculate fault current; whether fuse will blow; and touch voltage on appliance frame. Wiring faults that could cause transposition in appliance. Unsafe situation caused by transposition.	32	10	58

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 6	**G8.6**	**Flexible cords and cables**			**Four factors when selecting flexible cord. Why two-core extension is not used for a Class I appliance. Flexible cord current ratings. Why three-pins plugs must not be connected to both ends of a flexible cord. Why earth pin in longer on a plug**	**69**	**26**	**5**
			Nov 2013	5	Four factors when selecting flexible cord. Why two-core extension used for a Class I appliance. Flexible cord current ratings. Why three-pins plugs must not be connected to both ends of a flexible cord.	68	22	10
			May 2014	4	Defining criteria for selecting a replacement flexible cord. Colour coding of flexible cords.	86	10.5	3.5
			Nov 2015	6	Flexible cord for Class I appliance – minimum number of cores; colour coding and test required. Flexible cord for Class II appliance – minimum number of cores; colour coding and test required. Cord failure when would on drum.	75	15	10

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 7	**F8.13.1**	**RCDs**			**Define PRCD and SRCD. Situations where PRCDs are unsafe. RCD protection for a hand-held appliance. Why RCD does not trip.**	**15.5**	**34.5**	**50**
			Mar 2008	4	How RCD operates on fault, meaning of PRCD. Three disadvantages of rewireable fuses. Why not permitted to use fuse wire on HRC fuse	75	12.5	12.5
			May 2012	6	How RCD operates on fault. Two advantages of HRC fuses. Why not permitted to use fuse wire on HRC fuse. Reloading rewireable fuses.	37	29	34
			Sep 2013	3	Characteristics of HRC fuse to be checked for similarity. Advantages of HRC fuse when compared to rewireable fuse. Why HRC fuse is not to be replaced with fuse wire. Why important to load rewireable properly.	36	38	26
			Nov 2013	9	Explain how a RCD operates when a fault occurs. Define PRCD. Advantages of HRC fuses. Wiring rewireable fuses.	35	31	34

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 8	**J8.17**	**Electrical appliance testing**			**IR test of appliance with MOV protection. Testing insulation integrity of appliance with MOV protection while live. IR testing of appliance with semi-conductor devices. IR test of motor.**	**52**	**31**	**17**
			May 2014	2	IR test of appliance with MOVs fitted. Testing the polarity test of an appliance. Why PEC test carried out before an IR test.	62	22.5	15.5
			May 2014	7	Repairs to a Class I appliance and a Class II appliances. Tests and inspections required by AS/NZS 3760.	65.5	22.5	12
			Jun 2015	6	What polarity testing confirms. Earth continuity testing. Insulation resistance testing.	74	21	5
			Sep 2015	7	IR testing of appliance semi-conductors. Explain why certain test are carried out. Why PEC test carried out before an IR test.	52	24	24
			Nov 2015	9	IR testing of Class I appliance with MOVs incorporated. Testing integrity of insulation of live Class I appliance	48	21.5	30.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 9	**G8.2**	**Electrical circuits**			**Draw circuit diagram of Class I electric heater. Calculate current flowing at 230V. Calculate power consumed at 240V.**	**67.5**	**5**	**27.5**
			May 2014	5	Draw internal circuit of Class I appliance with three resistors. Calculate maximum power consumed by the appliance.	79	12	9
			Sep 2014	8	Draw internal circuit of Class I appliance with three resistors. Calculate current drawn by the appliance.	80	16.5	3.5
			Jun 2015	7	Draw internal circuit of Class I appliance with two elements. Calculate maximum power dissipated. Calculate current drawn if elements were connected in series.	64	17	19
			Sep 2015		Draw internal circuit of Class I appliance with three elements. Calculate maximum power dissipated.	41	41	18

A1.3 - Moderation

EAS 1079 was moderated by secure email. A teleconference was held with moderators on 23 May.

A1.4 - Marking

A teleconference was held with the markers on 18 June.

Version 2 of the answer schedule was sent to markers on 28 June.

Comments

This was a very good paper with most candidates achieving excellent marks. A few candidates struggled with the calculations.

In general, the paper covered most parts of the theory required to assess this subject

The moderation of this paper was very well done, however there was a small problem with the wording in question 2.

A1.5 - Amendments to EAS 1079

The significant amendments to EAS 1079 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(b)	-	-	Answer corrected
1(f)	Option corrected.	-	-
2(b)	Rewritten to make intention clearer	Amended accordingly	Amended to better reflect question asked.
3(b)	Rewritten to make intention clearer	-	-
4(b)	-	Amended to be more accurate	-
5(a)	Rewritten to make intention clearer	-	-
5(b)	Marks corrected	-	-
6(a)		-	Option added
6(c)(ii)	Marks increased from 1 to 2	Amended accordingly	-
6(d)	Marks decreased from 2 to 1	Amended accordingly	-
9(a)	-	Note added	-
9(b)	-	Answer corrected	-

Appendix 2

Electrical Appliance Serviceperson (Qualified) Examinations

18 June 2016

EASQ 3014, a moderated paper was used for the examination of 18 June 2016.

A2.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EASQ 3014	27	22	81.5
June 2016	**27**	**22**	**81.5**

EASQ 3014

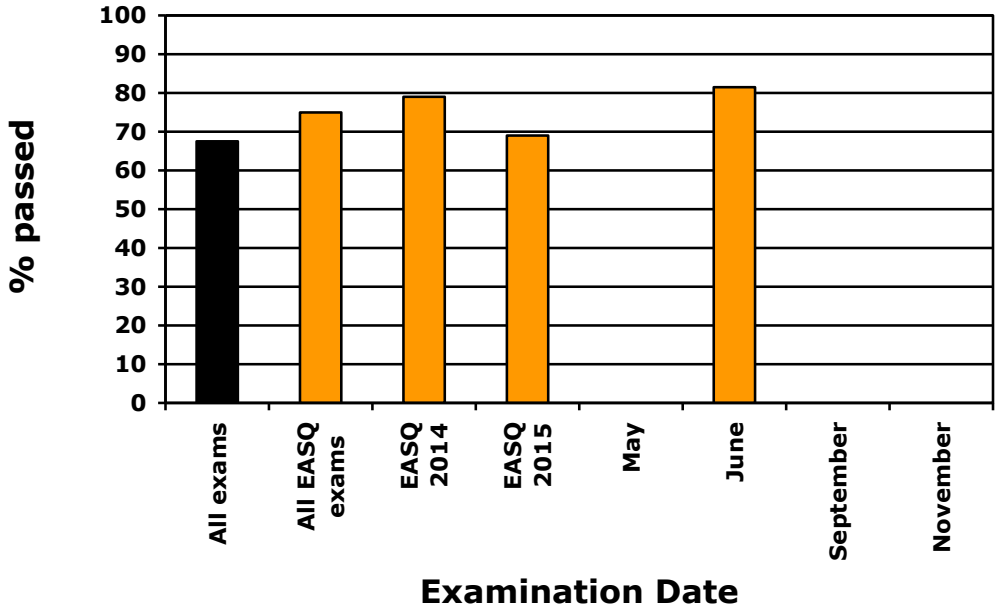
All candidates

Average pass mark 75 %
Median mark 80

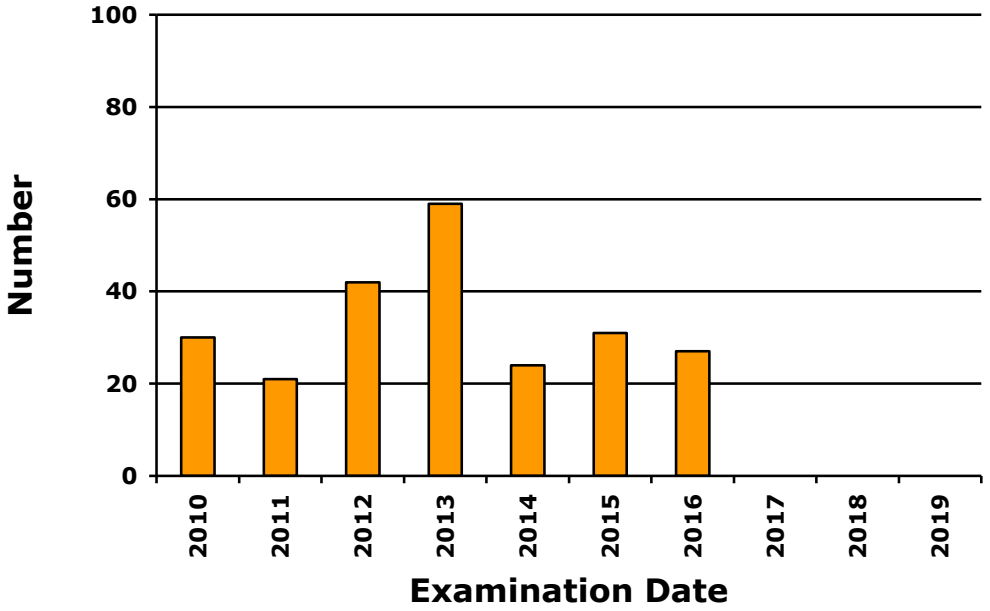
Those who passed

Average pass mark 81 %
Median mark 85

Pass Rates - EASQ Examinations - 2016



Candidate Numbers - EASQ Examinations



Mark Ranges

Number of candidates

Range	EASQ 3014			**June 2016**	
90 – 100	8			**8**	**candidates**
80 – 89	5			**5**	**candidates**
70 – 79	5			**5**	**candidates**
60 – 69	4			**4**	**candidates**
50 – 58	4			**4**	**candidates**
40 – 49	0			**0**	**candidates**
30 – 39	0			**0**	**candidates**
0 – 29	1			**1**	**candidates**
	27			**27**	

% of candidates

Range	EASQ 3014			**June 2016**	
90 – 100	29.5			**29.5**	**% of candidates**
80 – 89	18.5			**18.5**	**% of candidates**
70 – 79	18.5			**18.5**	**% of candidates**
60 – 69	15			**15**	**% of candidates**
50 – 58	15			**15**	**% of candidates**
40 – 49	0			**0**	**% of candidates**
30 – 39	0			**0**	**% of candidates**
0 – 29	3.5			**3.5**	**% of candidates**

A2.3 - Moderation

EASQ 3014 was moderated by secure email. A teleconference was held with moderators on 23 May.

A2.4 - Marking

A teleconference was held with the markers on 27 June.

Comments

A2.5 - Amendments to EASQ 3014

The significant amendments to EASQ 3014 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
5(a)	Rewritten to make intention clearer	Option added	-
5(c)	Rewritten to make intention clearer	-	-
6(b)	Rewritten to make intention clearer	Amended accordingly	-
6(e)	Rewritten to make intention clearer	Amended accordingly	-
7(a)(iv)	-	-	Option added

Appendix 3

Electrical Service Technician Examinations

25 June 2016

EST 2069, a moderated paper, was used for the examination of 25 June 2016.

A3.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EST 2069	125	93	74.5
June 2016	**125**	**93**	**74.5**

EST 2069

All candidates

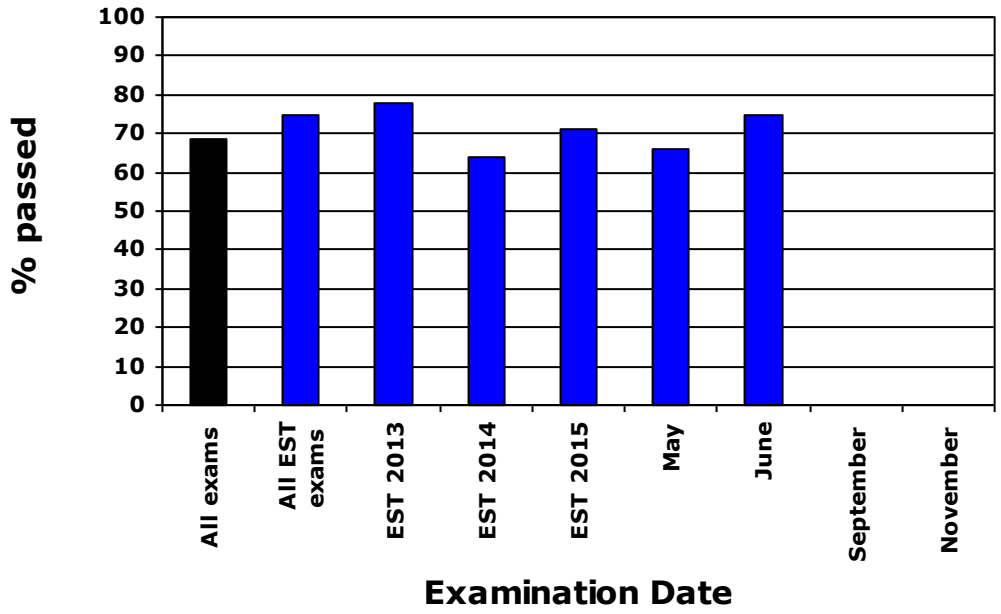
Average pass mark 66 %
Median mark 68

Those who passed

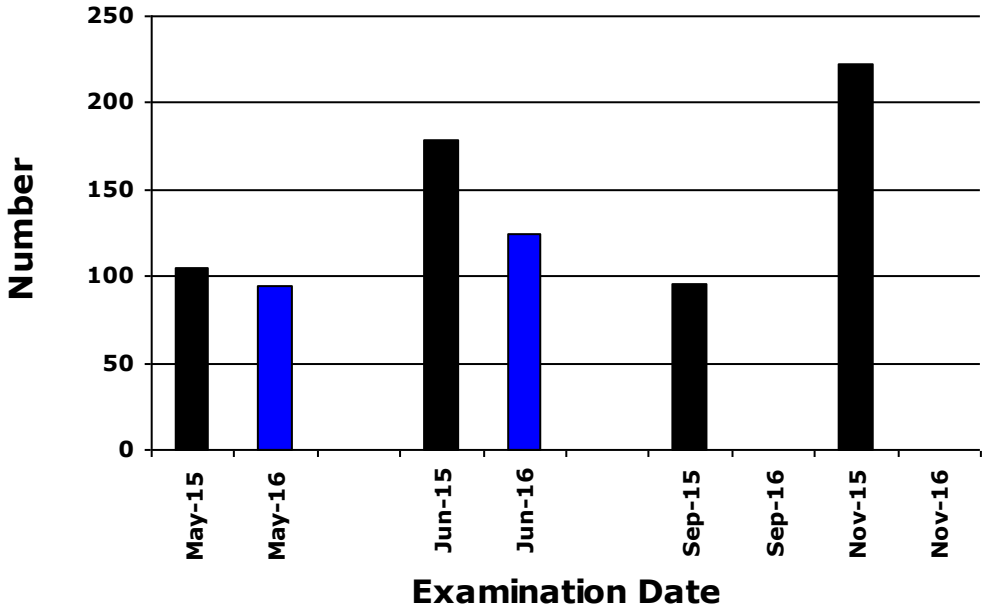
Average pass mark 74 %
Median mark 75

4 Candidates gained 90 marks or more.

Pass Rates - EST Examinations - 2016



Candidate Numbers - EST Examinations - 2016



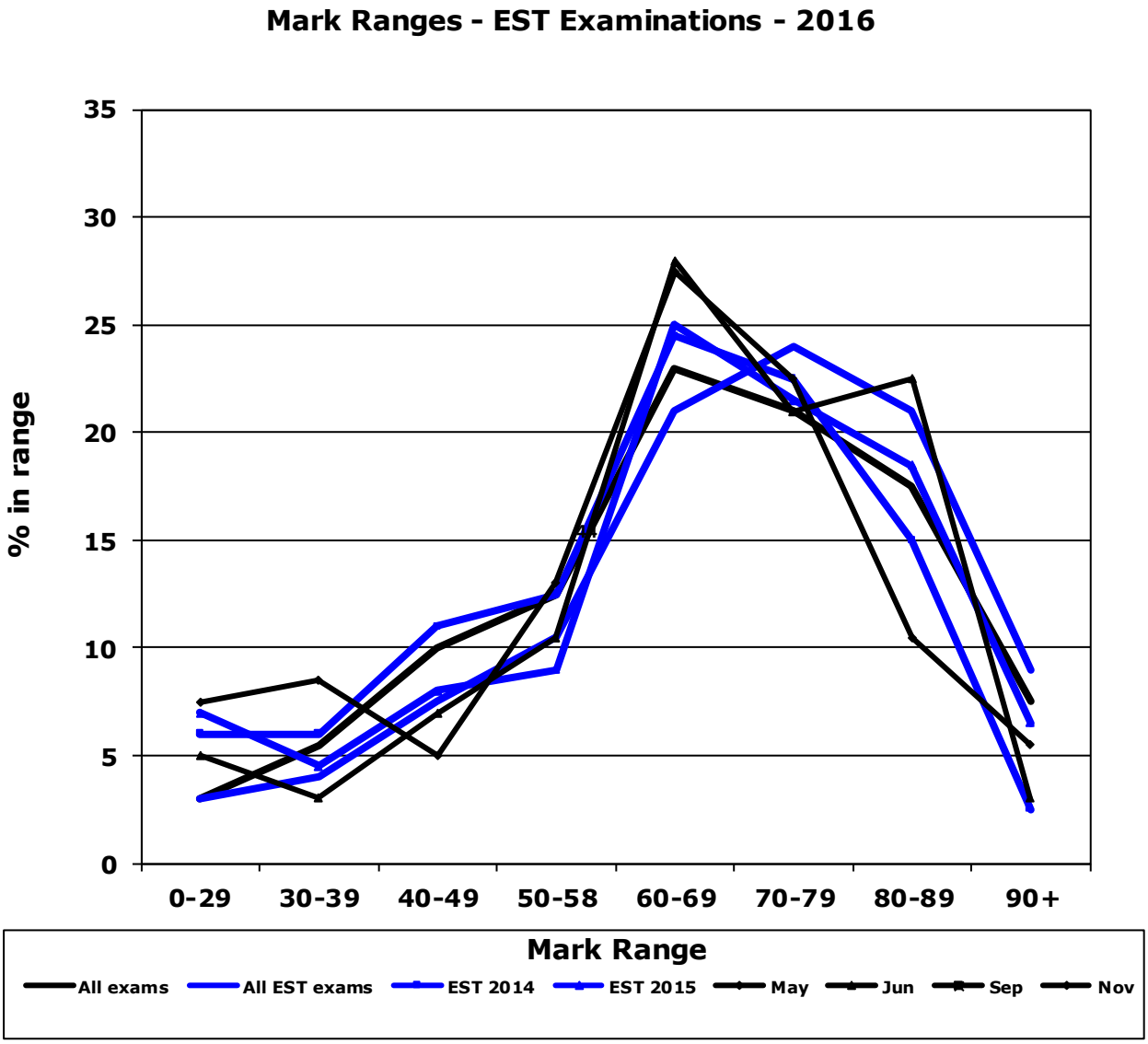
Mark Ranges

Number of candidates

Range	EST 2069			**June 2016**	
90 – 100	4			**4**	**candidates**
80 – 89	28			**28**	**candidates**
70 – 79	26			**26**	**candidates**
60 – 69	35			**35**	**candidates**
50 – 58	13			**13**	**candidates**
40 – 49	9			**9**	**candidates**
30 – 39	4			**4**	**candidates**
0 – 29	6			**6**	**candidates**
	125			**125**	

% of candidates

Range	EST 2069			**June 2016**	
90 – 100	3			**3**	**% of candidates**
80 – 89	22.5			**22.5**	**% of candidates**
70 – 79	21			**21**	**% of candidates**
60 – 69	28			**28**	**% of candidates**
50 – 58	10.5			**10.5**	**% of candidates**
40 – 49	7			**7**	**% of candidates**
30 – 39	3			**3**	**% of candidates**
0 – 29	5			**5**	**% of candidates**


Mark Ranges - EST Examinations - 2016
% in range
35
30
25
20
15
10
5
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
All exams
All EST exams
EST 2014
EST 2015
May
Jun
Sep
Nov

A3.2 - Overall Marking Analysis

Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with some similar questions from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1		**10, 2 mark questions**				**59**	**32**	**9**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**K8.16**	**Workplace safety**			**Printing press repaired – testing required by AS/NZS 3760; making circuit safe before reconnecting; testing to ensure press is connected to MEN system.**	**62.5**	**28**	**9.5**
			May 2015	3	Three-phase motor repaired – ensuring isolation; testing to ensure safe to connect; and testing after connection.	76.5	13	10.5
			May 20115	8	Difference between isolation and switching off. What does prove test prove establish. Ensuring appliance remains isolation. Safety of persons and property	53	32	15
			Sep 2015	7	Describe how to isolate three-phase induction motor. How to test to locate fault on the motor.	21	44	35
			May 2016	2	Explain prove-test-prove method and how it is used. Explain why testing was ineffective. Precautions when using test instruments.	31	37	32

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**D8.19.2**	**Three-phase induction motor starters**			**Name parts of motor control circuit. How thermistor protects motor. How thermal overload protects motor. What happened is supply lines reversed.**	**67**	**27**	**6**
			May 2014	7	Draw diagram of 230V control circuit for DOL starter. Types of faults that could occur. What cause overload on motor. Why motor fails to start.	60	35	5
			Sep 2014	7	Name parts of motor control circuit. Effect if certain parts faulty. Replacement device for thermal overload	30	24.5	45.5
			Nov 2014	8	Name parts of motor control circuit. Explain how thermistor protects motor. Faulty stop button. Why reduced voltage starter used.	37.5	38	24.5
			Jun 2015	8	Name parts of motor control circuit. Effect if certain parts faulty. Protection of motor against over temperature.	31.5	24.5	44

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**F8.11**	**Protection - General**			**Describe correct discrimination. Define markings on an HRC fuse. Why back-up protection used. Inverse time characteristic graphs.**	**25**	**25**	**50**
			Jun 2013	4	Fuses – define current rating; under-rated fuse; and over-rated fuse. Characteristics of no-voltage relay and phase-reversal rely. Describe internal mechanism if thermal MCB	49	32	19
			Sep 2013	2	Define discrimination. Meaning of terms found on a HRC fuse. Why back-up protection installed. Define the inverse-time characteristic and draw graph.	29	33	38
			Jun 2014	7	Define term current rating. Under-rated and over-rated fuses. Characteristics of gM type fuse. Operation of protection devices. Define term kA rating.	27	48	25

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**J8.17**	**Electrical measuring and test instruments**			**Effect of connecting ammeter in parallel and voltmeter is series. Using testing instruments. Using clip-on ammeters. Why ohmmeter not used for IR test.**	**26.5**	**39**	**34.5**
			Jun 2012	5	How to use a clip-on ammeter. Isolating appliances. Continued isolation. Precautions with test instrument.	51.5	31.5	17
			Sep 2012	3	Current measurement of appliance – test instrument that does not require the disconnection of appliances; and test instrument that requires disconnection of conductors.	44	19	37
			May 2013	4	Main effect of connecting ammeter in parallel and voltmeter in series. Intervals for appliance inspection. Connecting instruments to live appliance	35.5	44	20.5
			Sep 2013	9	Main effect of connecting ammeter in parallel and voltmeter in series. Intervals for appliance inspection. Precautions when connecting instruments to live appliance.	34	33	33

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**I8.21**	**Damp areas**			**Define the term IP rating and following numbers. Define protection of a fitting with a rating of IP5X. Protection prohibited in swimming pool. Information on replacement luminaire for pool**	**74.5**	**21.5**	**4**
			Nov 2011	2	Define IPC. Degree of protection provided by IP 6X fitting. Degree of protection provided by a IP00W fitting. Replacing fittings near swimming pool.	38.5	33.5	28
			Sep 2012	6	Define the term IP rating and following numbers. Define protection of a fitting with a rating of IP56.	90	5	5
			Sep 2013	4	Define damp situation. Selection and installation requirements for equipment in damp areas. Define the term IP rating and following numbers. Protection provided by the letter W.	63.5	23.5	13
			Nov 2013	3	Define the term IP rating and following numbers. Define protection of a fitting with a rating of IP34. IP ratings of replacement pump and control switch	74	17	9

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**F8.11**	**Protection - General**			**HRC fuses – define current rating; overrated and underrated fuses; Reloading rewireable fuses. How phase-failure and phase-reversal relays provide protection. What happens when MCB detects and overload.**	**52**	**31**	**17**
			Sep 2015	5	Purpose of Fuse, MCB and RCD on a switchboard. How MCB operates when overload and short-circuit occurs. Define current rating and fusing factor for HRC fuses. Effect on three-phase motor operation if one fuse blows.	28	47	25
			Nov 2015	4	Fuse current rating. Effect of over-rated and under-rated fuses. How phase-failure and phase-reversal relays work. Reloading rewireable fuses. How MCB thermal mechanism works.	42	28	30
			May 2016	3	HRC fuses – define current rating; overrated and underrated fuses; and fuse characteristics. Under-voltage and phase reversal relays. MCB characteristics.	40.5	36	23.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q8	**D8.19.2**	**Three-phase induction motor starters**			**Draw a 230V control circuit for a star/delta starter. Why motor overheats. Where heat-sensing device place. Changing direction of rotation of three-phase motor.**	**13**	**17**	**70**
			Jun 2013	6	Name parts of motor control circuit. Describe how thermal overload and thermistor protect motor. Reversal of three-phase motor	77.5	16.5	6
			May 2014	7	Draw diagram of 230V control circuit for DOL starter. Types of faults that could occur. What cause overload on motor. Why motor fails to start.	60	35	5
			Sep 2014	7	Name parts of motor control circuit. Effect if certain parts faulty. Replacement device for thermal overload	30	24.5	45.5
			Nov 2014	8	Name parts of motor control circuit. Explain how thermistor protects motor. Faulty stop button. Why reduced voltage starter used.	37.5	38	24.5
			Jun 2015	8	Name parts of motor control circuit. Effect if certain parts faulty. Protection of motor against over temperature.	31.5	24.5	44

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**G8.2**	**Electrical circuits**			**Draw components and supply of Class 1 oven. Calculate current drawn by appliance. Calculate drop in power output of one element open-circuited.**	**49**	**16**	**35**
			Nov 2013	8	Draw components and supply of Class 1 appliance. Calculate current drawn by appliance.	53.5	22.5	24

A3.3 - Moderation

EST 2069 was moderated via secure email and a meeting. The meeting was held on 19 May.

A3.4 - Marking

A teleconference was held with the markers on 5 July.

Version 2 of the answer schedule was sent to markers on 6 July.

Comments

This was a very good paper with most candidates achieving excellent marks. There were a few who struggled with the calculations and reading the circuit drawings.

In general, the paper covered most parts of the theory required to assess this EST subject.

The moderation was good except for question 8(b).

A3.5 - Amendments to EST 2069

The significant amendments to EST 2069 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	Rewritten to make intention clearer	-	-
1(b)	-	Answer corrected	Option added
1(c)	Partly rewritten to make intention clearer	Answer amended to be more accurate	-
1(e)	Partly rewritten to make intention clearer	-	-
1(f)	Partly rewritten to make intention clearer	-	-
1(g)	Rewritten to make intention clearer	Option added	-
1(i)	Partly rewritten to make intention clearer	-	-
1(j)	Rewritten to make intention clearer	-	-
2	Introduction partly rewritten to make intention clearer	-	-
2(a)	Rewritten to make intention clearer	-	-
3(a)	Editorial amendment	-	-
3(a)(ii)	-	Option added	-
3(b)	Replaced with a more topical question	Amended accordingly	-
3(c)	Replaced with a more topical question	Amended accordingly	-
5(b)	Rewritten to make intention clearer	-	-
5(c)	Rewritten to make intention clearer	-	-
6(b)	Rewritten to make intention clearer	-	-
6(d)	Rewritten to make intention clearer	Amended to better align with standard	-
8	Rewritten to make intention clearer	Amended accordingly	-
9(b)	-	Answer corrected	-

Appendix 4

Electrician Regulations Examinations

5 and 25 June and 3 July 2016

ER 76, a moderated paper, was used for the examination of 5 June 2016
ER 77, a moderated paper, was used for the examination of 25 June 2016
ER 78, a moderated paper, was used for the examination of 3 July 2016

A4.1 - Overall Candidate Performance

	Number of candidates	**Number of candidates who passed**	**Percentage passed**
ER 76	2	2	100
ER 77	852	438	51.5
ER 78	6	5	80.5
June 2016	**860**	**445**	**52**

ER 77

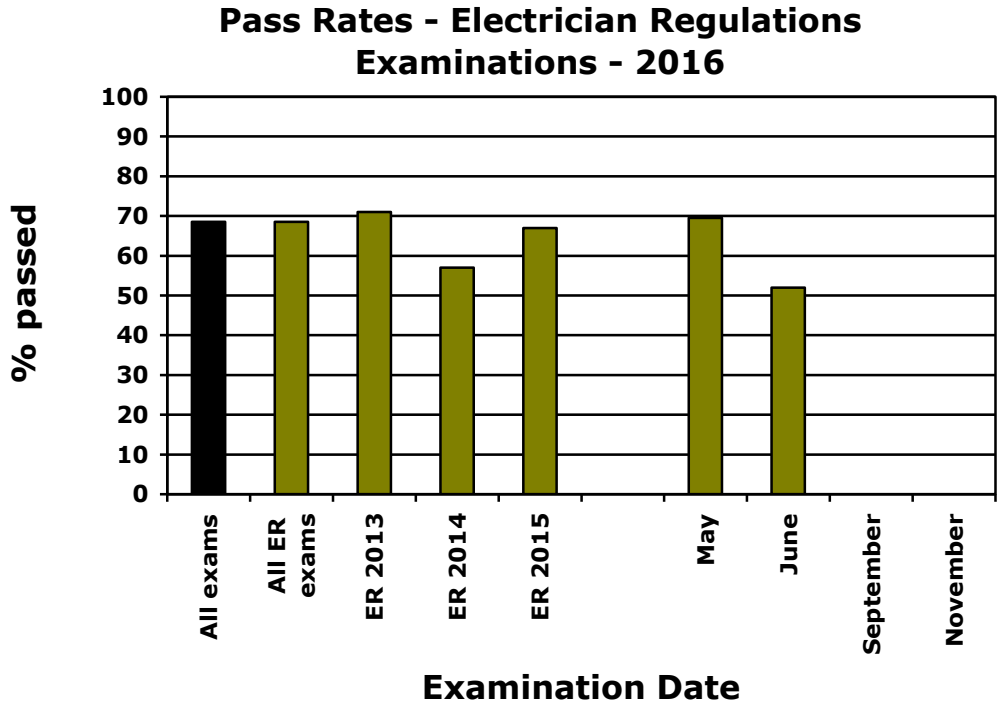
All candidates

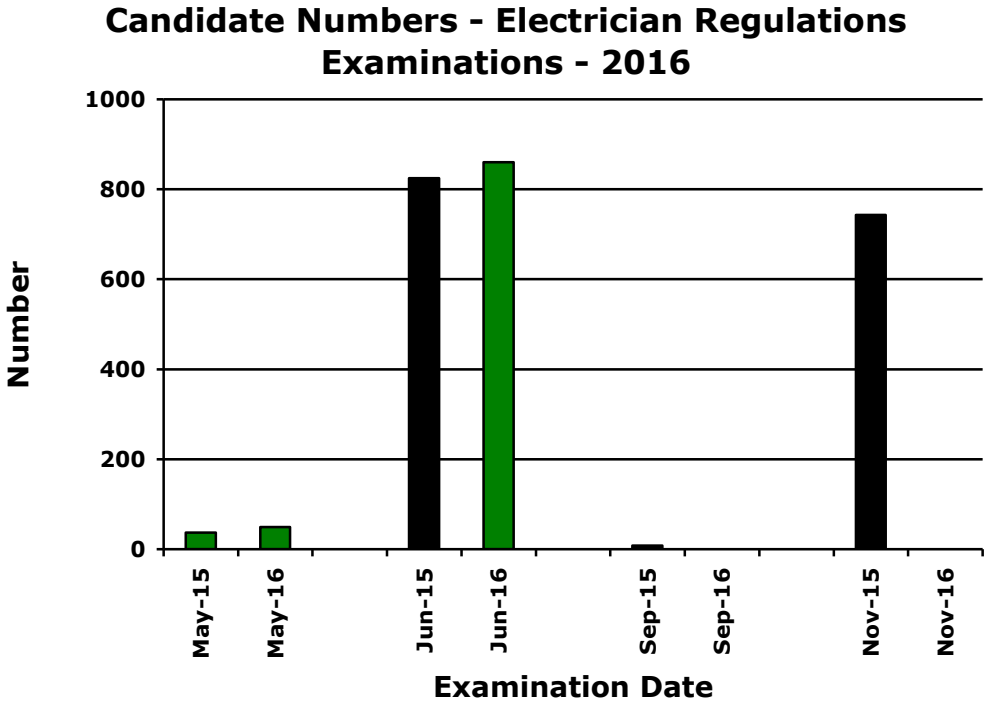
Average pass mark 58 %
Median mark 59.5

Those who passed

Average pass mark 70 %
Median mark 69

one candidate gained 95 marks.


Pass Rates - Electrician Regulations
Examinations - 2016
% passed
100
90
80
70
60
50
40
30
20
10
0
All exams
All ER exams
ER 2013
ER 2014
ER 2015
May
June
September
November
Examination Date


Candidate Numbers - Electrician Regulations
Examinations - 2016
Number
1000
800
600
400
200
0
May-15
May-16
Jun-15
Jun-16
Sep-15
Sep-16
Nov-15
Nov-16
Examination Date

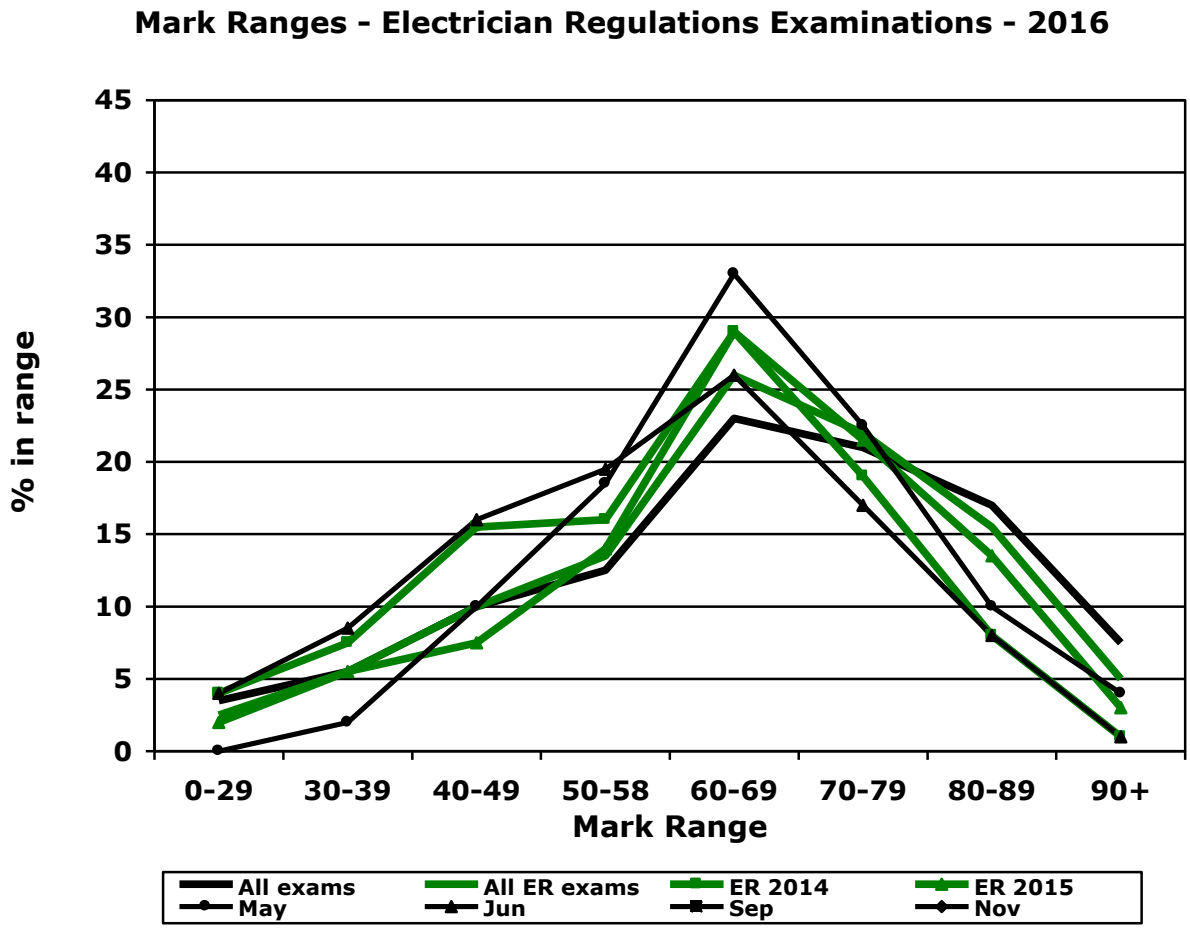
Mark Ranges

Number of candidates

Range	ER 76	ER 77	ER 78			**June 2016**	
90 – 100	1	11	0			**12**	**candidates**
80 – 89	0	66	2			**68**	**candidates**
70 – 79	1	140	2			**143**	**candidates**
60 – 69	0	221	1			**222**	**candidates**
50 – 58	0	168	0			**168**	**candidates**
40 – 49	0	140	0			**140**	**candidates**
30 – 39	0	72	1			**73**	**candidates**
0 – 29	0	34	0			**34**	**candidates**
	2	**852**	**6**			**860**	

% of candidates

Range	ER 76	ER 77	ER 78			**June 2016**	
90 – 100	50	1	0			**1**	**% of candidates**
80 – 89	0	8	33.5			**8**	**% of candidates**
70 – 79	50	16.5	33.5			**17**	**% of candidates**
60 – 69	0	26	16.5			**26**	**% of candidates**
50 – 58	0	19.5	0			**19.5**	**% of candidates**
40 – 49	0	16.5	0			**16**	**% of candidates**
30 – 39	0	8.5	16.5			**8.5**	**% of candidates**
0 – 29	0	4	0			**4**	**% of candidates**


Mark Ranges - Electrician Regulations Examinations - 2016
% in range
45
40
35
30
25
20
15
10
5
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
All exams
All ER exams
ER 2014
ER 2015
May
Jun
Sep
Nov

A4.2 – Overall Marking Analysis

Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with similar questions from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	**-**	**10, 2 mark questions**				**47**	**40**	**13**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**F13.1**	**Protection - General**			**Methods of achieving automatic disconnection of supply. Earthing system impedance. Describe earth fault loop.**	**55**	**8**	**37**
			Nov 2009	8	Hazards if impedance of neutral is higher than earth. Switching of ranges. Mechanical stress on socket outlets	28	32	40
			Jun 2014	7	Testing and verifying operation of RCDs. IR test of an installation. Principle of protection by automatic disconnection of supply and how it is achieved.	29.5	39.5	31
			Nov 2014	5	Characteristics of short-circuit protection devices. Where overload devices can be omitted. Devices that can be used for automatic disconnection of supply. Differences between gG and gM HRC fuses.	23	39	38

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**I**	**Damp areas**			**Communal bathroom - define zones for shower and hand basins; requirements for ceiling lights; installation of light switch; hand dryers and socket outlet.**	**38**	**34.5**	**27.5**
			Nov 2010	7	Determine zones of shower and hand basin in bathroom. Protection of socket outlet. Ratings of equipment in domestic bathrooms.	44	32	24
			Sep 2011	3	En-suite bathroom – install light switch; towel rail and permanent connection unit; socket outlet; fan heater; and light. Determine zones, IP ratings; installation and protection requirements	50	48	2
			Jun 2013	2	In a bathroom determine position, zone and IP rating of two light switches. Position, zone, IP rating and protection for socket outlet. Position, zone and IP rating of towel rail and permanent connection unit.	71.5	19	9.5
			Sep 2014	6	In a bathroom determine zones around basin and shower. Electrical protection for socket outlet. IP ratings of equipment and apparatus.	45.5	18	36.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**G3**	**Installation of cables**			**Testing continuity of earthing system. Final subcircuits protected by MCBs – earth fault loop impedance; resistance of PEC and active conductors and permitted length. Permanently connected final subcircuit protected by HRC fuse – earth fault loop impedance; resistance of PEC and active conductors and permitted length.**	**57**	**22**	**21**
			Nov 2013	7	Two hazards if main neutral has high impedance. Requirements for supplying installation at other than standard low voltage. Methods for determining size of earthing conductors.	28	31	41
			Nov 2014	4	Types of underground wiring systems. Installation requirements for cable between two buildings. Situations where aerial conductors are insulated. Minimum size for aluminium aerial conductor	60.5	31.5	8
			Nov 2015	3	Methods of achieving isolation. Isolation switches where there is more than one occupier. Devices for automatic disconnection of supply. Size of MEN link.	44	40	16

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**H**	**Switchboards**			**Modular switchboard with various fittings and cables to be connected. Connection of mains and main earthing conductor. Connections of circuits to RCBOs.**	**23**	**20.5**	**56.5**
			Jun 2010	7	Where first MEN switchboard installed; Characteristics of short circuit protection devices. Orientation of circuit breakers. Areas where switchboard prohibited. Conductors that must be connected to main earth bar.	59.5	24.5	16
			Jun 2013	7	Where first MEN switchboard must be installed. Main characteristics of short – circuit protective device. Orientation of circuit breakers. Areas where installing a switchboard is prohibited.	69	20	11
			Mar 2015	6	Modular switchboard – where main earth, main neutral, ME link, main phase, water heater supply are connected. Connection arrangements for neutral conductors and active conductors	76	15	9

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**G2**	**Cable selection**			**Calculate maximum demand of a new science classroom in a school.**	**34.5**	**40**	**25.5**
			Jun 2011	8	Determine maximum demand of single-phase electrical installation.	44.5	39	16.5
			Nov 2011	7	Determine maximum demand of single-phase electrical installation.	59.5	26.5	14
			Jun 2012	8	Define maximum demand. Determine maximum demand of single-phase electrical installation.	48	39	13
			Jun 2013	4	Calculate maximum demand of 230V domestic installation.	55	26	19
			Jun 2014	5	Calculate maximum demand of a domestic installation.	74	12	14
			Nov 2014	7	Calculation maximum demand of the single-phase boarding house.	14.5	9	76.5
			Jun 2015	3	Calculate maximum demand of a single-phase non-domestic electrical installation	32.5	37	30.5
			Sep 2015	8	Calculate maximum demand of a domestic installation.	54	24	22
			Nov 2015	4	Calculate maximum demand of a domestic installation.	58	26.5	15.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**H**	**Switchboards**			**Requirements for space in front of switchboard. Access to switchroom. Connection of main neutral conductor. Requirements for main switches.**	**18.5**	**53.5**	**28**
			Nov 2010	3	Main functions of MEN switchboard. Installing main switchboard near fire sprinkler. Requirements for hinged switchboard. Requirements for neutral bars, MEN connection and connection of earthing.	45	39	16
			Nov 2012	8	Installing switchboard in cupboard. Restricting access to live parts. Identifying main switchboard in large complex. Access to and space around switchboard	55	29	16
			Jun 2014	3	Circumstances where switchboard can be installed in damp area. Draw wiring in switchboard. Whether switchboard meets RCD requirements	34.5	26	39.5
			Sep 2014	5	Requirements for MEN switchboard. Earth arrangements for distribution board. Marking of fuses. Prohibited locations for switchboards.	9	63.5	27.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**F13.1**	**Protection - General**			**New bedrooms added to existing hotel – state how final subcircuits are to be RCD protected. Existing bedrooms in hotel converted to units - state how final subcircuits are to be RCD protected.**	**7.5**	**23**	**69.5**
			Jun 2011	6	Additions and alterations to an installation – conductions under which range does not require RCD protection; protection for socket outlet in bathroom. Home dialysis unit requirements. Maximum rated residual current of RCDS.	42	44.5	13.5
			Nov 2012	2	Requirements for a socket outlet and PC unit in bathroom. RCD protection on replaced switchboard. Electrically unsafe RCDs	48.5	37.5	14
			Jun 2014	7	Testing and verifying operation of RCDs. IR test of an installation. Principle of protection by automatic disconnection of supply and how it is achieved.	29.5	39.5	31
			Jun 2015	6	Work in an apartment complex – requirements for RCDs; requirements for RCDs in child-care centre. Why cooking appliances don't require RCD protection	24.5	38.5	37

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**C12.2**	**MEN Systems**			**Points where neutral is earth in MEN system. Protective and functional earthing. Conductive conduit requirement. Requirements for connecting devices.**	**26**	**26**	**48**
			Jun 2012	6	Diagram of MEN system supplying installation; draw fault loop for faulty appliance circuit. Reason why impedance of fault loop must be low. Maximum length of run for 2.5 mm^2 cable that will permit protection to operate. Touch voltage limits	44	25	31
			Nov 2013	5	Diagram of MEN system supplying installation showing fault on appliance – state what various parts represent. Why earth fault loop impedance tests carried out at switchboard and furthest socket outlet. Explain why cable does not comply with AS/NZS 3000	30	33	37
			Mar 2015	5	Draw MEN system and indicate fault loop. Why earth fault loop has low impedance. Purpose of equipotential bonding. Difference between exposed conductive parts and extraneous conductive parts	63.5	24.5	12

A4.3 – Moderation

The paper was moderated by secure email and a meeting. The meeting was held on 15 April.

The papers were moderated by secure email and a meeting. The meeting was held on 16 and 17 May.

A4.4 – Marking

Teleconferences were held with markers of 5 and 11 July.

Version 2 of the marker schedule was sent to markers on 5 July.

Version 3 of the marker schedule was sent to markers on 11 July.

Comments – ER 77

This paper was far too long. There were 88 bullet points to answer in 180 minutes. By calculation this means there were only 2 minutes for each and every bullet point to be answered, whether it was a one-line answer or a six-line answer. To read the question, search the Standards book and find the **correct** answer, and then write it into the answer sheet was an almost impossible task. An examination paper with about 50 bullet points should be the limit. The allocation of half marks to a question is a bit rich as time taken to find the answer and copy the answer onto paper is time consuming and if a question is worth asking it should be worth at least one mark. Judging by the number of unanswered questions a large percentage of candidates ran out of time to complete their paper.

My impression of the exam was that it was long, (32 pages) fair and was not hard. The damp area and maximum demand questions were easy.

A tricky exam with many changes made from previous papers. When the markers disagree on the answers to questions it shows how tricky it is for the candidates to arrive at the correct answer. Overall a very good paper, many struggled with it, not too many got high marks. A large number of candidates did not complete all questions.

Very fair paper with quite a few curve balls. Can see candidates who struggled to read questions properly had difficulty answering the long questions.

Many seemed to run out of time but most also wrote far too much for most of the answers.

A4.5 – Amendments to ER 77

The significant amendments to ER 77 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(c)	Rewritten to make intention clearer	Three options added	-
1(e)	Rewritten to make intention clearer	Amended accordingly	-
1(h)	Rewritten to make intention clearer		-
1(i)	Rewritten to make intention clearer	Amended accordingly	-
1(j)		Three options added	Option added
2(a)	Rewritten to make intention clearer		Four options added
2(b)	Deleted and replaced with (b)	Amended accordingly	Six options added
2(c)	Replaced with (b)	Amended accordingly	Option added. Note added relating to a pictorial description being acceptable
3(a)	-	-	Note added relating to there being no Zone 0 in the shower and Zone dimensions can be taken from figure 6.3
3(b)	Preamble rewritten to make intention clearer	-	-
3(c)	Preamble rewritten to make intention clearer	-	-
3(f)(iii)		-	Reference corrected
4(c)	Preamble rewritten to make intention clearer	-	-
4(c)(ii)	-	Answer corrected	-
4(c)(iii)	-	Answer corrected	-
5	Introduction rewritten to make intention clearer	-	Answer corrected
5(b)	Rewritten to make intention clearer. Replaced (b), (c), (d) replaced with (b)(i), (ii), (iii), (iv)	Amended accordingly	-
6	-	Two calculations corrected	Alternative solution added
6(a)	-	-	-

The significant amendments to ER 77 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
7(a)(i)	-	-	Two options added
7(a)(ii)	-	-	Three options added
7(c)	-	-	Three options added
7(d)	Rewritten to make intention clearer	Amended accordingly	Two options added
8(a)	Introduction rewritten to make intention clearer	-	-
8(a)(iii)	-	-	Answer corrected to align with AS/NZS 3000
8(a)(v)	-	-	Answer corrected to align with AS/NZS 3000
9(b)	-	-	Two options added
9(c)	Answers required reduced from two to one	Amended accordingly	Option added
9(d)	Answers required reduced from two to one	Amended accordingly	References corrected
9(e)	Rewritten to make intention clearer	-	-

Appendix 5

Electrician Theory Examinations

17 and 18 June 2016

ET 57, a moderated paper, was used for the examination of 18 June 2016.
ET 58, a composite paper, was used for the examination of 17 June 2016.

A5.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
ET 57	621	222	36
ET 58	1	1	100
June 2016	**622**	**223**	**36**

ET 57

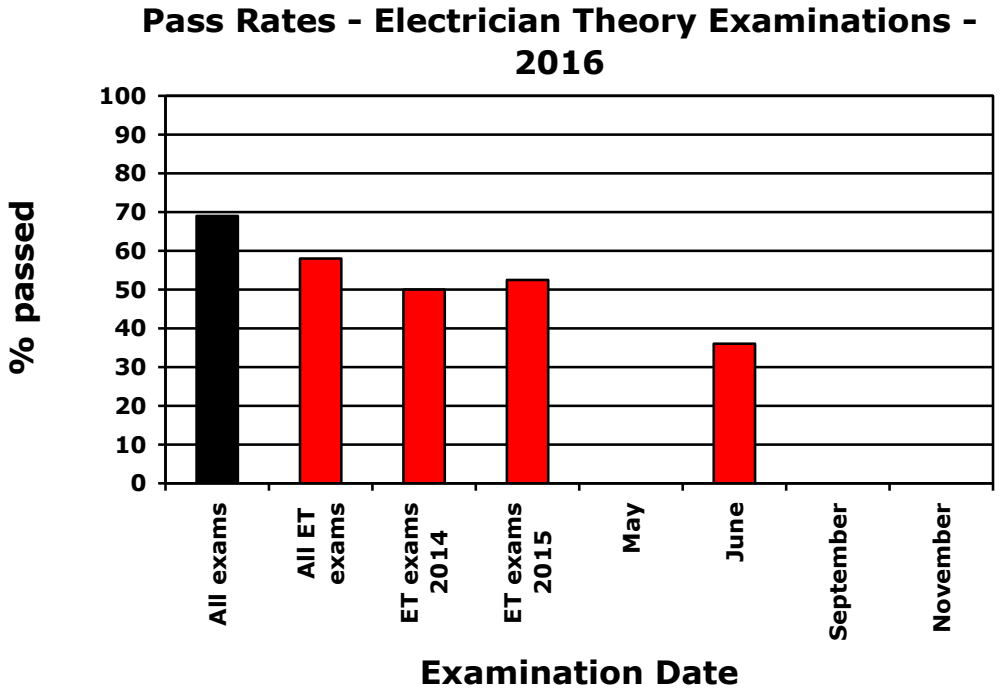
All candidates

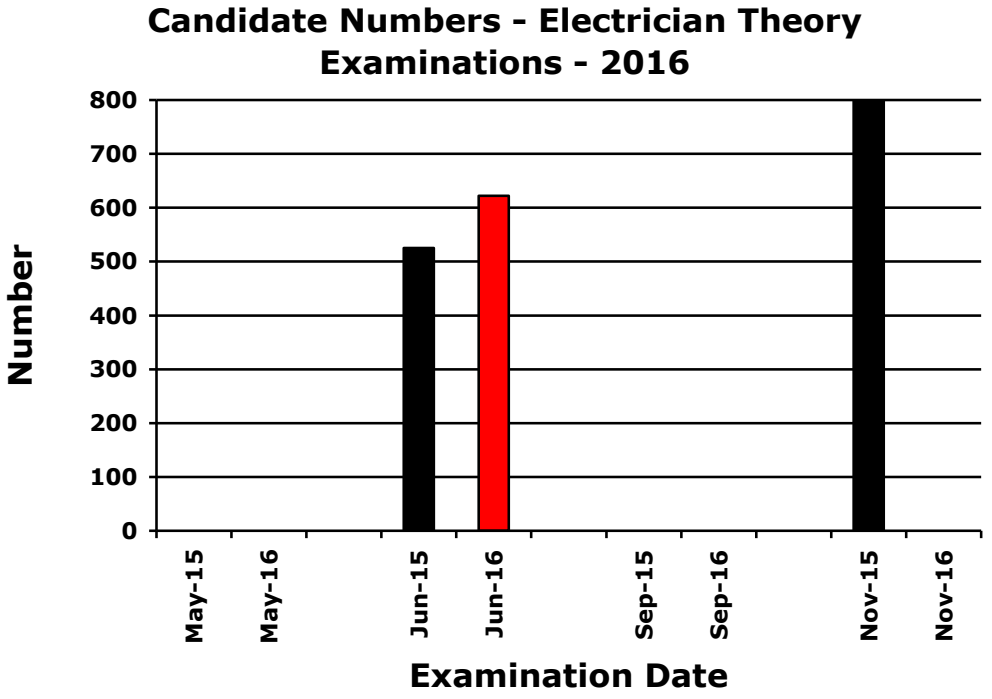
Average pass mark 52 %
Median mark 51

Those who passed

Average pass mark 72 %
Median mark 71

2 Candidates gained 95 marks or more


Pass Rates - Electrician Theory Examinations - 2016
% passed
100
90
80
70
60
50
40
30
20
10
0
All exams
All ET exams
ET exams 2014
ET exams 2015
May
June
September
November
Examination Date


Candidate Numbers - Electrician Theory Examinations - 2016
Number
800
700
600
500
400
300
200
100
0
May-15
May-16
Jun-15
Jun-16
Sep-15
Sep-16
Nov-15
Nov-16
Examination Date

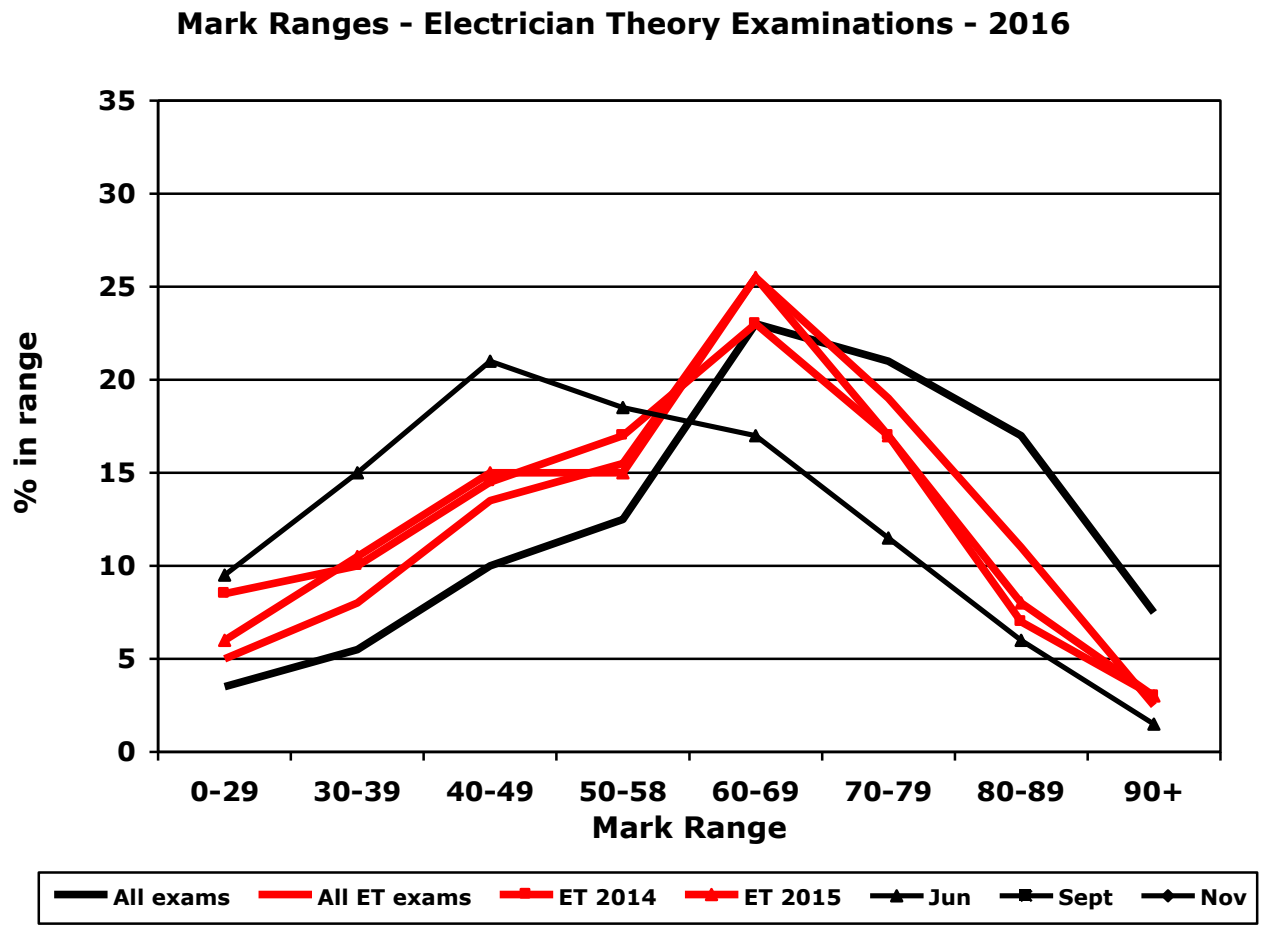
Mark Ranges

Number of candidates

Range	ET 57	ET 58		**June 2016**	
90 – 100	10	0		**10**	**candidates**
80 – 89	37	0		**37**	**candidates**
70 – 79	70	0		**70**	**candidates**
60 – 69	105	1		**106**	**candidates**
50 – 58	115	0		**115**	**candidates**
40 – 49	130	0		**130**	**candidates**
30 – 39	95	0		**95**	**candidates**
0 – 29	59	0		**59**	**candidates**
	621	**1**		**622**	

% of candidates

Range	ET 57	ET 58		**June 2016**	
90 – 100	1.5	0		**1.5**	**% of candidates**
80 – 89	6	0		**6**	**% of candidates**
70 – 79	11.5	0		**11.5**	**% of candidates**
60 – 69	17	100		**17**	**% of candidates**
50 – 58	18.5	0		**18.5**	**% of candidates**
40 – 49	21	0		**21**	**% of candidates**
30 – 39	15	0		**15**	**% of candidates**
0 – 29	9.5	0		**9.5**	**% of candidates**


Mark Ranges - Electrician Theory Examinations - 2016
% in range
35
30
25
20
15
10
5
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
All exams
All ET exams
ET 2014
ET 2015
Jun
Sept
Nov

A5.2 - Overall Marking Analysis

Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with similar questions from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	**-**	**10, 2 mark questions**				**39**	**37**	**24**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**D23.1**	**Single-phase induction motor operation**			**How a rotating magnetic field created in single-phase induction motor. Why capacitor-start motor has a higher starting torque. Name parts of capacitor-start, capacitor-run motor**	**14**	**21**	**65**
			Nov 2004	9	Circuit diagrams, rotation and advantages of single phase motors	17	32.5	50.5
			Jun 2008	3	Describe how single phase supply can simulate a rotating magnetic field. Switching of start winding. Single phase motor faults	11.5	21	67.5
			Nov 2013	6	Draw diagram of 230V capacitor–start, capacitor-run motor. Describe operation of the motor. Why capacitor–start, capacitor-run motor is used instead of split-phase motor.	14.5	12	73.5
			Jun 2015	4	Explain why single-phase motor does not rotate. Disconnection of start winding in refrigerator motor. Effect of drop in speed on single-phase motor. Characteristics of universal motor	16.5	30	53.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**E15.1**	**Transformers - General**			**Calculate current drawn by transformer. Calculate transformer primary line and phase currents. Why transformers rated in kVA. Loading of transformers.**	**21**	**14**	**65**
			Nov 2012	7	Three-phase delta-star transformer – non-standard secondary voltage. Calculate secondary phase and line voltages; and primary and secondary line currents. Form of cooling for the transformer.	54.5	23.5	22
			Jun 2013	7	Three-phase delta-star transformer with 66kV primary voltage -. Calculate secondary phase and line voltages; and primary and secondary line currents. Conditions that occur when CT circuit opened when live.	61	22	17
			Nov 2014	6	Three-phase delta-star transformer – non-standard secondary voltage. Calculate secondary phase and line voltages. Calculate full load kVA rating and secondary line current. Calculate percentage regulation.	55	19	26
			Nov 2014	9	Maximum demand reading on commercial site – calculate kVA rating of transformer; maximum phase current and line current.	10.5	11.5	78

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**K14.2**	**Isolation procedures**			**Precautions when leaving work site unattended. Difference between isolating and switching off. Methods for preventing machine being reconnected. for continued isolation. Voltage testing.**	**50**	**34.5**	**15.5**
			Nov 2009	9	Describe when danger and out-of-service tags used. Precautions when attaching danger tag. Difference between switching off and isolating. Prove test prove method.	75	20	5
			Nov 2011	3	Disconnecting motor from a three-phase motor circuit - how to isolate; leaving the area safe; testing to ensure motor is safe to connect; and actions to ensure it is safe to connect	41.5	37	21.5
			Nov 2012	9	Danger and Out-of-Service tags, precautions when attaching tag to switch, how prove-test-prove is carried out. Difference between switching off and isolating.	76.5	20	3.5
			Jun 2015	8	Where danger tag and out-of-service used. Precautions when attaching danger tag. Difference between switching off and isolating. How prove-test-prove testing is carried out.	82	15	3

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**C12.2**	**MEN Systems**			**Three-phase oven with fault on one phase – calculate line current before fault; current flowing in fault; and total fault current. Determine whether fuse will operate and voltage that will develop on oven frame.**	**17**	**18**	**65**
			Jun 2013	2	Commercial oven with earth fault on one phase – calculate total current in faulty phase; calculate whether protection will operate, calculate touch voltage appearing on frame of the oven; and state whether fault cause a shock hazard.	17	40	43
			Jun 2014	7	Commercial oven with earth fault on one phase – calculate total current in faulty phase calculate whether protection will operate, and calculate touch voltage appearing on frame of the oven. Maximum resistance in PEC that will permit fuse to operate.	29.5	16	54.5
			Jun 2015	7	Three-phase oven with fault on one phase – calculate total current flowing under fault conditions. Refer to graph and show how long for fuse to blow. Calculate touch voltage on frame of oven.	37	12.5	50.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**B12.1**	**a.c. Theory**			**Single phase installation with inductive loads with differing power factors – calculate power of each load; total kVA of installation; and power factor**	**26.5**	**7.5**	**66**
			Jun 2010	5	Small factory with heating, lights at 0.8 lag pf and machines at 0.5pf lag. Calculate power in kW, power in kVA; and total line current	9	5	86
			Nov 2010	7	Three-phase commercial installation – calculate total power and neutral current.	39	9	52
			Nov 2014	7	Single phase installation with resistive and inductive loads – calculate Var of two loads, total kVA of installation; and power factor	21	3	76

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**D22.3**	**Three-phase induction motor starters**			**Draw a power circuit for a forward/reverse DOL starter. Testing of motor windings with ohmmeter in star and delta. Determine fault on motor winding.**	**5**	**24.5**	**70.5**
			Nov 2008	5	Draw power circuit for star/delta starter. Draw control circuit for circuit for star/delta starter	22.5	17.5	60
			Jun 2015	2	Draw a power circuit for a forward/reverse DOL starter. Define ramp time. Motor operating at low speeds. Why 6 conductors required between star/delta starter and motor	29	32.5	38.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**J20**	**Testing of installations, appliances and fittings**			**Isolated installation with fixed-wired appliances – actions taken before commencing IR testing; how to carry out IR testing. Earth loop impedance testing required to be carried out.**	**28.5**	**48**	**23.5**
			Jun 2012	5	Actions taken before IR test carried out on an installation. How to carry out IR test. How to confirm that test result of less than 1MΩ is acceptable.	46	25	29
			Jun 2013	9	Describe different methods of testing the integrity of the insulation of a Class I appliance. Describe how earth continuity test carried on a Class I appliance.	40	26.5	33.5
			Nov 2013	7	Three-phase water pump, isolator; DOL start and circuit not connected to switchboard – test to ensure safe to connect to the supply and describe testing that can only be carried out with motor disconnected	37	45	18
			Jun 2014	2	Three-phase socket outlet and final subcircuit – documents that detail testing and describe three tests using test instruments	62	24.5	13.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**H.17**	**Switchboards**			**Draw supply to MEN switchboard and supply protected by RCD from MEN switchboard to distribution board. Why no link in distribution switchboard? What happens if MEN link not installed in switchboard.**	**33.5**	**45**	**21.5**
			Nov 2009	4	Draw supply to MEN switchboard and supply protected by RCD from MEN switchboard to distribution board	51	22	27
			Jun 2011	3	Draw wiring to single-phase switchboard that incorporates RCD protection for final subcircuits.	78	9	13
			Nov 2011	4	MEN switchboards – closest to point of supply; and differences from distribution switchboard. Connecting MEN installation to earth; Faults on installation with MEN link missing. Connection of main earthing lead.	72.5	24.5	3
			Jun 2014	3	Draw supply to MEN switchboard and supply protected by RCD from MEN switchboard to distribution board	51.5	17	31.5
			Nov 2015	6	Switchboard closest to pint of supply. MEN system components in a switchboard. Points where MEN system earthed. Fault current flowing.	65	25	10

A5.3 - Moderation

ET 57 was moderated by secure email and a moderation meeting. The meeting was held on 20 May.

A5.4 - Marking

Teleconferences were held with the markers on 27 June and 4 July.

Version 2 of the answer schedule was sent to markers on 28 June.

Comment

The paper was good in that it required candidates to demonstrate their practical and theoretical skills and understanding of their trade. Few questions left room for alternate answers which didn't have too much to do with the question. The range and scope of questions in this paper seemed balanced, fair and reasonable. The number of questions or bullet points inside each question seemed reasonable and there would appear to have been enough time to complete the paper within the 3 hours.

There is always an issue with the grammar of the questions and it seems to be accentuated where English is not the first language. There is also the problem of the candidate not reading and interpreting the question accurately which results in answers that bear no resemblance to the original question.

The "unit standard" method of learning means that a portion of theory is studied vigorously and then not followed-up so there is little need to revise throughout the training period. With modern technology, it is so easy to search the web for any information, at any time, use the knowledge and then promptly forget it until required again when the process is repeated. The exam room situation requires that the information be recalled from memory and if it cannot be recalled from memory, then a problem exists.

The following questions had issues that should have been resolved at moderation:

- 5(b)(iii) - should have been based on a fuse operating time of 0.4 s, but the question actually stated 4 s, yet the model answer still gave results based on 0.4 s.

- 7(c) - was actually impossible to resolve from the stated table results in the question paper.

A5.5 - Amendments to ET 57

The significant amendments to ET 57 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)(ii)	Rewritten to make intention clearer	-	-
1(b)(i)	-	Amended to be more accurate	Answer amended to be more accurate
1(b)(ii)	Rewritten to make intention clearer	-	-
1(c)	Rewritten to make intention clearer	Amended accordingly	-
1(d)	Rewritten to make intention clearer	-	Answer corrected
1(f)	Rewritten to make intention clearer	Amended accordingly	Option added
1(g)	-	-	Note added
1(j)	-	-	Two options added
2(a)(i)	-	Option added	Amended to be more accurate
2(a)(ii)	Rewritten to make intention clearer	Amended accordingly	-
2(c)	Rewritten to make intention clearer	Amended accordingly	Two options added
3	Rewritten to make intention clearer	Amended accordingly	-
3(c)	-	-	Amended to be more accurate
4(a)	-	-	Option added
4(b)	Rewritten to make intention clearer	-	-
4(c)	-	-	Editorial amendment
4(e)	-	-	Amended to be more accurate
5(a)(i)	Rewritten to make intention clearer	-	-
5(a)(ii)	-	-	Answer corrected
5(a)(iii)	Rewritten to make intention clearer	-	Answer corrected
5(b)(i)	-	-	Note added
5(b)(ii)	-	-	Note added. Answer corrected
5(c)	Rewritten to make intention clearer	-	-
6(c)	-	-	Answer corrected
6(d)	-	-	Answer corrected
7(b)	New question – replaces (b), (c), (d) and (e)	Amended accordingly	-
7(c)	New question – replaces (b), (c), (d) and (e)	-	Answer corrected

The significant amendments to ET 57 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
8	Rewritten to make intention clearer	Amended accordingly	-
8(a)(iv)	-	-	Amended to be more accurate
9(a)	Marks reduced from 10 to 5	Amended accordingly	-
9(b)	New question	Amended accordingly	Option added
9(c)	New question	Amended accordingly	Note added
9(d)	New question	Amended accordingly	-

Appendix 6

Electrical Inspector Examinations

18 June 2016

IT 33, a moderated paper, was used for the examination of 18 June 2016.

A6.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
IT 33	52	33	63.5
June 2016	**52**	**33**	**63.5**

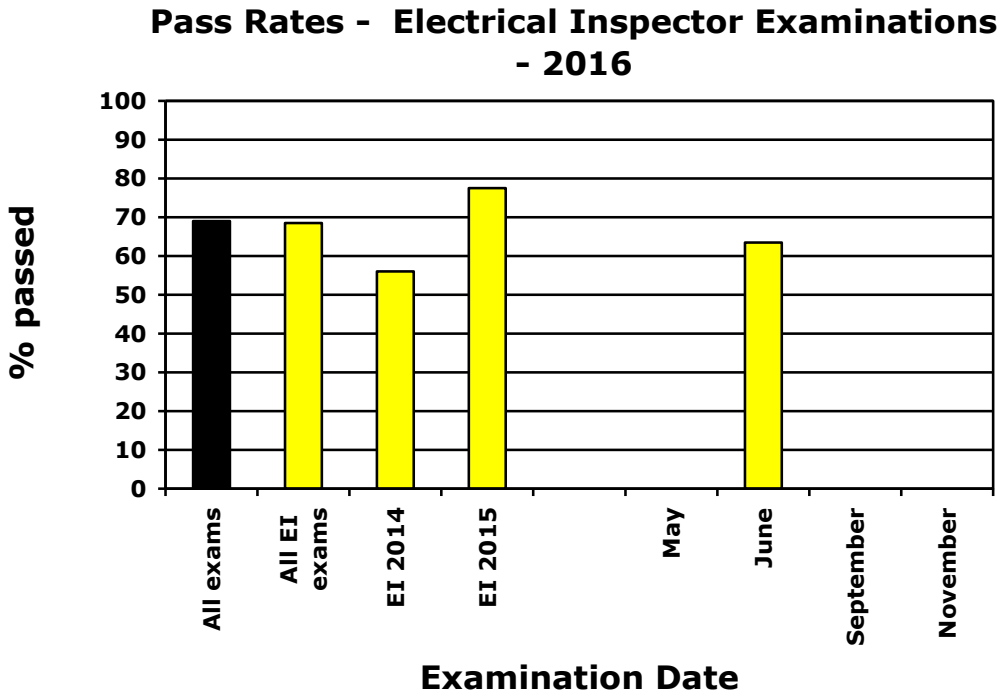
IT 33

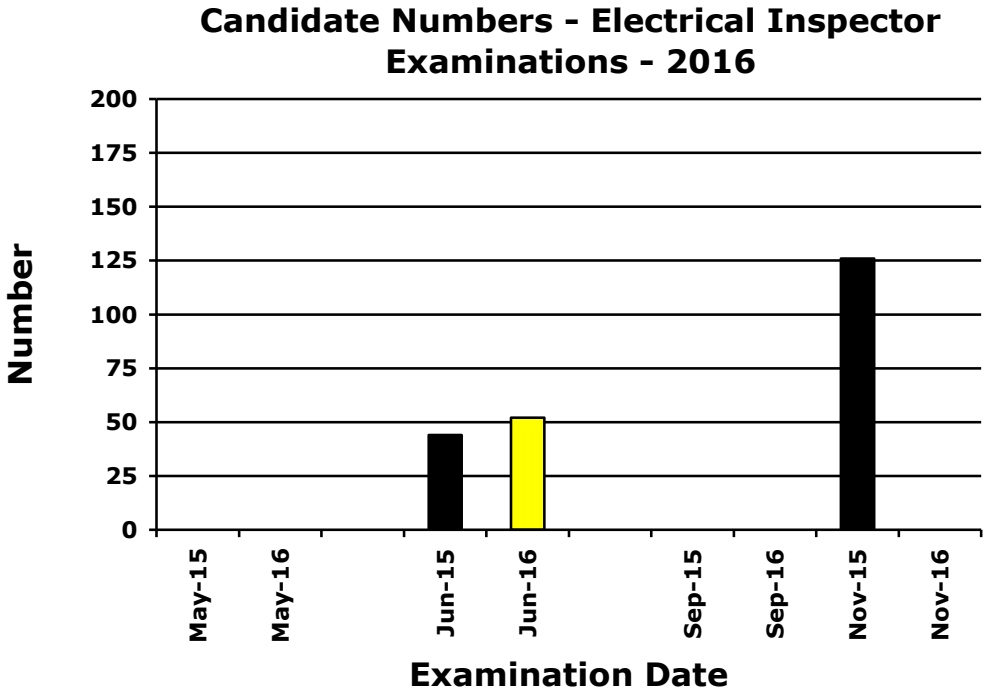
All candidates

Average pass mark 60 %
Median mark 63.5

Those who passed

Average pass mark 70 %
Median mark 67.5


Pass Rates - Electrical Inspector Examinations - 2016
% passed
100
90
80
70
60
50
40
30
20
10
0
All exams
All EI exams
EI 2014
EI 2015
May
June
September
November
Examination Date


Candidate Numbers - Electrical Inspector Examinations - 2016
Number
200
175
150
125
100
75
50
25
0
May-15
May-16
Jun-15
Jun-16
Sep-15
Sep-16
Nov-15
Nov-16
Examination Date

Mark Ranges

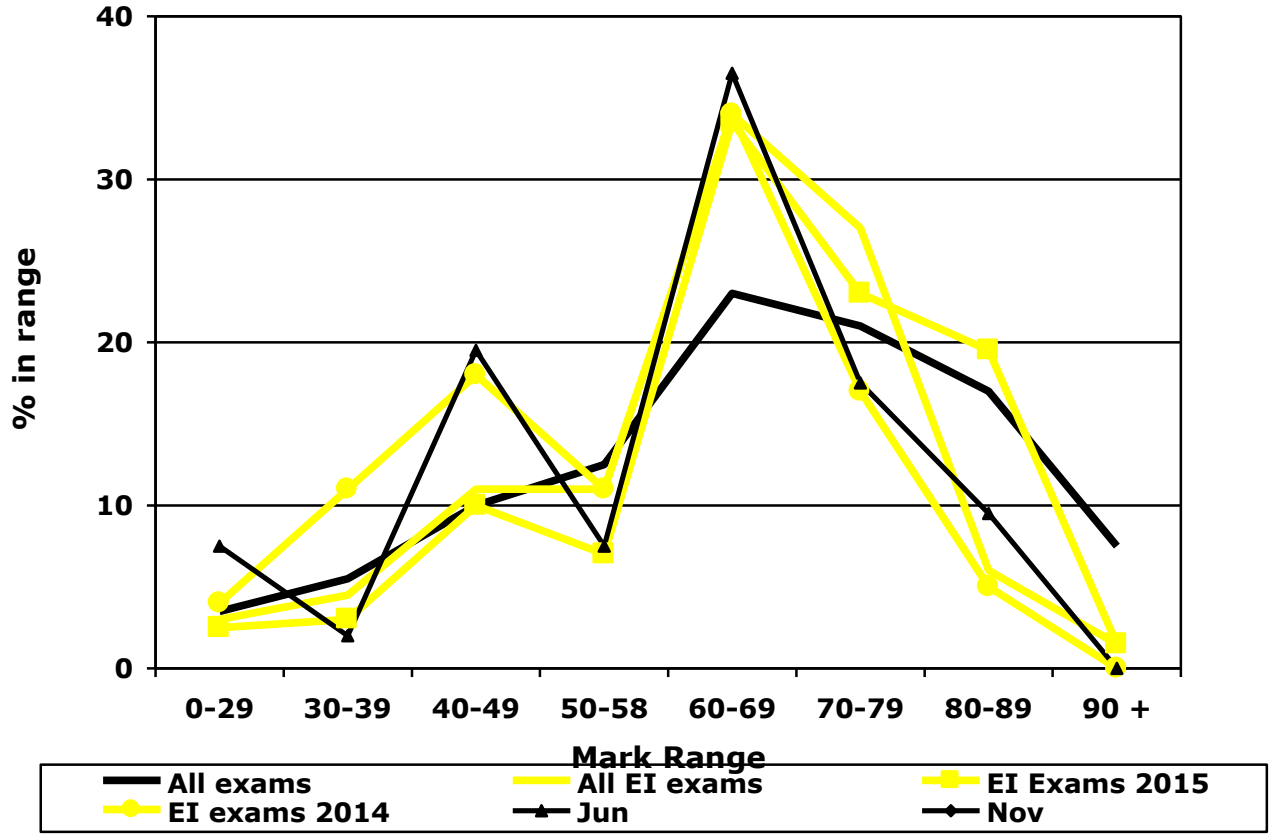
Number of candidates

Range	IT 33			**June 2016**	
90 – 100	0			**0**	**candidates**
80 – 89	5			**5**	**candidates**
70 – 79	9			**9**	**candidates**
60 – 69	19			**19**	**candidates**
50 – 58	4			**4**	**candidates**
40 – 49	10			**10**	**candidates**
30 – 39	1			**1**	**candidates**
0 – 29	4			**4**	**candidates**
	52			**52**	

% of candidates

Range	IT 33			**June 2016**	
90 – 100	0			0	**% of candidates**
80 – 89	9.5			**9.5**	**% of candidates**
70 – 79	17.5			**17.5**	**% of candidates**
60 – 69	36.5			**36.5**	**% of candidates**
50 – 58	7.5			**7.5**	**% of candidates**
40 – 49	19.5			**19.5**	**% of candidates**
30 – 39	2			**2**	**% of candidates**
0 – 29	7.5			**7.5**	**% of candidates**

Mark Ranges - Electrical Inspector Examinations - 2016



A6.2 - Overall Marking Analysis

Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with similar questions from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	**-**	**10, 2 mark questions**				**48**	**36.5**	**15.5**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**J.8**	**Inspection - Homeowners Electrical Work**			**Work permitted to be done by homeowner and cable sizes. Certification of homeowner work. Work required to be installed, certified and inspected by registered person.**	**46**	**35**	**19**
			Jun 2008	2	Inspection of homeowner work – test and inspection documents, minimum size of cables, protection	28.5	50	21.5
			Nov 2010	2	Homeowner work – which document used; minimum size of cables and flexible cords; minimum rating of control switch. Document for checking and testing; testing of final subcircuits; minimum protection required	65.5	24.5	10

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**I9.7.6**	**Damp Areas**			**Fountains supplied by SELV and low voltage. Why certain methods prohibited in damp area. Protection requirements in a sauna.**	**36.5**	**32.5**	**31**
			Jun 2008	3	Advice to electrician re zone of fittings on bathroom. Fittings in multiple zones	2	36	62
			Nov 2009	9	En-suite bathroom – install light switch; towel rail and switch; and socket outlet. Determine zones, IP ratings and installation requirements	23	29	48
			Jun 2010	6	En-suite bathroom – change that will allow fittings to be installed. Define zones on plan. Install light switch; towel rail and switch; and socket outlet.	87	6.5	6.5
			Nov 2013	3	Installation of lights in a bathroom. Installation of light switches near basins. Installing socket outlet i Zone 1 of swimming pool	59	25	16

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**G.1**	**Electrical Installations - General**			**Reasons why installation does not comply and changes that need to be made to ensure it complies. Hazards of a phase/neutral transposition.**	**23**	**27**	**50**
			Jun 2011	9	Calculate voltage drop in single-phase installation; why installation does not comply with AS/NZS 3000. Change that will permit installation to comply.	70	10	20
			Jun 2014	7	Two LPG gas bottles and air-conditioning compressor outside domestic installation. Draw exclusion zone for the bottles. Changes that allow installation to comply. Isolation requirements for compressor	23	14.5	62.5
			Jun 2015	5	New mains and earthing system installed – why it does not comply with AS/NZS 3000; what happens if installation livened; changes to earthing and protection to make installation comply	59	23	18

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**G.1**	**Electrical Installations - General**			**Cable to 230V pump – calculate minimum size of cable that will meet load and voltage drop requirements. Maximum demand by assessment. Switching of a neutral conductor.**	**59.5**	**13.5**	**27**
			Nov 2009	8	Singe phase supply to pottery kiln – calculate cable size, loading and volt drops.	58.5	19.5	22
			Jun 2010	4	Singe phase supply to pottery kiln – calculate cable size based on load, volt drop and earth loop impedance requirements.	60	9	31
			Nov 2011	9	Mains cable for three-phase commercial development – determine minim size copper and aluminium cable that meets load and voltage drop requirements	46	11	43
			Nov 2013	9	New submain, switchboard and socket outlet – state maximum voltage drop permitted; calculate voltage drop in consumers mains; and calculate voltage drop in final subcircuit cable and minimum size.	33.5	19	47.5
			Nov 2014	8	Driveway lighting in factory complex. Calculate volt drop to new luminaire and whether it complies with AS/NZS 3000	31	0	69

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**G.5**	**Caravan Parks and Caravans**			**Overcurrent requirements between caravan socket outlet and domestic socket outlet. Connection of supply lead to caravan. Fittings that cannot be connected in low consumption premises.**	**34.5**	**42.5**	**23**
			Nov 2013	8	Documents required for new work and inspection of caravan. Whether or not inspector can inspect own work. Requirements for re-inspection. Requirements for limiting current of incoming supply.	18	31	51
			Jun 2014	6	What must be verified before connectable installation connected to supply? Offences when issuing an electrical warrant of fitness. Electrical warrant of fitness being renewed for caravan state three supply arrangements. Requirements for changeover switches.	16	37.5	46.5
			Nov 2014	2	Requirements for a periodic assessment of caravan park. Documentation for caravan. Periodic assessment of caravan part service pillars.	71	21	8
			Jun 2015	3	New caravan park service pillars – testing requirements for RCBOs, fault loop impedance testing and inspection requirements for pillars	20.5	34	45.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**F.1**	**Protection - General**			**Define total clearing time and cut-off characteristic. Explain how discrimination achieved using total clearing time and cut-off characteristic. Fault protection – how method achieves outcome and how it is verified to be operating correctly.**	**44**	**19**	**37**
			Nov 2013	7	Time current characteristic graph – state what is meant by inverse time-current characteristic; define total operating time. Determine different operating characteristics of gG fuse.	31.5	16.5	52
			Jun 2014	5	Time current characteristic graph – explain how discrimination achieved and current required to operate fuses in required time. Fault protection not provided by RCCB. Sensitivity of RCDs.	27	27	46
			Nov 2014	5	Time current characteristic graph – determine fusing characteristics of 25A HRC fuse. Why earth fault loop impedance needs to be low. Explain how discrimination is achieved.	31	31	38
			Nov 2015	4	HRC fuses – define pre-arc time and total clearing time. Sate pre-arc time and total clearance time from a graph for HRC fuses. Where additional RCD protection required	45	30	25

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**G.1**	**Electrical Installations - General**			**Three-phase residential development with common area. Calculate maximum demand of a heaviest loaded phase.**	**4**	**31**	**65**
			Jun 2014	2	Three-phase residential development with common area. Calculate maximum demand of a heaviest loaded phase.	3.5	25	71.5
			Nov 2014	4	Three-phase residential development with common area. Balance living unit loads across three-phases. Calculate loading in communal area. Balance loads across three phases.	46	33	21
			Jun 2015	2	Balance loads evenly across three-phase of a residential apartment complex	2	25	73
			Jun 2015	5	New mains and earthing system installed – why it does not comply with AS/NZS 3000; what happens if installation livened; changes to earthing and protection to make installation comply	59	23	18
			Jun 2015	6	Determine heaviest loaded phase in a factory with single-phase and three-phase loads.	2	25	73

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**G.2**	**Appliances and Fittings**			**Requirements for fire detectors; recessed lighting; electric cables for floors. Inspection of lampholders and testing polarity testing in existing electrical installation.**	**59.5**	**27**	**13.5**
			Jun 2008	9	Advice to electrician regarding recessed luminaires – protection, installation methods, installation conditions	24	33	43
			Nov 2010	4	Installation of apparatus and accessories – requirements for; socket outlets; multi-core cables; SELV cables and socket outlets; and recessed luminaires.	41	22	37
			Jun 2015	6	Requirements for recessed luminaires. Installing smoke alarms. Locations for isolating switches for generation system and changeover devices.	50	23	27

A6.3 - Moderation

This paper was moderated via secure email and a meeting. The meeting was held on 16 May.

A6.4 - Marking

Teleconferences were held with the markers on 27 June and 5 July.

Version 2 of the answer schedule was sent to markers on 28 June.

Comment

The exam was generally well completed by most candidates. The standard of accuracy in writing the answers was generally good, but the calculation questions caused problems for some.

The exam did not require many changes during the marking period. Credit should go to the moderation team for a good exam.

A6.5 - Amendments to IT 33

The significant amendments to IT 33 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(b)	Answers required reduced from 4 to 2	Amended accordingly	-
1(c)	Rewritten to be more accurate	-	-
1(d)	-	-	3 options added
1(f)	Rewritten to be more accurate	Amended accordingly	Option added
1(g)	-	Amended to be more accurate	-
1(h)(i)	Rewritten to be more accurate	Amended accordingly	-
2	Rewritten to create a more topical question	Amended accordingly	-
2(a)	-	-	Amended to be more accurate
3(a)	Rewritten to be more accurate	-	-
3(c)	Rewritten to be more accurate	Amended accordingly	-
4(a)	-	Additional reference inserted	-
4(b)	-	Amended to be more accurate	-
4(c)	Editorial amendment	Answer corrected	-
6(a)	Rewritten to be more accurate	Amended accordingly	-
6(b)	Marks corrected	Amended accordingly	-
7(c)(i)	-	Marks corrected	-
7(d)	-	Answer corrected	-
8	Rewritten to be more accurate	-	-
8(d)	-	Range of acceptable answer included	-
9(d)(i)	-	Option added	-

Appendix 7

Electrical Installer

18 June 2016

EIN 12, a moderated paper was used for the examination of 18 June 2016.

A7.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EIN 12	2	1	50
June 2016	**2**	**1**	**50**

EIN 12

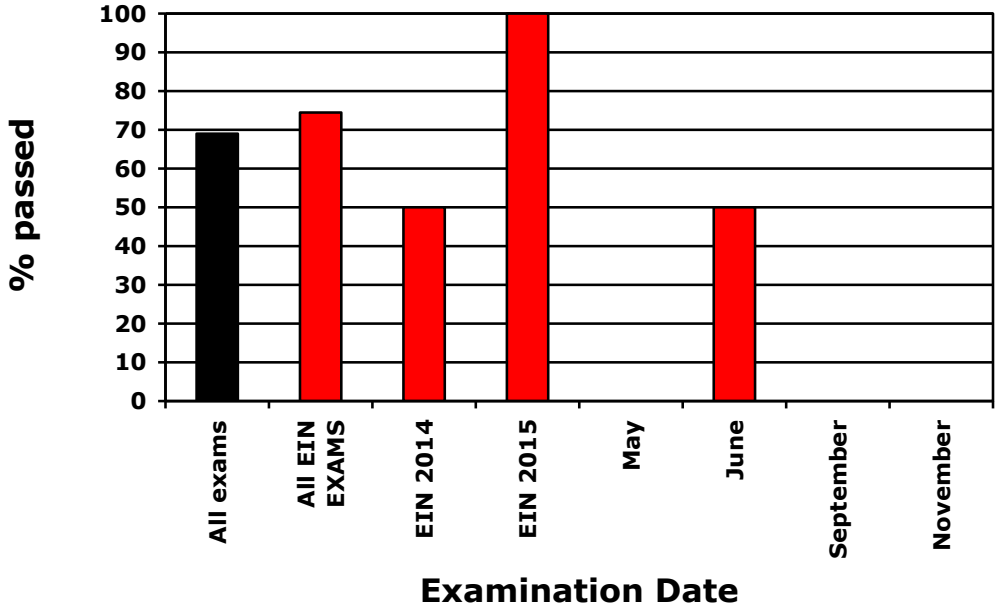
All candidates

Average pass mark %
Median mark

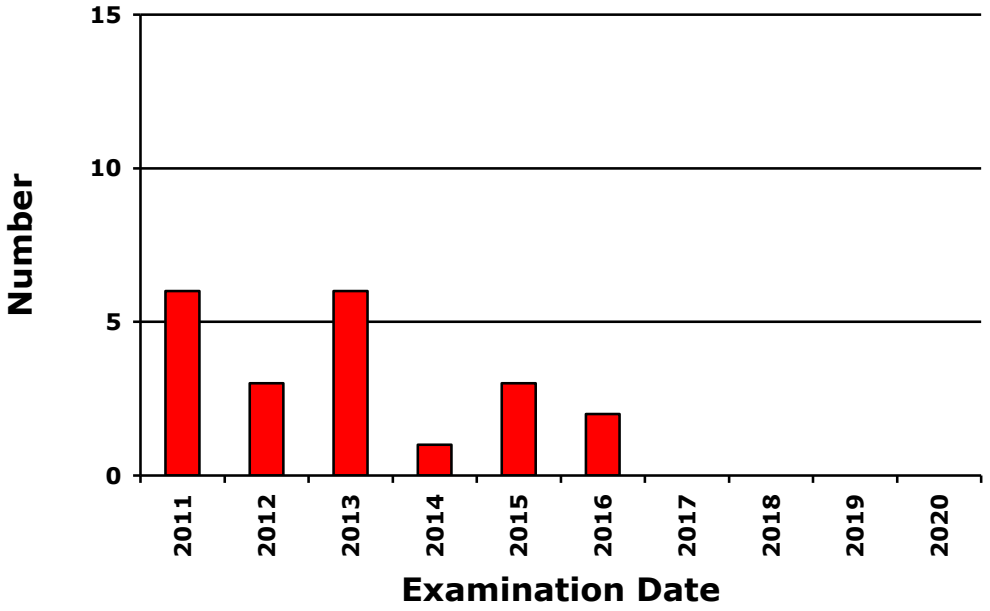
Those who passed

Average pass mark %
Median mark

Pass Rates - EIN Examinations - 2016



Candidate Numbers - EIN Examinations



Mark Ranges

Number of candidates

Range	EIN 12			**June 2016**	
90 – 100	0			**0**	**candidates**
80 – 89	1			**1**	**candidates**
70 – 79	0			**0**	**candidates**
60 – 69	0			**0**	**candidates**
50 – 58	0			**0**	**candidates**
40 – 49	1			**1**	**candidates**
30 – 39	0			**0**	**candidates**
0 – 29	0			**0**	**candidates**
	1			**1**	

% of candidates

Range	EIN 12			**June 2016**	
90 – 100	0			**0**	**% of candidates**
80 – 89	50			**50**	**% of candidates**
70 – 79	0			**0**	**% of candidates**
60 – 69	0			**0**	**% of candidates**
50 – 58	0			**0**	**% of candidates**
40 – 49	50			**50**	**% of candidates**
30 – 39	0			**0**	**% of candidates**
0 – 29	0			**0**	**% of candidates**

A7.3 – Moderation

EIN 12 was moderated by secure email and a meeting. The meeting was held on 19 May.

A7.4 - Marking

Comments

A7.5 - Amendments to EIN 12

The significant amendments to EIN 10 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(e)	Rewritten to be more accurate	-	-
1(f)(ii)	Rewritten to be more accurate	-	-
1(g)	-	Amended to be more accurate	-
1(h)	-	Option added	-
1(j)	Partly rewritten to be more accurate	-	-
1(j)(ii)	-	Option added	-
2(a)	-	Amended to be more accurate	-
2(b)	Rewritten to be more accurate	Amended accordingly	-
2(d)	Editorial amendment	Amended to be more accurate	-
3(c)	Rewritten to be more accurate	-	-
3(b)	-	Amended to be more accurate	-
3(d)	Rewritten to be more accurate	Amended accordingly	-
4(a)	Rewritten to be more accurate	-	-
4(b)	Rewritten to be more accurate	Option added	-
4(c)	Rewritten to be more accurate	-	-
5(e)	Rewritten to be more accurate	-	-
6(b)	Rewritten to be more accurate	Not added regarding alternate answer	-
8(a)	Rewritten to be more accurate	-	-
8(c)	Partly rewritten to be more accurate	-	-

Appendix 8

Associated Tradespersons

There was no Associated Tradesperson examination in June 2016