May 2016 Examinations

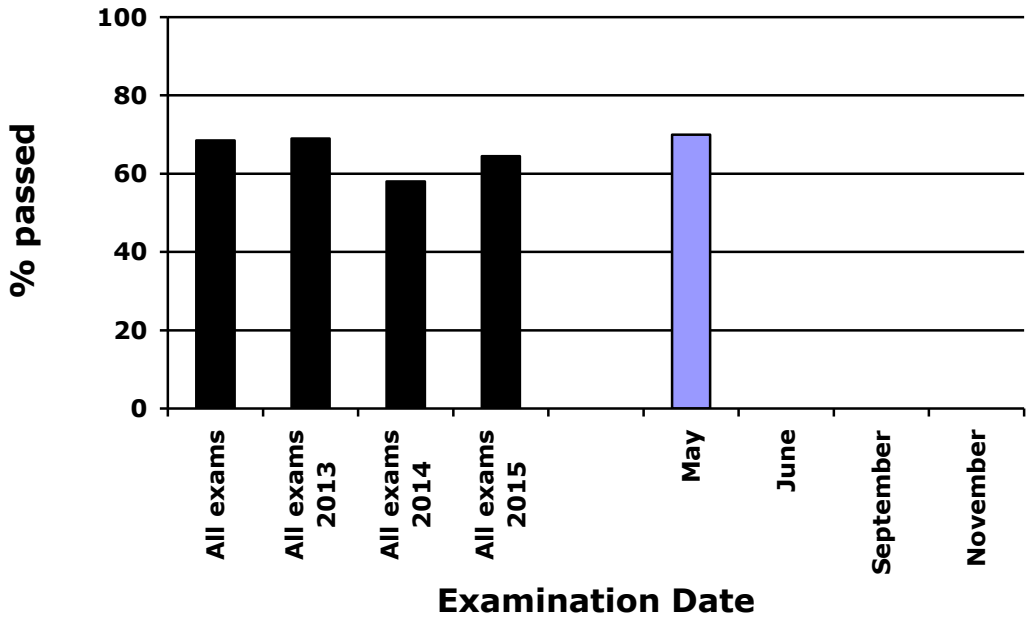
Electrical Workers Registration Board.

1. Summary of Examinations

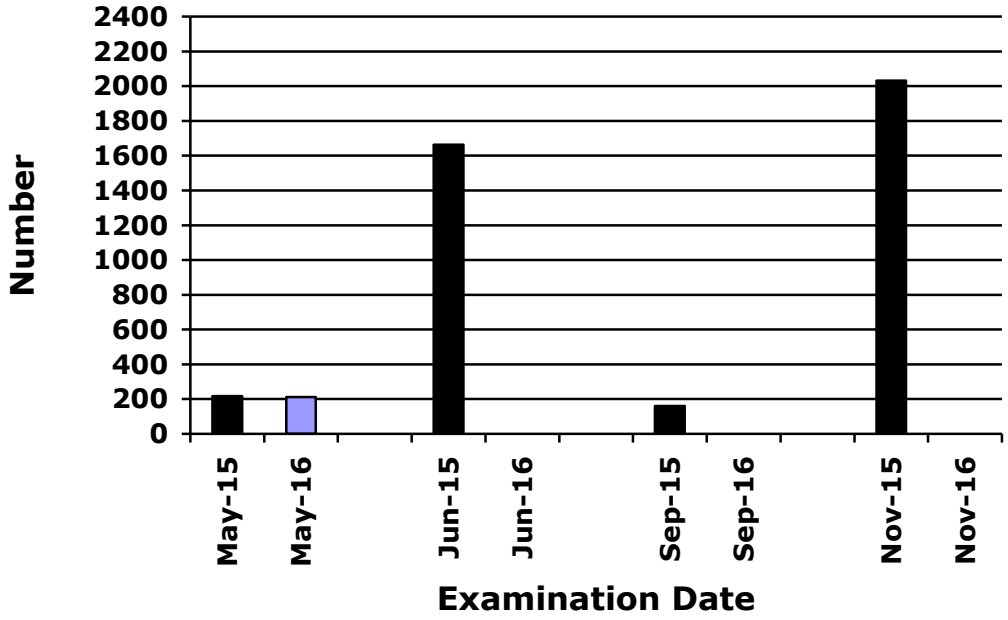
Pass rates:

	Number of candidates	**Number of candidates who passed**	**Percentage passed**
EAS	69	53	77
EASQ			
EST	94	62	66
Elec. Regulations	49	34	69.5
Elec. Theory			
Elec. Inspector			
Elec. Installer			
AT			
ESAI			
May 2016	**212**	**149**	**70**

Pass Rates - All Examinations - 2016



Candidate Numbers - All Examinations - 2016



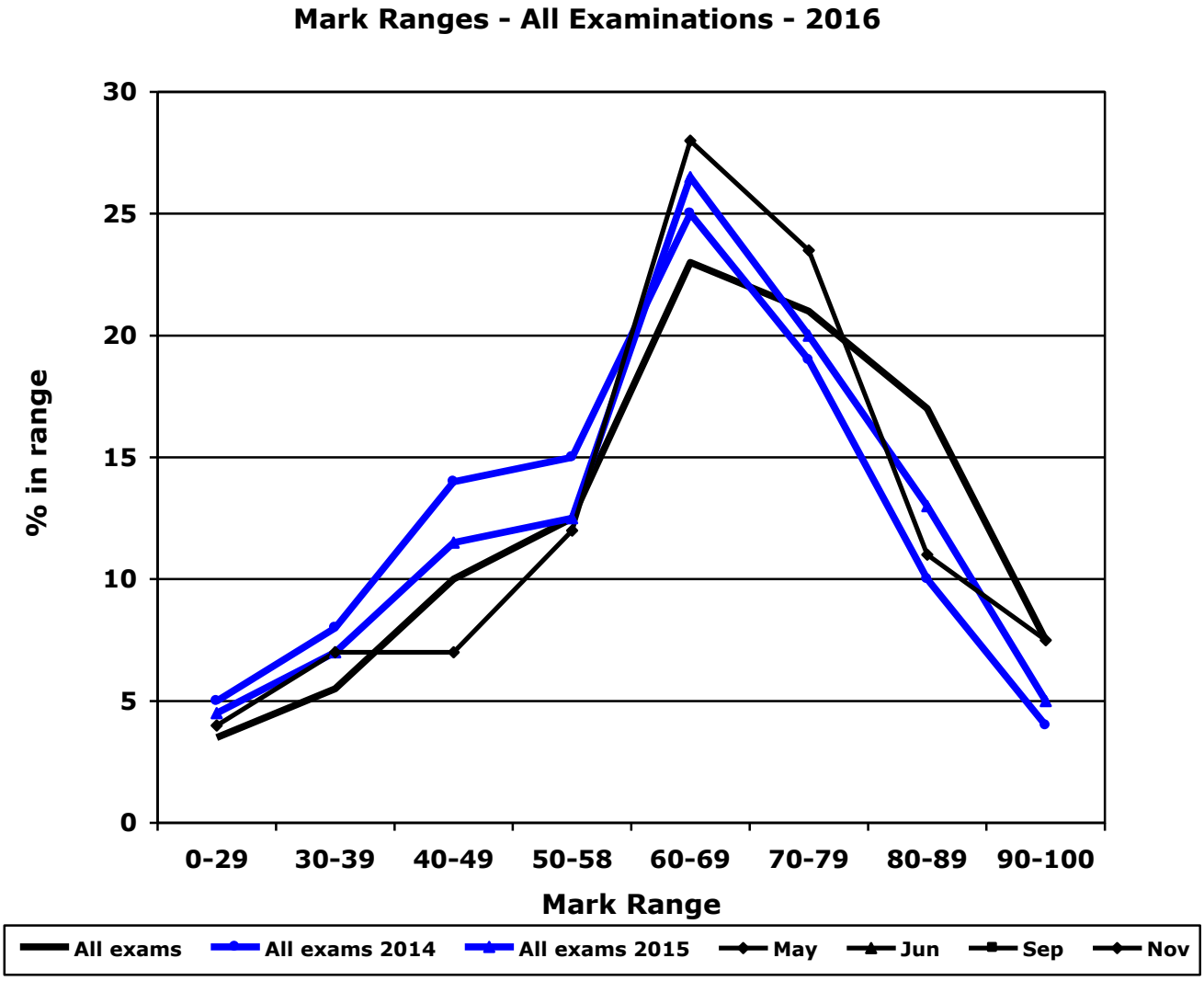
Mark Ranges

Number of candidates

Range	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	**May 2016**
										Total Candidates
90 – 100	9		5	2						**16**
80 – 89	9		10	5						**24**
70 – 79	18		21	11						**50**
60 – 69	17		26	16						**59**
50 – 58	5		12	9						**26**
40 – 49	5		5	5						**15**
30 – 39	5		8	1						**14**
0 – 29	1		7	0						**8**
	69		**94**	**49**						**212**

% of candidates

Range	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	**May 2016**
										% of Candidates
90 – 100	13		5.5	4						**7.5**
80 – 89	13		10.5	10						**11**
70 – 79	26		22.5	22.5						**23.5**
60 – 69	25		27.5	33						**28**
50 – 58	7		13	18.5						**12**
40 – 49	7		5	10						**7**
30 – 39	7		8.5	2						**7**
0 – 29	2		7.5	0						4


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 70% is consistent with pass rates in other May examinations

2.2 Candidates Numbers

There were 6 fewer candidates than the number of candidates that sat the corresponding May examination in 2015.

The candidate numbers for May examinations are as follows:

	EAS	EASQ	EST	ER	ET	EI	EIN	AT	ESAI	Total
2004	72		35							**107**
2005	179		48							**227**
2006	225		70							**295**
2007	181		95							**276**
2008	185		107							**292**
2009	237		89						1	**327**
2010	154		67							**221**
2011	81	4	69		1					**155**
2012	80		105							**185**
2013	73		68	26					20	**187**
2014	58		84		2					**144**
2015	61		105	37				15		**218**
2016	69		94	49						**212**

These statistics incorporate all examinations held in May each year.

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 – May 2016

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

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
A	0	0	0
B	18	14	78
C	13	9	69
D	0	0	0
E	0	0	0
F	0	0	0
G	0	0	0
H	0	0	0
J	0	0	0
K	24	23	96
L	0	0	0
M	1	1	100
N	5	2	40
O	0	0	0
P	28	21	75
Q	8	8	100
R	55	37	67
S	8	6	75
T	0	0	0
U	52	28	54
V	0	0	0
W	0	0	0
X	0	0	0
Y	0	0	0
Z	0	0	0
	212	**149**	**70**

6. Electrical Appliance Serviceperson Performance – May 2016

6.1 Examination centre pass rates for the Electrical Appliance Serviceperson Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
B	8	7	87.5
K	13	13	100
P	16	12	75
R	23	16	69.5
S	4	3	75
U	5	2	40
	69	**53**	**77**

Examination centres not shown did not have candidates sit this examination

6.2 Candidate performance in Electrical Appliance Serviceperson Examinations

The pass rate of 77% is in line with past results for Electrical Appliance Serviceperson examinations.

Candidates generally did well in questions 1, 2, 4, 5, 7 and 8. In question 1, 47% of candidates gained 15 or more marks while 49% were able to gain between 10 and 14.5 marks. For questions 2, 4, 5, 7 and 8. between 46.5% and 67% of candidates gained 7.5 marks or more.

Candidates had difficulty with the following questions:

- Question 3 related to power and current calculations for a heater controlled by a three-heat switch. Candidates seemed to have difficulty in determining how the elements were connected in a certain switch position. Only 33.5% of candidates could gain 7.5 marks or more for this question, while 37.5% could not gain at least 5 marks. In past questions of this type over 50% of candidates were able to gain 7.5 marks or more

- Question 6 related to determining fault current flowing in a faulty appliance, whether the protection would operate and the voltage that would appear on the appliance frame. Most candidates could not decide what actually occurs in these circumstances. 32% of candidates gained 7.5 marks or more for this question, while 58% could not gain at least 5 marks.

- Question 9 related to testing an electrical appliance. Most candidates knew how to do earth continuity testing, but few knew how to do an earth leakage test. 33% of candidates gained 7.5 marks or more for this question, while 22% could not gain at least 5 marks.

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

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

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

Examination centres not shown did not have candidates sit this examination

7.2 Candidate performance in Electrical Appliance Serviceperson (Qualified) Examinations

There was no Electrical Appliance Serviceperson (Qualified) examination in May 2016.

8. Electrical Service Technician Performance – May 2016

8.1 Examination centre pass rates for the Electrical Service Technician Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
B	10	7	70
K	11	10	91
M	1	1	100
P	12	9	75
R	9	6	66.5
S	4	3	75
U	47	26	55
	94	**62**	**66**

Examination centres not shown did not have candidates sit this examination

8.2 Candidate performance in Electrical Service Technician Examinations

The pass rate of 66% is consistent with examinations of this type.

Candidates generally did well in questions 1, 2, 3, 6, 7 and 9. In question 1, 56% of candidates gained 15 or more marks while 28% were able to gain between 10 and 14.5 marks. For questions 2, 3, 6, 7 and 9, between 31% and 56% of candidates gained 7.5 marks or more.

Candidates had difficulty with the following questions.

- Question 4 related to testing of a three-phase motor. While most candidates were able to describe how to isolate the motor, many had difficulty with describing how to do an insulation resistance test. They did not know what needed to be disconnected to obtain a valid test. While 41.5% of candidates gained 5 marks or more for this question, only 25.5% gained 7.5 marks or more.

- Question 5 related to basic theory of impedance and calculating the power in a series/parallel circuit. The use of impedance in the question seemed to disconcert most candidates. Only 23.5% of candidates could gain 7.5 marks or more for this question, while 59.5% could not gain at least 5 marks.

- Question 8 related to testing of various electrical appliances. Candidates seemed unable to explain how to test in different situations. Only 25.5% of candidates could gain 7.5 marks or more for this question, while 41.5% could not gain at least 5 marks.

9. Electrician Regulations Performance – May 2016

9.1 Examination centre pass rates for the Electrician Regulations Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
C	13	9	69
N	5	2	40
Q	8	8	100.00
R	23	15	65
	49	**34**	**69.5**

Examination centres not shown did not have candidates sit this examination

9.2 Candidate performance in Electrician Regulations Examinations

There were four moderated Electrician Regulations examination papers in the May period and the overall pass rate of 69.5% is higher than average. ER 72 had one candidate, ER 73 had 45 candidates and ER 74 and ER 75 had one candidate each.

ER 73

Candidates generally did well in questions 4, 5, 6, 7 and 8.

Candidates had difficulty with the following questions:

- Question 1 incorporated 10, 2 mark questions on a range of topics. Only 18% of candidates could gain 15 marks or more for this question, but 69% were able to gain at least 10 marks.

- Question 2 related to calculating the size of an aluminium cable to a three-phase building. It is not clear why the use of an aluminium cable causes problems for candidates. Only 18% of candidates could gain 7.5 marks or more for this question, while 73% could not gain at least 5 marks.

- Question 3 related to testing for a phase/neutral transposition on the consumer mains of a house. Most candidates were not able to show a logical approach to testing of this type. Only 15.5% of candidates could gain 7.5 marks or more for this question, while 51% could not gain at least 5 marks.

- Question 9 related to calculating the voltage drop on a socket outlet final subcircuit comprising three cables. Most candidates had very little concept of how to tackle this question. Only 27% of candidates could gain 7.5 marks or more for this question, while 73% could not gain at least 5 marks.

10. Electrician Theory Performance – May 2016

10.1 Examination centre pass rates for the Electrician Theory Examinations

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

Examination centres not shown did not have candidates sit this examination

10.2 Candidate performance in Electrician Theory Examinations

There was no Electrician Theory examination in May 2016

11. Electrical Inspector Performance – May 2016

11.1 Examination centre pass rates for the Electrical Inspector Examinations

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

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

11.2 Candidate performance in Electrical Inspector Examinations

There was no Electrical Inspector examination in May 2016

12. Electrical Installer Performance – May 2016

12.1 Examination centre pass rates for the Electrical Installer Examinations

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

Examination centres not shown did not have candidates sit this examination

12.2 Candidate performance in Electrical Installer Examinations

There was no Electrical Installer examination in May 2016.

13. Associated Tradesperson Performance – May 2016

13.1 Examination centre pass rates for the Associated Tradesperson Examinations

Centre Code	Number of Candidates	Number who passed	Pass rate (%)
Total	**15**	**13**	**87**

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 May 2016.

Appendix 1

Electrical Appliance Serviceperson Examinations

7 May 2016

EAS 1078, a moderated paper, was used for the examination of 7 May 2016.

A1.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EAS 1078	69	53	77
May 2016	**69**	**53**	**77**

EAS 1078

All candidates

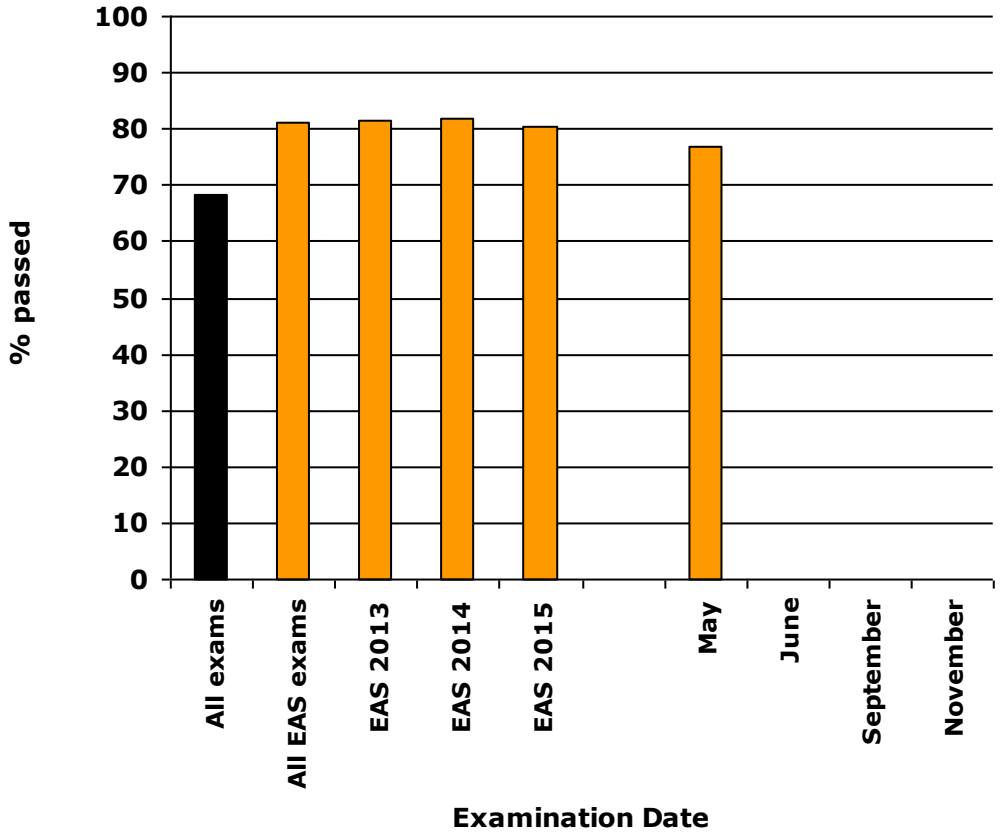
Average pass mark 69 %
Median mark 70

Those who passed

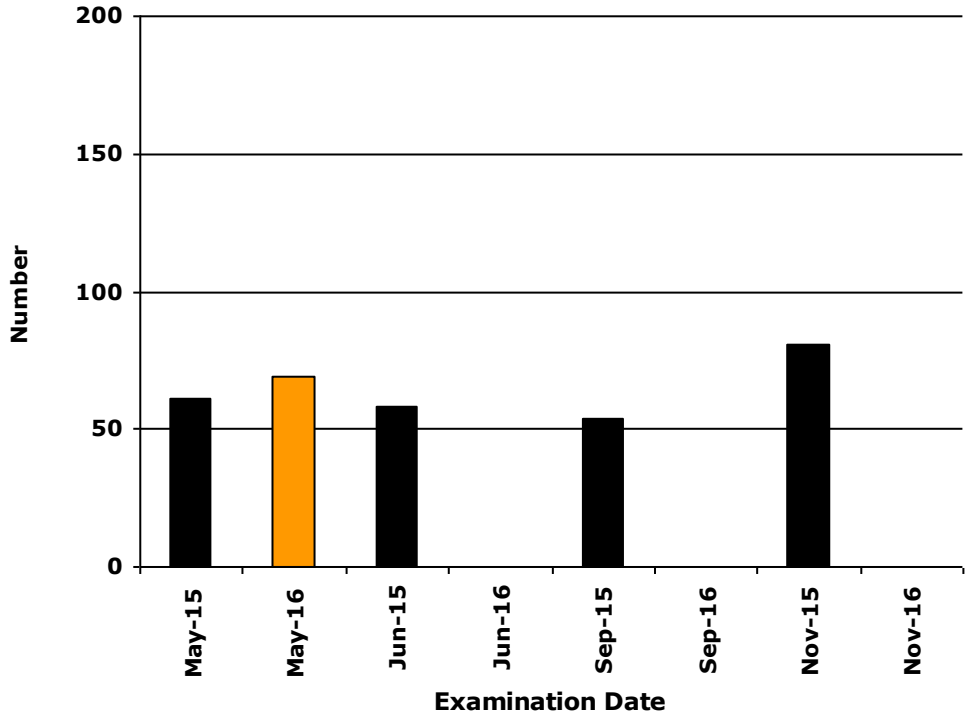
Average pass mark 76.5 %
Median mark 74

2 Candidates gained 95 marks or more.

Pass Rates - EAS Examinations - 2016



Candidate Numbers- EAS Examinations - 2016



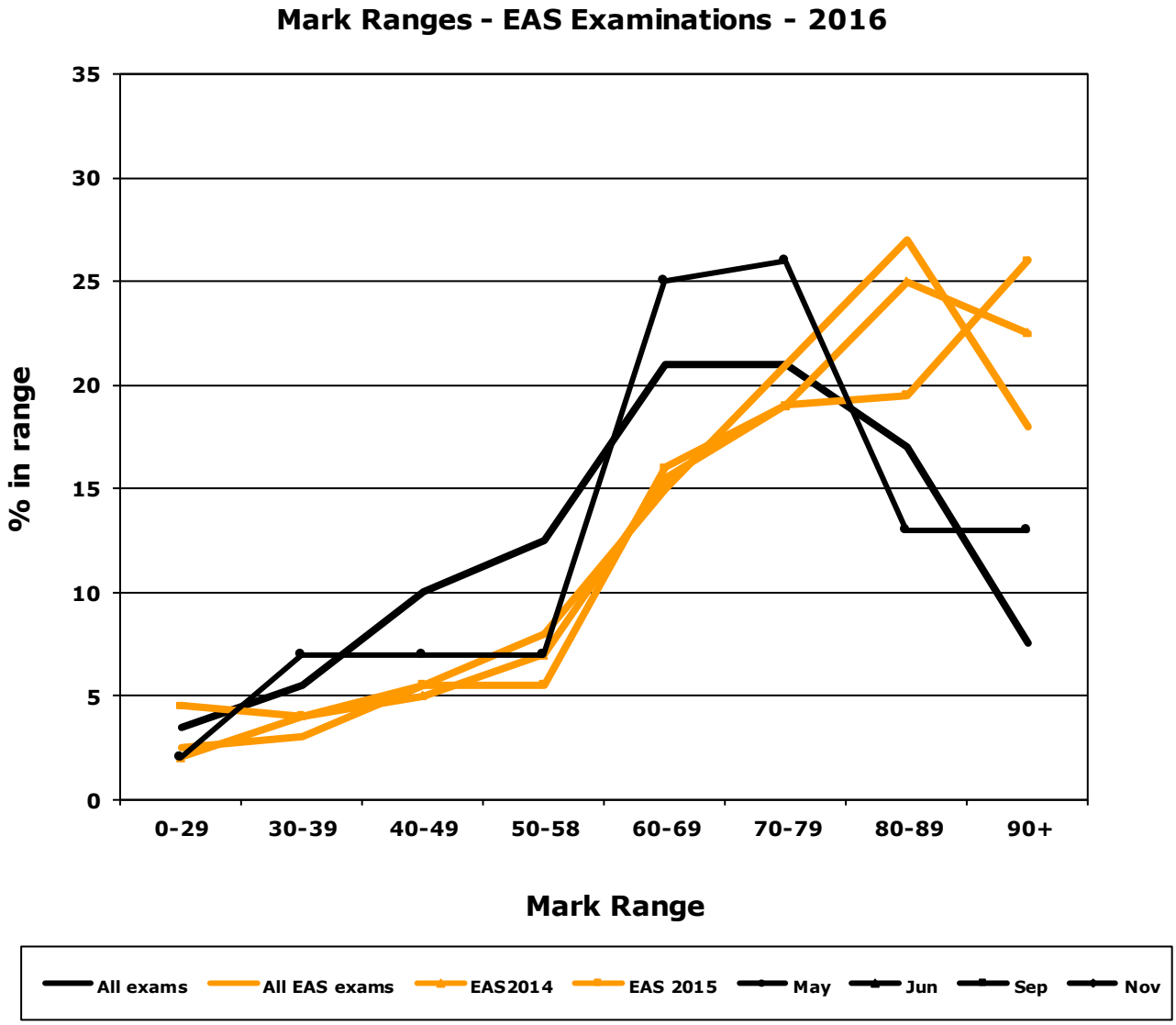
Mark Ranges

Number of candidates

Range	EAS 1078				**May 2016**	
90 – 100	9				**9**	**candidates**
80 – 89	9				**9**	**candidates**
70 – 79	18				**18**	**candidates**
60 – 69	17				**17**	**candidates**
50 – 58	5				**5**	**candidates**
40 – 49	5				**5**	**candidates**
30 – 39	5				**5**	**candidates**
0 – 29	1				**1**	**candidates**
	69				**69**	

% of candidates

Range	EAS 1078				**May 2016**	
90 – 100	13				**13**	**% of candidates**
80 – 89	13				**13**	**% of candidates**
70 – 79	26				**26**	**% of candidates**
60 – 69	25				**25**	**% of candidates**
50 – 58	7				**7**	**% of candidates**
40 – 49	7				**7**	**% of candidates**
30 – 39	7				**7**	**% of candidates**
0 – 29	2				**2**	**% 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**				**42**	**49**	**9**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 2	**I8.20**	**Damp areas**			**Define damp situation in an electrical installation Using an appliance in damp conditions. Why PEC must be 1Ω or less. Repairing an appliance.**	**46.5**	**30.5**	**23**
			May 2011	5	Define "damp situation". Define IP rating and first and second numbers. State specific level of protection for fitting rated IP34	57	13.5	29.5
			Nov 2011	3	Define IP classification and state general level of protection of 1st number and 2nd number. Define protection of IP34 fitting. Using appliance with no IP rating in damp situation.	48	23	29
			Nov 2012	9	Define an earthed situation. How damp conditions can affect operation of an appliance. Re-testing of a repaired appliance.	35.5	26.5	38
			Nov 2013	4	Define damp situation. Define IP classification and state general level of protection of 1st number and 2nd number. Define protection of IP34 fitting. .	84.5	4.5	11

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 3	**B8.3**	**a.c. Theory**			**Heater controlled by three-heat switch. Calculate power in medium position; current in high position; maximum voltage drop at socket outlet; and power consumed at maximum voltage drop**	**33.5**	**29**	**37.5**
			May 2013	5	Heater controlled by three-heat switch. Calculate current in low position. Calculate maximum power consumed. Calculate drop in power consumed if supply voltage drops 5%.	56	8	36
			Jun 2014	3	Heater with a three-heat switch – calculate maximum power consumed; power consumed on medium; minimum current drawn; and power consumed when operating at minimum voltage.	62.5	6.5	31
			Nov 2014	9	Oven with two elements, calculate – current in low position; power in low position; power in medium position; and current in high position.	51	8	41

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q.4	**G8.6**	**Flexible cords and cables**			**Why extension fails if would on drum. Precaution to prevent failure. Define current rating. methods of reducing voltage drop. Why two-core extension cord can't supply Class I appliance.**	**67**	**20**	**13**
			Sep 2013	5	Appliances supplied by a flexible cord wound on a drum. Voltage drop in cords. Cord current ratings. Use of flexible cords	71	20.5	8.5
			May 2014	6	Using a flexible cord would on a drum, describe how it could fail. Define the current rating of a cord. Why voltage drops in cord. Why three-pin plug is not connected to a flexible cord.	71	21	8
			Sep 2014	7	Why extension fails if would on drum. Types of extensions cords to replace one that overheats. Voltage drop in flexible cords. Define current rating.	60	25.5	14.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 5	**F8.11**	**Protection - General**			**Characteristics of HRC fuse. Advantages of HRC fuses. Why HRC fuse must not be replaced with fuse wire. Rewiring rewireable fuse. Current rating of fuse.**	**65**	**22**	**13**
			May 2014	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.	58.5	29.5	12
			Sep 2014	9	Characteristics of an HRC fuse. Rewiring a rewireable fuse. Visual checks of an appliance.	76	20	4
			May 2015	3	HRC fuses – four electrical characteristics; using an under-rated fuse; and using an over-rated fuse. Putting new fuse wire in a rewireable fuse. MCBs – define tripping factor and how mechanisms operate	60.5	18	21.5
			Nov 2015	3	Characteristics of an HRC fuse. Effect of using fuses with lower and higher current ratings. Advantages of HRC fuses. Reloading rewireable fuse.	53.5	26	20.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 6	**G8.19**	**Commission and decommission electrical appliances**			**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**
			Nov 2014	6	Heater with high PEC resistance and short circuit fault used without being repaired– calculate fault current flowing; whether fuse will operate; and calculate touch voltage on frame.	25	9	66
			May 2015	2	Vacuum cleaner with high PEC resistance and short circuit fault used without being repaired– calculate fault current flowing; power consumed; whether fuse will operate; and calculate touch voltage on frame.	70.5	11.5	18
			Jun 2015	4	Heater with short-circuit fault. Calculate current flowing when fault occurred. Calculate why MCB tripped. Calculate voltage on frame of the appliance when fault occurred.	14	14	72

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 7	**K8.15**	**Workplace safety**			**Safety reasons why main switch is turned off. Continued isolation of an appliance. Difference between switching off and isolation. Safety precautions for employees.**	**61**	**30.5**	**8.5**
			Jun 2014	7	Precautions when connecting test instruments. Why bonding is necessary for socket outlets on isolating transformer. Safety precautions when main switch cannot be turned off. Locating fault on circuit	35	42.5	22.5
			May 2015	6	Safety when changing fuse. Difference between isolation and switching off. Steps for continued isolation. Precautions when connecting test instruments.	60.5	28	11.5
			Nov 2015	4	Safety when changing fuse. One method of isolating an appliance. Difference between isolation and switching off. Steps when carrying out prescribed electrical work.	66	25	10

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 8	**J8.17**	**Electrical appliance testing**			**Visual inspections of appliance. Suitability of switch used for d.c. current. Why earth-pin on plug is longer. Why bayonet cap adaptor can't be used for Class I appliance.**	**64**	**29**	**7**
			Jun 2014	6	Class I appliance, visual inspection of plug and appliance. Why micro-gap switch not suitable for d.c. Why earth pin longer on 3 pin plug. Why bayonet cap unsuitable for Class I appliance	80	16	4
			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
			Sep 2015	6	Visual inspection of parts of a Class I appliance. Suitability of a.c. switch for a d.c. circuit. Why earth pin on plug longer than other. Why neutral is connected to outer contact of Edison screw lampholder	74	18.5	7.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q. 9	**J8.17**	**Electrical appliance testing**			**Earth continuity testing of appliance. Why ohmmeter not used for IR testing. Testing insulation integrity of appliance when it is live.**	**33**	**45**	**22**
			Sep 2014	5	Testing a Class I appliance with ohmmeter – state test, how it is carried out, the results and reason for test. IR testing – instrument and test voltage and why ohmmeter not suitable.	82	16	2
			May 2015	7	Explain how earth continuity test is carried out on a Class I appliance. Why ohmmeter is not used for an IR test. Insulation testing in accordance with AS/NZS 3760.	69	19.5	11.5
			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

A1.3 - Moderation

EAS 1078 was moderated by secure email. A teleconference was held with moderators on 11 April.

A1.4 - Marking

A teleconference was held with the markers on 18 May.

Version 2 of the answer schedule was sent to markers on 19 May.

Comments

This was an easy paper and all should have passed with no problems. Those that passed generally got good marks.

A1.5 - Amendments to EAS 1078

The significant amendments to <u>EAS 1078</u> arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
2(a)	-	Note added relating to alternative answers	-
3(d)	-	Answer corrected	-
4(a)(ii)	-	-	Option added
4(b)	-	Answer corrected	-
4(c)	-	-	Answer amended to be more accurate
5(e)	-	-	Answer amended to be more accurate
6(a)(i)	Rewritten to make intention clearer	-	-
6(b)	Rewritten to make intention clearer	-	-
8(a)	Rewritten to make intention clearer	-	-

Appendix 2

Electrical Appliance Serviceperson (Qualified) Examinations

There was no Electrical Appliance Serviceperson (Qualified) examination in May 2016.

Appendix 3

Electrical Service Technician Examinations

14 May 2016

EST 2068, a moderated paper, was used for the examination of 14 May 2016.

A3.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
EST 2068	94	62	66
May 2016	**94**	**62**	**66**

EST 2068

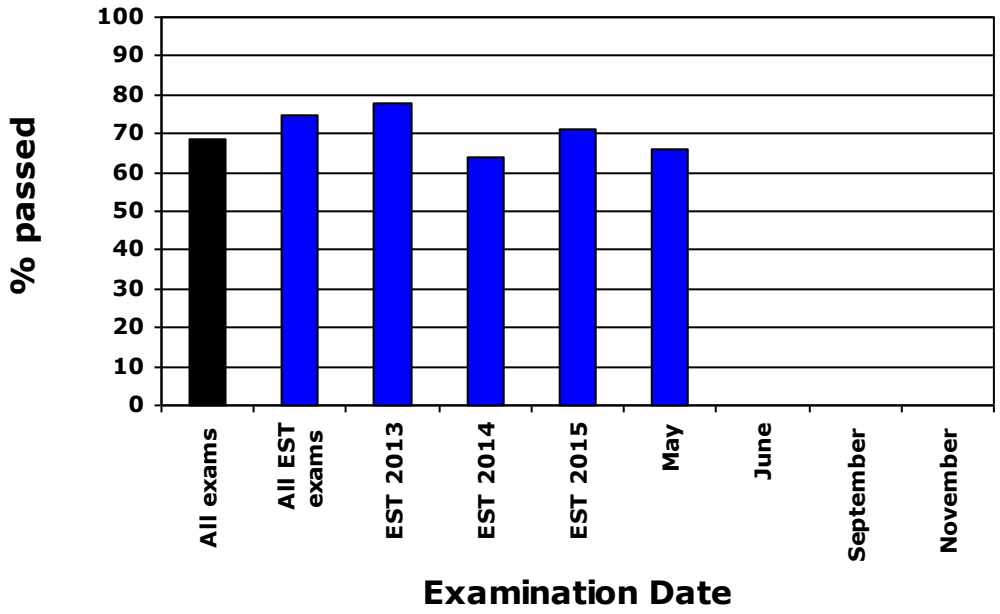
All candidates

Average pass mark 62 %
Median mark 66

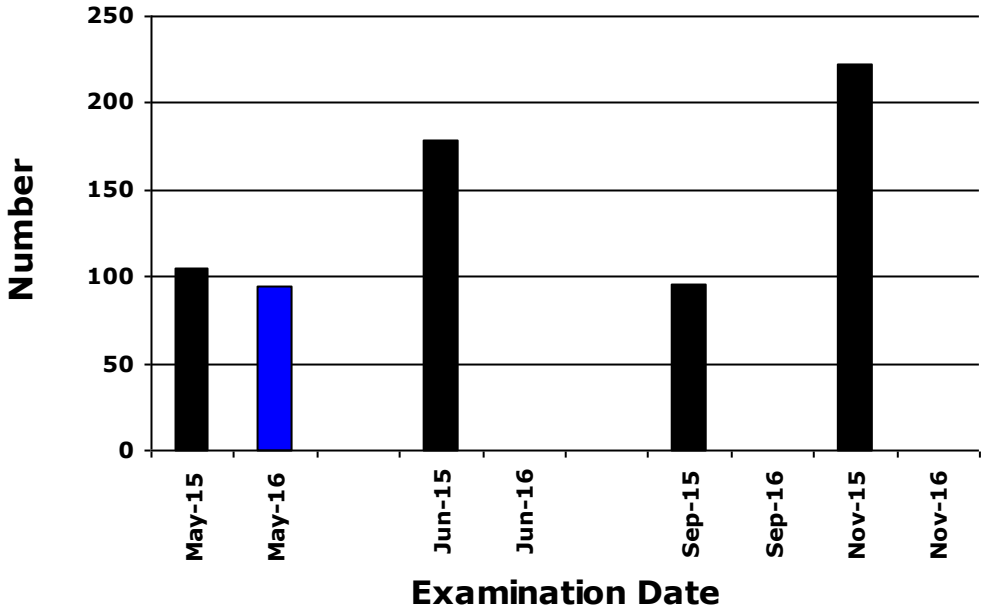
Those who passed

Average pass mark 73 %
Median mark 72

Pass Rates - EST Examinations - 2016



Candidate Numbers - EST Examinations - 2016



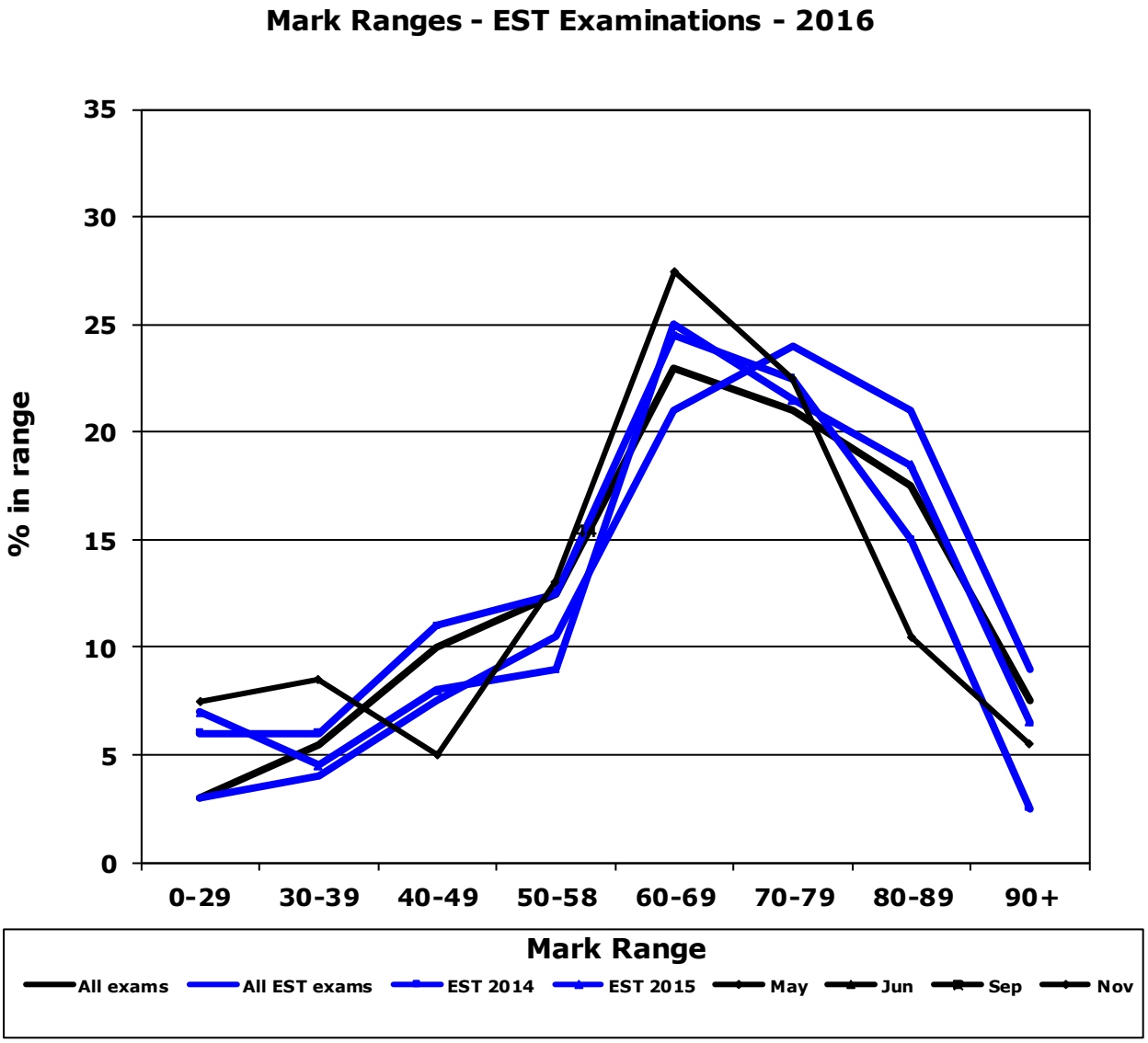
Mark Ranges

Number of candidates

Range	EST 2068			**May 2016**	
90 – 100	5			**5**	**candidates**
80 – 89	10			**10**	**candidates**
70 – 79	21			**21**	**candidates**
60 – 69	26			**26**	**candidates**
50 – 58	12			**12**	**candidates**
40 – 49	5			**5**	**candidates**
30 – 39	8			**8**	**candidates**
0 – 29	7			**7**	**candidates**
	94			**94**	

% of candidates

Range	EST 2068			**May 2016**	
90 – 100	5.5			**5.5**	**% of candidates**
80 – 89	10.5			**10.5**	**% of candidates**
70 – 79	22.5			**22.5**	**% of candidates**
60 – 69	27.5			**27.5**	**% of candidates**
50 – 58	13			**13**	**% of candidates**
40 – 49	5			**5**	**% of candidates**
30 – 39	8.5			**8.5**	**% of candidates**
0 – 29	7.5			**7.5**	**% of candidates**


Mark Ranges - EST Examinations - 2016
35
30
25
20
15
10
5
0
% in range
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**				**56**	**28**	**16**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**K8.16**	**Workplace safety**			**Explain prove-test-prove method and how it is used. Explain why testing was ineffective. Precautions when using test instruments.**	**31**	**37**	**32**
			Sep 2014	2	Precautions when isolator not adjacent to motor. Why prove-test-prove method used. Situation where isolating switch has two danger tags. How to establish isolation has taken place. Why isolating switch live after being opened. Continued isolation.	57.5	34	8.5
			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	3	How to use clip-on ammeter. Precautions when using test instruments. Isolating and switching off. Why testing only between phases is not a safe test.	40.5	44	15.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**F8.11**	**Protection - General**			**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**
			Sep 2014	9	MCBs – define tripping factor; internal operation on overload; and internal operation on short-circuit. HRC fuses – define current rating; calculate typical fusing currents; and define inverse-time characteristic	34	24	42
			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

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**J8.18**	**Electrical appliance testing**			**Three-phase motor – how to isolate; how to carry out IR test of the circuit; and how to carry out IR test on the motor.**	**25.5**	**41.5**	**33**
			Sep 2012	7	Testing of three-phase plug-in appliance – two tests require using test instrument. Outcomes of polarity testing	44	19	37
			Jun 2013	3	Three-phase motor – IR testing; precaution to protect thermistor; installing motor safely, instrument tests.	12	51	37
			Jun 2013	8	Safely isolate printing press. Testing before reconnection. Safety checks after reconnection.	40	36	24
			Jun 2014	8	Tests to ensure three-phase appliance safe to connect. Polarity testing. IR testing of three-phase motor. Danger of connecting voltmeter in series.	49	25	26
			Nov 2014	5	Reconnecting three-phase motor – order tests need to be carried out. and why. Describe how test are carried out.	47.5	41.5	11

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**B8.3**	**a.c. Theory**			**Define impedance and state components that make up impedance. Calculate power dissipated by one resistance in a series/parallel circuit.**	**23.5**	**17**	**59.5**
			Nov 2011	5	Define impedance. Components of impedance. Calculate impedance of circuit. Calculate power dissipated by a 230V series/parallel circuit.	18	24	58
			May 2012	9	Heater with two elements. Calculate minimum power at 230V, maximum power at 230V. Current of rating of fuse. Reason why power increases when supplied at 240V.	60	7	33
			Sep 2013	3	Define impedance. Components of impedance. Calculate impedance of circuit. Calculate power dissipated by a 230V series/parallel circuit.	31	20	49
			May 2015	9	Define impedance. Components of impedance. Calculate impedance of circuit. Calculate power dissipated by a 230V series/parallel circuit.	40.5	15	44.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**J8.18**	**Electrical appliance testing**			**State Standard that details tests and inspection on Class I appliance. State which inspections and tests are required and details of testing. State specific visual inspections required.**	**54**	**29**	**17**
			May 2014	4	Requirements of AS/NZS 3760 for testing a Class I appliance to check the integrity of the protective earthing conductors. Describe two tests to check the integrity of the insulation.	85.5	12	2.5
			Jun 2014	3	Requirements of instrument tests detailed by AS/NZS 3760. IR test on three-phase appliances. Colour coding for three-phase flexible cable.	63	30	7
			Jun 2015	3	Name Standard for testing a Class I appliance. Describe how instrument test are carried out. Visual inspection of a Class I appliance.	73.5	12.5	14
			Nov 2015	7	State Standard used for testing appliances – tests and inspections required. Testing requirements. Visual inspections. .	42	34	24

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**G8.6**	**Flexible cords and cables**			**Replacement flexible cord – calculate minimum current rating; colour coding; and factors affecting cord selection. Testing to ensure repaired heater can produce rated heat output.**	**56.5**	**24.5**	**19**
			Jun 2015	6	Calculate minimum size of flexible cord for heater and state conductor colours. Why loop in MIMS cable. Conductor colours of three-phase cord. Characteristics of flexible cord.	54.5	24	21.5
			Non 2015	2	Replacement flexible cord – calculate minimum current rating, state minimum size and colour coding. Testing to ensure repaired heater can produce rated output.	47	26.5	26.5
			Nov 2015	3	Cord characteristics that prevent appliance producing rated output. Colour coding for three-phase cable. Inspections after fitting plug to flexible cord. Cord current rating.	55.5	28.5	16

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q8	**J8.18**	**Electrical appliance testing**			**Test require before three-phase appliance put back into service. Polarity testing. IR testing of appliance with MIMS elements. Testing to ensure appliance connected to MEN system.**	**25.5**	**33**	**41.5**
			Jun 2013	3	Three-phase motor – IR testing; precaution to protect thermistor; installing motor safely, instrument tests.	12	51	37
			Jun 2013	8	Safely isolate printing press. Testing before reconnection. Safety checks after reconnection.	40	36	24
			Jun 2014	8	Tests to ensure three-phase appliance safe to connect. Polarity testing. IR testing of three-phase motor. Danger of connecting voltmeter in series.	49	25	26
			Nov 2014	5	Reconnecting three-phase motor – order tests need to be carried out. and why. Describe how test are carried out.	47.5	41.5	11
			May 2015	5	Three-phase appliance repaired – PEC testing; Insulation testing when appliance live; and why covers need securing.	34	34	32

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**C8.10**	**MEN Systems**			**Voltages on MEN system. Define the term MEN system. Why neutral required for unbalanced three-phase load. Situation where no neutral required for a three-phase load. System frequency**	**51**	**24.5**	**24.5**
			May 2015	6	Define MEN system. Nominal system voltages. Frequency and peak voltages. Situations where neutral is required in three-phase cable. Situations where neutral is not required in three-phase cable.	40.5	34	25.5
			Sep 2015	8	Why neutral conductor is earthed in an MEN system. How effective earthing provides protection against electric shock. What occurs when a transposition occurs on a pump protected by a RCCB and a MCB.	14.5	34.5	51

A3.3 - Moderation

EST 2068 was moderated via secure email and a meeting. The meeting was held on 11 April.

A3.4 - Marking

A teleconference was held with the markers on 23 May.

Version 2 of the answer schedule was sent to markers on 24 May.

Comments

A3.5 - Amendments to EST 2068

The significant amendments to EST 2068 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	Rewritten to be more accurate	-	-
1(d)	Rewritten to be more accurate	-	-
1(e)	-	Answer corrected	-
1(g)	Rewritten to be more accurate	-	-
1(h)	Rewritten to be more accurate	-	-
1(i)	Rewritten to be more accurate	-	-
1(j)	Rewritten to be more accurate	-	-
2(a)(ii)	Rewritten to be more accurate	Answer corrected	-
3(a)(ii)	Rewritten to be more accurate	-	-
3(b)	Rewritten to be more accurate	-	-
4	Introduction partly rewritten to be more accurate	-	-
4(a)	Marks increased from 3.5 to 4	Amended accordingly	-
4(b)(iii)	-	Answer corrected	-
4(c)	Marks decreased from 3 to 2.5	Amended accordingly	-
5(a)(ii)	-	Note added relating to alternative answer	-
5(a)(iii)	Rewritten to be more accurate	-	-
6	Replaced with a more topical question	Amended accordingly	-
7(a)(iii)	Rewritten to be more accurate	-	-
7(b)	Preamble rewritten to be more accurate	-	-
7(b)	-	Alternative solution added	-
7(e)	-	-	2 options added
8(d)(ii)	Amended to be more accurate	-	-
9(b)	-	Marks allocated across question	Option added

Appendix 4

Electrician Regulations Examinations

7 February, 6 March, 10 April and 8 May 2016

ER 72, a moderated paper, was used for the examination of 7 February 2016
ER 73, a moderated paper, was used for the examination of 6 March 2016
ER 74, a moderated paper, was used for the examination of 10 April 2016
ER 75, a moderated paper, was used for the examination of 8 May 2016

A4.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
ER 72	2	2	100
ER 73	45	30	66.5
ER 74	1	1	100
ER 75	1	1	100
May 2016	**49**	**34**	**69.5**

ER 73

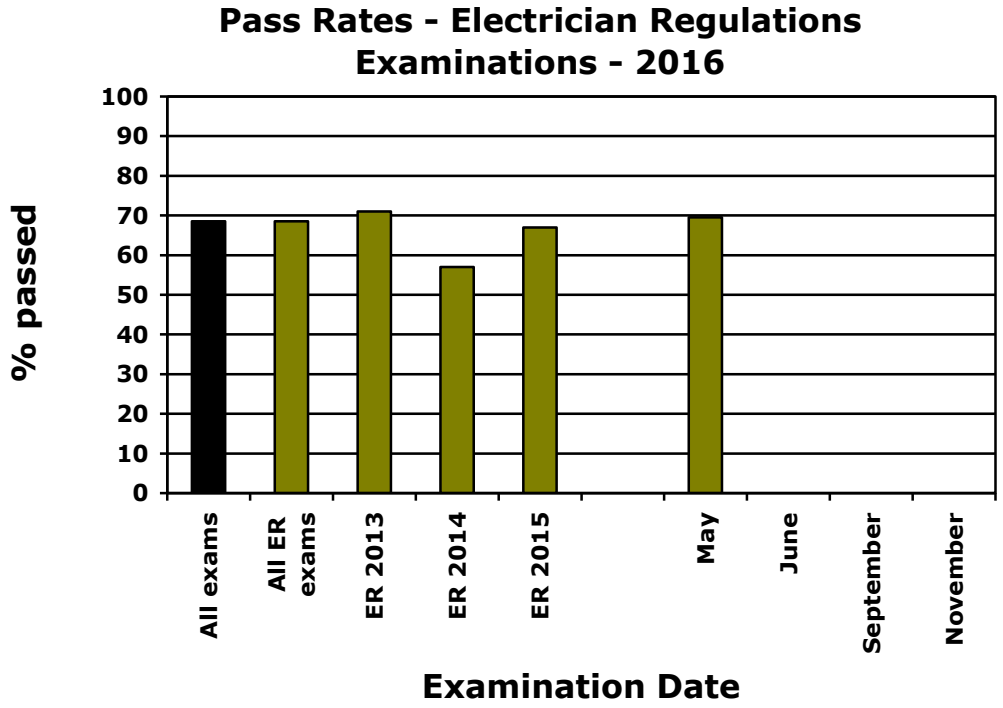
All candidates

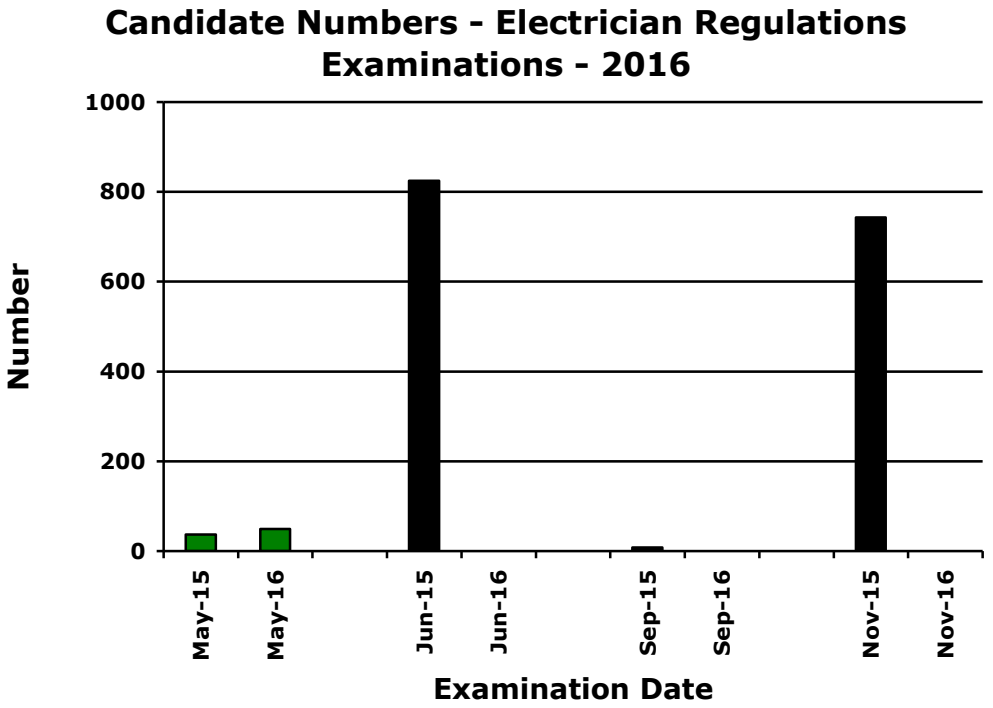
Average pass mark 64.5 %
Median mark 65

Those who passed

Average pass mark 72 %
Median mark 70

One candidate gained 96 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

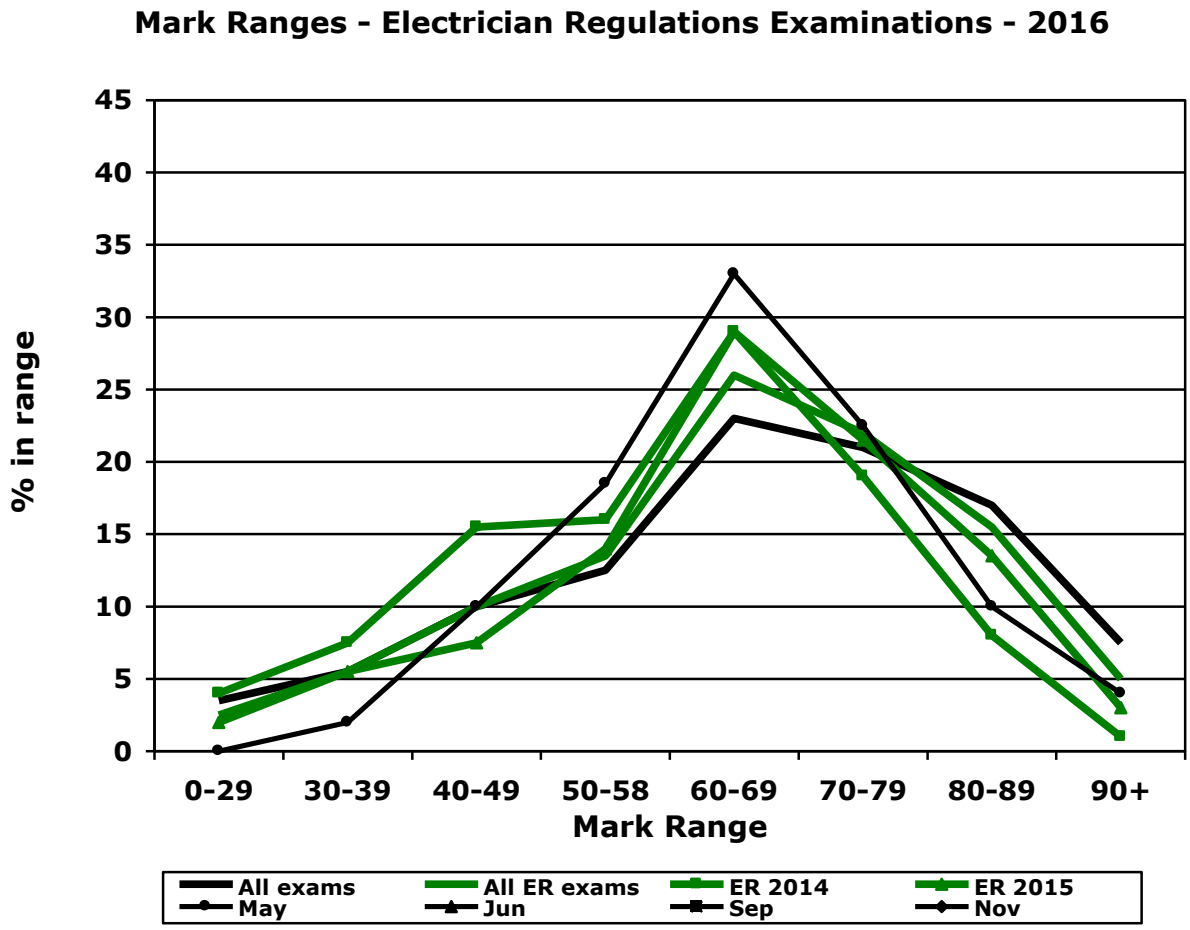
Mark Ranges

Number of candidates

Range	ER 72	ER 73	ER 74	ER 75		**May 2016**	
90 – 100	0	2	0	0		**2**	**candidates**
80 – 89	0	4	1	0		**5**	**candidates**
70 – 79	1	9	0	1		**11**	**candidates**
60 – 69	1	15	0	0		**16**	**candidates**
50 – 58	0	9	0	0		**9**	**candidates**
40 – 49	0	5	0	0		**5**	**candidates**
30 – 39	0	1	0	0		**1**	**candidates**
0 – 29	0	0	0	0		**0**	**candidates**
	2	**45**	**1**	**1**		**49**	

% of candidates

Range	ER 72	ER 73	ER 74	ER 75		**May 2016**	
90 – 100	0	4.5	0	0		**4**	**% of candidates**
80 – 89	0	9	100	0		**10**	**% of candidates**
70 – 79	50	20	0	100		**22.5**	**% of candidates**
60 – 69	50	33	0	0		**33**	**% of candidates**
50 – 58	0	20	0	0		**18.5**	**% of candidates**
40 – 49	0	11	0	0		**10**	**% of candidates**
30 – 39	0	2.5	0	0		**2**	**% of candidates**
0 – 29	0	0	0	0		**0**	**% 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**				**18**	**51**	**31**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	**J1**	**Testing and inspection of electrical installations**			**Transposition on mains to house – calculate current flowing in earth electrode; would protection operate; how to test for a transposition; and effect of transposition on socket outlets.**	**15.5**	**33.5**	**51**
			Jun 2013	6	Why testing polarity of mains cable is necessary. Testing to confirm or otherwise whether a phase/neutral transposition has occurred in single-phase installation.	68.5	7.5	24
			Jun 2014	6	Why testing polarity is necessary. Testing for a phase/neutral transposition in a single –phase installation	63	10	27
			Mar 2015	7	Why testing polarity is necessary. Testing for a phase/neutral transposition in a single –phase installation	67	6	27
			Nov 2015		Why testing polarity is necessary. Testing for a phase/neutral transposition in a single –phase installation	7	7	86

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**G2**	**Cable selection**			**Install a three-phase aluminium cable to a service building. Determine size of cable that meets the load and voltage drop requirements**	**18**	**9**	**73**
			Jun 2012	9	Install a three-phase cable to commercial complex. Determine size of cable that meets the load and voltage drop requirements	31	24.5	44.5
			Nov 2013	9	Install a three-phase cable to a ski-field service building. Determine size of cable that meets the load and voltage drop requirements	40	20.5	39.5
			Sep 2014	9	Install a three-phase aluminium cable in commercial development. Determine size of cable that meets the load and voltage drop requirements	9	36.5	54.5
			Mar 2015	9	Install a three-phase aluminium cable to a service building. Determine size of cable that meets the load and voltage drop requirements	33.5	18	48.5
			Sep 2015	4	Install a three-phase copper cable to a service building. Determine size of cable that meets the load and voltage drop requirements	18	12	70

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**G6**	**Appliances**			**General selection and installation requirements for equipment. Maximum m temperatures for equipment. Protection requirements for socket outlet. Requirement for switch controlling two socket outlets.**	**78**	**9**	**13**
			Nov 2012	7	Safest system for hand-held appliances on a construction site. Four systems than can be used and how two of those systems provide protection.	46.5	30	23.5
			Jun 2014	8	Class I handheld appliances on construction site – describe four protective systems. Describe how two of those systems work. Polarity of socket outlets.	23.5	38.5	38
			Mar 2015	3	Requirements for - room heaters; vented water heaters and electricity converters.	63.5	30.5	6
			Jun 2015	4	Requirements for water heaters. Requirements for capacitors incorporated in circuits. Maximum rating of motor where overload protection not required.	66	24	10

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**G7**	**Fittings**			**Selection and installation requirements for switchgear. Isolation devices. Devices for shutting down. Use of functional switching.**	**78**	**20**	**2**
			Jun 2014	2	Fittings deemed to be unsafe. Requirements for unvented water heater. Switching requirements for stationary cooker. Connection requirements for free-standing cooker. Methods of connecting equipment. Current rating of switch for socket outlets.	52	34	14
			Nov 2014	8	Fittings not controlled by main switch. Identification requirements for two points of supply. Why functional switching used. Where switching of neutral prohibited.	71	15	14
			Jun 2015	5	Requirements for prevent equipment becoming energised and where an enclosure contains more than one electricity supply. Fittings not controlled by main switch. Number of main switches in a domestic installation. Functional switching	54	34	12

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**J1**	**Testing and inspection of electrical installations**			**Testing carried out with installation live; or not live. IR testing of installation with appliances with MIMS elements. Difference between polarity test and correct circuit connections test.**	**78**	**20**	**2**
			Jun 2013	3	New electrical installation – why IR testing needs to be carried; instrument and test voltage used; which parts tested separately; and maximum permitted test result for each part.	52	39	9
			Sep 2014	2	Sequence of test on low voltage installation. What happens if test fails? How IR testing carried out on consumer mains and submains. What is ensured by continuity of earthing test	45.5	36.5	18
			Mar 2015	2	New installation – recommended sequence of tests; how IR testing is carried out; why certain IR test are different; and how earth loop impedance test is carried out.	21	52	27

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**I**	**Damp areas**			**Installing lights in refrigeration room. Protection of equipment in hosing down area. Installation of equipment in a sauna.**	**87**	**6.5**	**6.5**
			Jun 2007	4	Swimming and spa pool – method of protection prohibited, socket outlets, wiring systems	*54*	*32*	*14*
			Nov 2007	8	Swimming pool – socket outlet requirements. Bathroom – zones and IP ratings	35	36	29
			Jun 2011	7	In ground swimming pool – socket outlets in Zone 1; supply of socket outlets in Zone 1; installation of luminaries. Wiring systems for a swimming pool. Preventing voltage gradients in a swimming pool.	62.5	27	10.5
			Nov 2015	8	Equipment installed in swimming pool area. Electrical equipment in pump house	33	52	15

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**G7**	**Fittings**			**Isolation and functional switching for room heaters. Requirements for gas/electric cooking appliance. Edison screw and festoon lighting. Earthing requirements for an electricity converter.**	**89**	**2**	**9**
			Nov 2014	3	Location of lampholders. Requirements for Edison screw lampholders. Installation requirements for recessed lighting	27	59	14
			Nov 2014	8	Fittings not controlled by main switch. Identification requirements for two points of supply. Why functional switching used. Where switching of neutral prohibited.	71	15	14
			Jun 2015	5	Requirements for prevent equipment becoming energised and where an enclosure contains more than one electricity supply. Fittings not controlled by main switch. Number of main switches in a domestic installation. Functional switching	54	34	12

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**G2**	**Cable selection**			**230V final subcircuit supplies three socket outlets – calculate voltage drop in each cable and maximum voltage drip of entire circuit**	**27**	**0**	**73**
			Jun 2013	9	230V final subcircuit supplies two socket outlets with cables of different sizes – calculate maximum current in each section and calculate whether voltage drop of circuit meets requirements	20	17.5	62.5
			Jun 2014	9	Higher rated lamp installed in driveway lighting –state maximum voltage drop permitted and calculate whether voltage drop complies	3	7	90

A4.3 – Moderation

The paper was moderated by secure email and a meeting. The meeting was held on 27 January.

The papers were moderated by secure email and a meeting. The meeting was held on 22 February.

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

A4.4 – Marking

Comments – ER 73

A4.5 – Amendments to ER 73

The significant amendments to ER 73 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	Answers required reduced from two to one	Amended accordingly	
1(b)	Rewritten to make intention clearer	Amended accordingly	Option added
1(e)	Rewritten to make intention clearer		
1(f)	Rewritten to make intention clearer	Amended accordingly	
1(g)	Rewritten to make intention clearer	Amended accordingly	
1(h)	Answers required reduced from two to one	Amended accordingly	
1(i)	Answers required reduced from two to one	Amended accordingly	
1(j)(i)	Rewritten to make intention clearer	Amended accordingly	
2	Introduction rewritten to make intention clearer		
2(a)	Rewritten to make intention clearer		
2(b)	Rewritten to make intention clearer		
2(c)	Editorial amendment to preamble		
2(d)(i)	Additional information inserted		
3	Editorial amendment to introduction		
3(d)		Reference corrected	
3(e)		Marks corrected	
4	Preamble rewritten to make intention clearer		
4(a)	Answers required reduced from two to one	Amended accordingly	
4(b)	Rewritten to make intention clearer	Amended accordingly	
4(c)	Replaced with a more topical question	Amended accordingly	
4(d)	Answers required reduced from two to one	Amended accordingly	

The significant amendments to <u>ER 73</u> arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
5(a)	4(a)	Answers required reduced from two to one	Amended accordingly
5(b)	Marks increased from 1 to 2	Amended accordingly	
5(c)	Deleted and replaced with 5(d)		
5(d)	Replaced with 5(e)		
6	Editorial amendment to introduction		
6(a)	Rewritten to make intention clearer	Amended accordingly	
6(b)	Editorial amendment to preamble		
6(c)		Amended to be more accurate	
7(a)((i)	Answers required reduced from two to one	Amended accordingly	
7(a)(ii)	Answers required reduced from two to one	Amended accordingly	
7(b)(ii)	Answers required reduced from two to one	Amended accordingly	
8(c)(ii)	Rewritten to make intention clearer	Amended accordingly	
8(d)	Marks corrected	Amended accordingly	
9	Rewritten to make intention clearer	Amended accordingly	

Appendix 5

Electrician Theory Examinations

There was no Electrician Theory examination in May 2016

Appendix 6

Electrical Inspector Examinations

There was no Electrical Inspector examination in May 2016

Appendix 7

Electrical Installer

There was no Electrical Installer examination in May 2016

Appendix 8

Associated Tradespersons

There was no Associated Tradesperson examination in May 2016