



ELECTRICAL WORKERS REGISTRATION BOARD

JUNE 2007 EXAMINATIONS

Summary Report

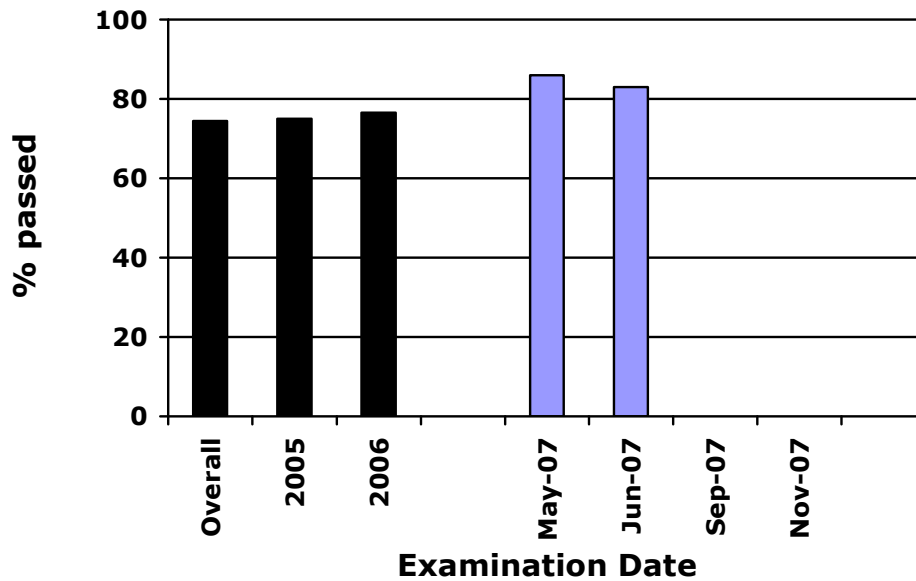
N J J Sickels
Registrar

1. Summary of Examinations

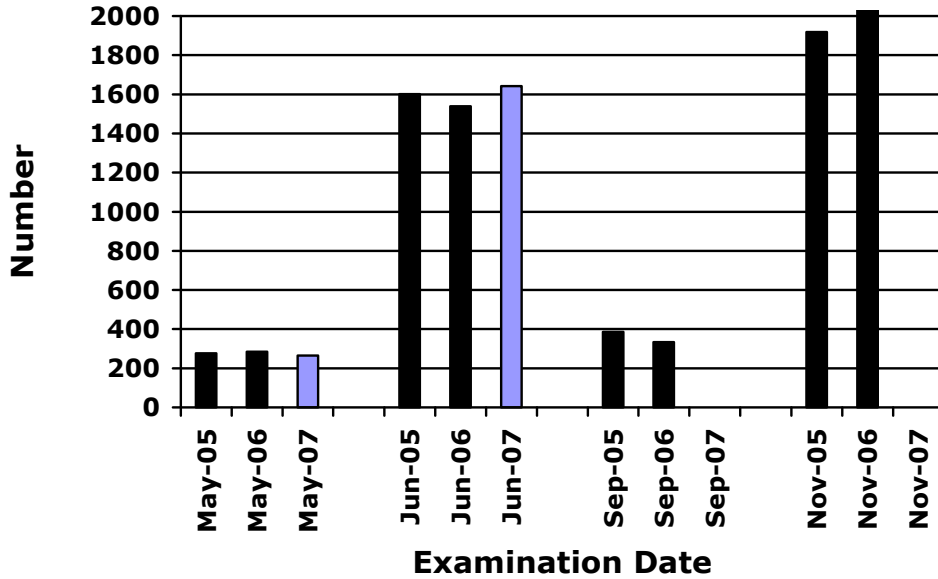
1.1 Overall

	Number candidates	of	Number candidates passed	of who	Percentage passed
ESTA	299		258		86.5
ESTB	70		67		96
Elec. Regulations	910		764		84
Elec. Theory	363		273		75
TEWC	0		0		0
Elec. Inspector	0		0		0
E Security	1		1		100
June 2007	1643		1363		83

2007 - PASS RATES - OVERALL



2007 - CANDIDATE NUMBERS - OVERALL



Mark Ranges

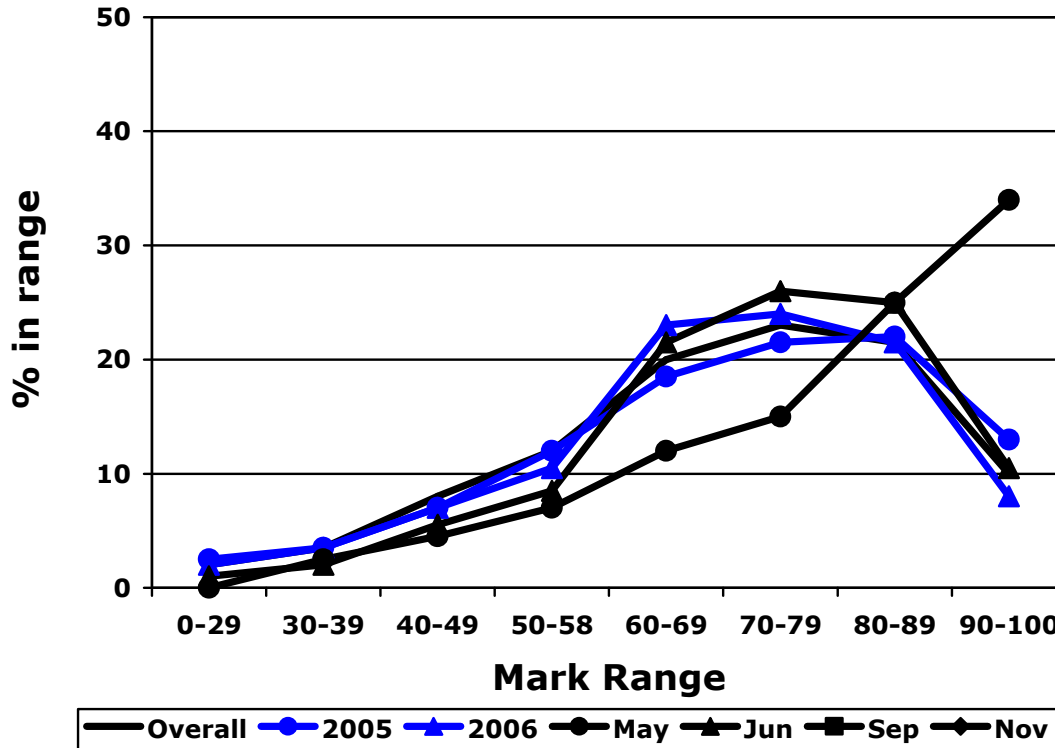
Number of candidates

Range	ESTA	ESTB	ER	ET	TEWC	EI	ES	November 2006	
90 - 100	61	12	66	33	0	0	0	172	candidates
80 - 89	100	29	216	66	0	0	1	412	candidates
70 - 79	55	21	263	84	0	0	0	423	candidates
60 - 69	42	5	219	90	0	0	0	356	candidates
50 - 58	15	2	82	40	0	0	0	139	candidates
40 - 49	12	1	44	32	0	0	0	89	candidates
30 - 39	9	0	14	14	0	0	0	37	candidates
0 - 29	5	0	6	4	0	0	0	15	candidates
	299	70	909	363	0	0	1	1643	

% of candidates

Range	ESTA	ESTB	ER	ET	TEWC	EI	ES	November 2006	
90 - 100	20.5	17	7	9	0	0	0	10.5%	of candidates
80 - 89	33.5	42	24	18	0	0	1000	25%	of candidates
70 - 79	18.5	30	29	23	0	0	0	26%	of candidates
60 - 69	14	7	24	25	0	0	0	21.5%	of candidates
50 - 58	5	2.5	9	11	0	0	0	8.5%	of candidates
40 - 49	4	1.5	5	9	0	0	0	5.5%	of candidates
30 - 39	3	0	1.5	4	0	0	0	2%	of candidates
0 - 29	1.5	0	0.5	1	0	0	0	1%	of candidates

2007 MARK RANGE - OVERALL



1.2 Comments

With two sets of examinations for Electrician Regulations, Electrician Theory, Electrical Service Technician A and Electrical Service Technician B consideration was given to drafting two completely different papers or papers where the same topic (albeit different questions) was covered in the same numbered question in each paper.

The latter approach was chosen because it was considered that producing examination papers of relatively the same difficulty would be easier to achieve. It would also be more transparent as industry would easily be able to see the relative merits of each examination when compared with each other.

Moderation

The Electrician Regulations and Electrician Theory examinations were moderated through meetings. The Electrical Service Technician A, Electrical Service Technician B, Tradespersons Electrical Work Certificate and Electronic Security Alarm Installer examinations were conducted by secure email and teleconferences.

All moderators participated as expected. A lot of work went into ensuring that both papers for the Electrician Regulations, Electrician Theory, Electrical Service Technician

A and Electrical Service Technician B papers were fair and relatively the same degree of difficulty. In the Electrician Theory and Electrical Service Technician B examination papers, questions were transferred between papers to ensure a similar degree of difficulty was achieved.

Marking

The marking went very well. The two examinations for Electrician Regulations, Electrician Theory, Electrical Service Technician A and Electrical Service Technician B meant an uneven distribution of papers to markers. This was particularly so with the Electrician Regulations examination which was exacerbated by the high number of candidates sitting. Some markers marked over 150 scripts.

Two main issues were raised by markers both in their reports and verbally:

Word-for-word answers

This is becoming more noticeable and it shows the disadvantage of having old examination papers freely available because the range of topics is limited. However, having the old examination papers freely available leads to transparency, because industry can see what was examined and how it was examined. This seems to have largely eliminated complaints around the marking and the standard of examination papers and lowered the number of papers needed to be remarked.

To counter this trend, the process of having new questions written has begun and these should be available for examinations in the New Year.

Best practice versus compliance

Markers generally try to ensure that the final answer schedule is as accurate as is possible. However, there was much discussion in this examination round about what should be expected from candidates. That is, there was some discomfort amongst the markers about accepting answers that may be "close" to what is required or that gave solutions that, while compliant, would be seen as very poor options.

It is clear that markers, as they become more experienced and familiar with the process are starting to raise their expectations of what they expect from candidates.

Candidate performance

The overall pass rate of 83% was excellent. The number of candidates who sat was consistent with the numbers who sat in June in 2005 and 2006. The number of candidates who sat Electrician Regulations and Electrical Service Technician A rose, but for Electrician Theory and Electrical Service Technician B, candidate numbers dropped. Electrician Regulation candidate numbers were the highest for a number of years and certainly since 2000.

Electrical Service Technician A

The pass rate of 86.5% for this examination was pleasing.

Candidate performance across the two papers was similar across all questions except:

- Question 2 Protection and control

For the ESTA 1026 examination, 78% of candidates were able to display a thorough knowledge of HRC fuses and the comparison between HRC and rewirable fuses. This percentage dropped to 37% for the ESTA 1027 examination where the question centred more on RCDs

- Question 3 Fault diagnosis

For the ESTA 1026 examination, 41.5% of candidates were able to display a thorough knowledge of calculating fault currents and shock voltages and the effect of transpositions. This percentage rose to 64% for the ESTA 1027 examination where the question required similar calculations and an explanation of transpositions. The total number of candidates who had a thorough knowledge and a basic knowledge was similar across both questions.

- Question 8 Single phase motors

For the ESTA 1026 examination, 58% of candidates were able to display a thorough knowledge of single phase capacitor start and universal motors. This percentage dropped to 29% for the ESTA 1027 examination where the question centred on single phase split-phase and universal motors

Candidates still continue to perform well in the straight calculation questions (questions 5 and 9), statutory requirements (questions 6) and cables and cords (question 7).

Some candidates still struggle with testing (question 4), particularly where the scenario includes aspects that are different from the norm. Only half of candidates in both papers could demonstrate a thorough knowledge of testing.

An abridged analysis is contained in Appendix 1 of this paper. The full analysis is contained in Attachment 1.

Electrical Service Technician B

The result for this examination was excellent at 96% although the number of candidates were down by about a third

Questions 6 and 7 were the only questions where candidate performance was markedly difference across the two examination papers. For question 6, 63% of candidates in the ESTB 2019 examination displayed a thorough knowledge of calculating a fault currents and power dissipated in a single phase appliance and describing the effects on transpositions. However, only 26% of candidates in the ESTB 2020 examination displayed a thorough knowledge of locating a fault in a three-phase hot water cylinder.

For question 7, 42% of candidates in the ESTB 2019 examination displayed a through knowledge of MEN systems. This figure rose to 61% in the ESTB 2020 examination.

Most candidates generally had a thorough knowledge of protection (question 3) statutory testing requirements (question 4) and IP ratings (question 5).

Both single-phase (question 2) and three-phase (question 9) motors and starters still cause problems for some candidates. Approximately half of all candidates have a poor to adequate knowledge of these topics.

An abridged analysis is contained in Appendix 2 of this paper. The full analysis is contained in Attachment 2.

Electrician Regulations

The number of candidates for this examination was the highest for any examination since full statistics on all examinations have been retained. The pass rate of 84% was excellent.

While the pass rates of 85% for the ER 23 examination and 83% for the ER 24 examination were similar, the performance varied markedly across the range of topics. This highlights the value of moderation. While the degree of difficulty between individual questions (for example, see question 4) seems to be quite marked, overall there was no difference in the degree of difficulty of the two papers

Most candidates had little difficulty with the fundamental principles of legislation (question 3) and calculating the maximum demand of a single-phase installation (question 9).

Question 2 related to the installation of RCDs and the questions in both examinations were quite similar. In the ER 23 examination only 21.5% of candidates could display a thorough knowledge, while over half of candidates showed a poor knowledge – less than 5 marks. However, in the ER 24 examination 60.5% of candidates displayed a thorough knowledge of this topic, and only 10% showed a poor knowledge. The poor performance in the ER 23 examination is concerning as RCDs are a basic component of electricians work.

Question 3 related to damp and wet areas. This question in the ER 23 examination related to a domestic bathroom and candidates struggled with this. Only 2% could display a thorough knowledge, while 69% could not even gain 5 marks. The main difference between this question and those in previous papers was that electrical equipment was often in two Zones and candidates had to apply the most stringent requirements. For example, the permanent connection unit was in Zone 2 of the bath and Zone 3 of the shower. The Zone 2 requirements had to be applied.

Given that bathrooms, particularly in an average house, are small it is a concern that the fact that electrical equipment could be in more than one zone seemed to completely disconcert candidates. In the ER 24 examination, the question related to swimming and spa pools. Candidates fared better in this examination with 54% displaying a thorough knowledge.

Question 5 related to the calculation of cable size and candidate performance in the ER 23 examination – a single-phase cable - was surprisingly good with 44% able to display a thorough knowledge and 65% were able to gain 5 or more marks. This is one of the highest percentage of candidates in this type of question. Conversely, in the ER 24 examination – a three-phase cable - only 27.5% could display a thorough knowledge and 34.5% were able to gain 5 or more marks. Why there is such a marked difference is not clear as both questions were quite similar.

Question 6 related to statutory inspection and testing requirements and once again there was stark difference with only 46% of candidates in the ER 23 examination able to display a thorough knowledge, but in the ER 24 examination this rose to 92.5%. Similarly, in Question 7, which related to switchboards, 88% of candidates in the ER 23 examination were able to display a thorough knowledge of the topic, but this dropped to 39% in the ER 24 paper.

Question 8 related to the earthing of fittings and appliances and 86% of candidates in the ER 23 examinations displayed a thorough knowledge of the topic, but this dropped to 51.5% in the ER 24 examination. Knowledge of the earth fault loop – in the ER 24 examination – is still very variable and this could explain the difference.

An abridged analysis is contained in Appendix 3 of this paper. The full analysis is contained in Attachment 3.

Electrician Theory

The pass rate of 75% for this examination was similar to the overall pass rate for Electrician Theory examinations for 2006. The candidate numbers were down considerably from previous examinations.

Like the Electrician Regulations examinations, the Electrician Theory examinations ET 21 and ET 22 had similar pass rates, 77% and 71% respectively. But, unlike the Electrician Regulations examinations, the results for each question were also fairly similar.

Questions 1, 2, 3, 4, 7 and 8 produced similar results across both papers.

Candidates had a very good knowledge of RCD characteristics (question 3) which contrasts with the poor results relating to the installation of RCDs in the Electrician Regulations examination.

Questions 4, 7 and 8 posed most difficulty for candidates. Question 4 related to motors with the ET 21 question relating to drawing a stop/start circuit and power calculations, while the ET 22 question related to motor efficiency and slip calculations and motor protection. In ET 21, 38% of candidates displayed a thorough knowledge while 32% displayed a thorough knowledge in ET 22.

Question 7 related to the operating principles of transformers and involved calculations. In ET 21, 40.5% of candidates displayed a thorough knowledge while 37.5% displayed a thorough knowledge in ET 22. However, in ET 22, 54.5% of candidates could not gain at least 5 marks.

Question 8 related to the calculation of currents and power dissipated when a fault occurs in an appliance. ET 21 related to a three-phase appliance and 31% were able to display a thorough knowledge. ET 22 related to a single-phase appliance and 27% were able to display a thorough knowledge.

An abridged analysis is contained in Appendix 4 of this paper. The full analysis is contained in Attachment 4.

Tradespersons Electrical Work Certificate

No candidate sat this examination.

A partial analysis is contained in Appendix 5.

Electrical Inspector

There was no Electrical Inspector examination in June 2007

Electronic Security Alarm Installer

One candidate sat this examination and passed with 87 marks.

A partial analysis is contained in Appendix 7.

Appendix 1

Electrical Service Technician A

9, 16, 22 and 23 June 2007 1 August 2007

ESTA 1026, a moderated paper, was used for the examination of 16 June 2007.
 ESTA 1027, a moderated paper, was used for the examination of 23 June 2007.
 ESTA 1028, a composite paper, was used for the examination of 9 June 2007.
 ESTA 1029, a composite paper, was used for the examination of 22 June 2007.
 ESTA 1030, a composite paper, was used for the examination of 1 August 2007.

A1.1 - Overall Candidate Performance

	Number candidates	of	Number candidates passed	of who	Percentage passed
ESTA 1026	87		78		90
ESTA 1027	209		177		84.5
ESTA 1028	1		1		100
ESTA 1029	1		1		100
ESTA 1030	1		1		100
June 2007	299		258		86.5

Candidate performance – ESTA 1026

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
87	78	Average pass mark	80.5%
		Median mark	84
	90%	<u>Those who passed</u>	
		Average pass mark	85%
		Median mark	87

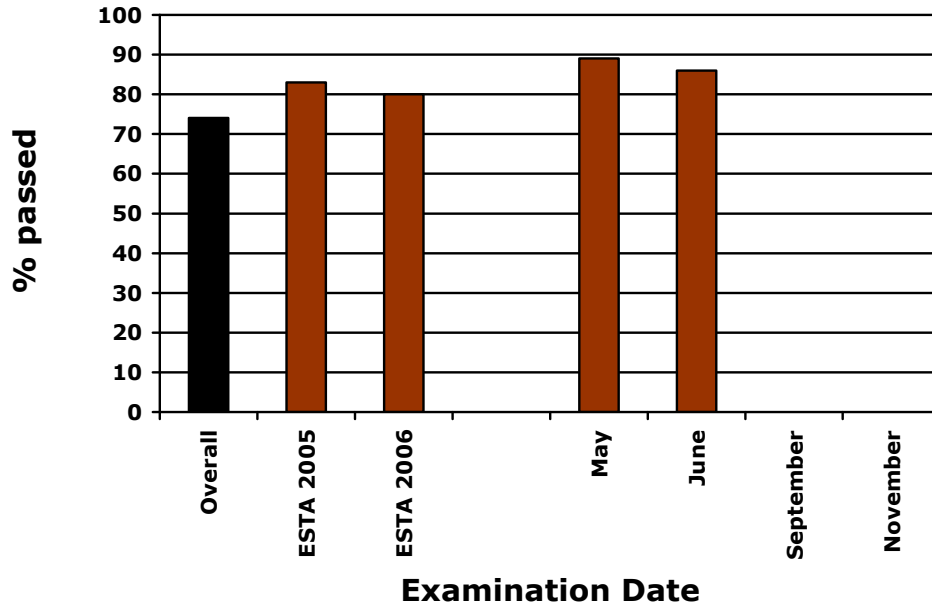
30 Candidates gained 95 or more marks. 3 candidates gained 100 marks.

Candidate performance – ESTA 1027

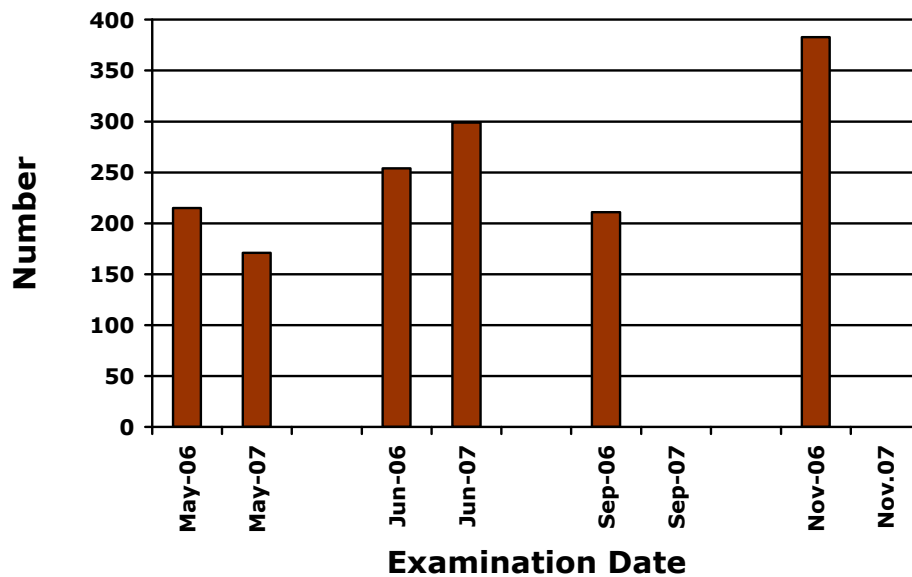
<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
209	177	Average pass mark	80%
		Median mark	74.5
	84.5%	<u>Those who passed</u>	80
		Average pass mark	83%
		Median mark	

9 Candidates gained 95 or more marks.

2007 PASS RATES - ESTA



2007 - CANDIDATE NUMBERS - ESTA



Mark Ranges

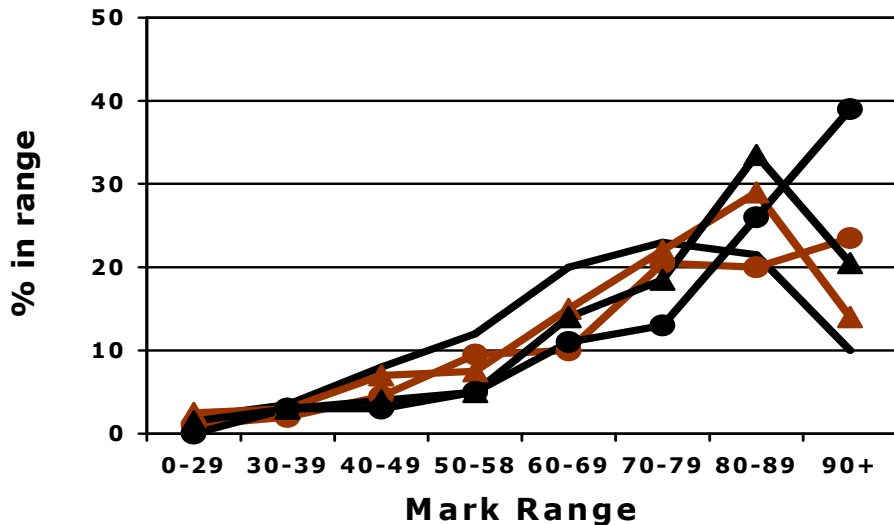
Number of candidates

Range	ESTA 1026	ESTA 1027	ESTA 1028	ESTA 1029	ESTA 1030	June 2007	
90 - 100	30	31	0	0	0	61	candidates
80 - 89	25	74	0	1	0	100	candidates
70 - 79	16	38	1	0	0	55	candidates
60 - 69	7	34	0	0	1	42	candidates
50 - 58	2	13	0	0	0	15	candidates
40 - 49	4	8	0	0	0	12	candidates
30 - 39	3	6	0	0	0	9	candidates
0 - 29	0	5	0	0	0	5	candidates
	87	209	1	1	1	299	

% of candidates

Range	ESTA 1026	ESTA 1027	ESTA 1028	ESTA 1029	ESTA 1029	June 2007	
90 - 100	34.5	15	0	0	0	20.5%	% of candidates
80 - 89	29	35.5	0	100	0	33.5%	% of candidates
70 - 79	18.5	18	100	0	0	18.5%	% of candidates
60 - 69	8	16	0	0	100	14%	% of candidates
50 - 58	2	6	0	0	0	5%	% of candidates
40 - 49	4.5	4	0	0	0	4%	% of candidates
30 - 39	3.5	3	0	0	0	3%	% of candidates
0 - 29	0	2.5	0	0	0	1.5%	% of candidates

2007 MARK RANGE - ESTA



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 similar questions from previous examination papers.

The questions in bold are from ESTA 1026

The questions in bold/italic are from ESTA 1027

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				90	9	1
<i>Q 1</i>	-	<i>10, 2 mark questions</i>				<i>76</i>	<i>20</i>	<i>4</i>

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	H1a.27 H1b.28	<u>Protection and Control</u> Protection characteristics <u>Protection and Control</u> RCD characteristics			Four characteristics of replacement HRC fuse, under-rated and over-rated fuses, technical advantages of HRC over rewirable fuses	78	14	8
Q 2	H1a.27 H1b.28	<u>Protection and Control</u> Protection characteristics <u>Protection and Control</u> RCD characteristics			<i>How RCD operates on fault, meaning of PRCD, why not permitted to use fuse wire on HRC fuse</i>	37	40	23
			Sep 2005	18	5 reasons why not to bridge HRC fuse with fuse wire	29	33	38
			Nov 2005	19	3 advantages HRC over rewirable, why not permitted to bridge HRC fuse with fuse wire.	52	17	31
			May 2006	6	Explain RCD operation on fault, what is a PRCD. Under-rated and over-rated fuses, HRC advantages	61	23	16
			Jun 2006	8	Explain RCD operation on fault, what is a PRCD. HRC advantages, not bridging HRC fuses	35	36.5	28.5
			Nov 2006	4	Characteristics of HRC fuses, advantages of HRC fuses over rewirable fuses, why not permitted to bridge HRC fuse carrier with fuse wire	55	31	14

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	H10.66	<u>Fault diagnosis</u>			Faulty heater, calculate current and shock voltage, explain danger to user, effect of transposition	41.5	40	18.5
Q 3	H10.66	<u>Fault diagnosis</u>			Faulty dishwasher, calculate current and power in PEC and whether fuse would operate, effect of transpositions	64	22.5	13.5
			Sep 2005	14	Faulty heater, calculate current and power dissipated, fuse operation,	84.5	4	11.5
			Jun 2006	9	Faulty heater, calculate current in PEC, explain sequence of events. Transpositions – effect on appliance, other transposition situations	37	28	35
			Sep 2006	7	Faulty heater, danger to person using it, calculate current in PEC and shock voltage, effect of transposition	17.5	46.5	36
			Nov 2006	3	Faulty washing machine, calculate current, , power dissipated in PEC and whether fuse will operate, cause of neutral to be switched in an appliance	56	30	14
			May 2007	2	Effect of transposition of neutral. Faulty washing machine - calculate current and power in PEC and whether fuse would blow	73	12	15

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	K4.46	<u>Testing and inspection methods</u>			Why ohmmeter not used for IR test, PEC testing, connecting ammeter in parallel	58.5	30	11.5
Q 4	K4.46	<u>Testing and inspection methods</u>			IR testing, testing appliance with MOV fitted	52.5	33.5	14
			Jun 2004	15	Insulation resistance testing of appliance with semi-conductors	42	33	25
			Jun 2004	16	PEC testing of an appliance	80	13	7
			May 2005	16	Why ammeter should not be connected in parallel	37	13	50
			Jun 2005	18	PEC test, max value, how low value contributes to safety	75	4	21
			Nov 2005	18	PEC and insulation resistance testing of concrete mixer	29	33	38
			May 2006	8	PEC test and insulation resistance test on concrete mixer	62.5	27.5	10
			May 2006	9	Reason for PEC, polarity and insulation resistance tests. Polarity testing	39	33	28
			Sep 2006	6	IR test not damage semi-conductors, IR test on concrete mixer, IR test on appliance with MOV surge protection	47.5	35	17.5
			Nov 2006	6	Reason for PEC, polarity and insulation resistance tests. WHY PEC test before IR test, Polarity testing	57	23	20

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	A5.5	<u>Theory</u> - Simple circuits			Draw 230V circuit supplying 3 resistors, calculate current, effect if one resistor open-circuited	77	9	14
Q 5	A5.5	<u>Theory</u> - Simple circuits			<i>Draw 230V circuit for heater supplying 2 elements, calculate current, maximum power, difference if elements connected in series</i>	66	22	12
			May 2006	2	Sketch single phase circuit with 2 resistances. Calculate current and power	91	7	2
			Jun 2006	5	Sketch single phase circuit with 3 resistances, 2 in series. Calculate current and power	54	10	36
			Sep 2006	4	Circuit of three resistances two in parallel and in series with another – calculate power, current and volt drop across series resistor	67	5	28
			Nov 2006	8	Draw circuit with 3 resistances in parallel, calculate current and power	62	11	27
			May 2007	6	Draw circuit with 3 resistances in series/parallel, calculate current and power	71	6	23

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	K2.38 K4.46	<u>Statutory testing and inspection requirements</u> <u>Testing and inspection methods</u>			Testing portable oven to AS/NZS 3760, polarity testing	72.5	20.5	7
Q 6	K2.38 K4.46	<u>Statutory testing and inspection requirements</u> <u>Testing and inspection methods</u>			Visual checks to AS/NZS 3760, PEC testing	65	30	5
			Jun 2006	7	Testing portable oven, reasons for PEC, polarity and insulation tests, why PEC test before insulation resistance test	35	46	19
			Sep 2006	4	Five visual checks required by Standard, why bayonet adaptors prohibited, why earth pin longer, use of micro-gap switch	72	22	6
			Sep 2006	9	Testing portable oven, reasons for PEC, polarity and insulation tests, reason for PEC, polarity and IR tests, why PEC test before insulation resistance test	54	25	21
			Nov 2006	5	Five visual checks required by Standard, PEC test in class I appliance	82	14	4
			May 2007	4	Five visual checks required by Standard, use of micro-gap switch, why earth pin longer, why bayonet cap must not be used	86	11	3

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	H3d.41	<u>Cables and Cords Specifications</u>			Why PEC should be longer in plug, why cord from Class II appliance not used on a Class I appliance, why earth pin longer, factors in cord selection	77	14	9
Q 7	H3d.41	<u>Cables and Cords Specifications</u>			Cord current ratings, colour coding	82	14.5	3.5
			Jun 2006	4	Selection criteria for cord, colour coding, and current ratings	40	50	10
			Nov 2006	7	Colour coding of replacement cords, care of extension leads	66	23	11
			May 2007	3	Colour coding of replacement cords, care of extension leads	90.5	6	3.5
			May 2007	7	Why volt drop in cord, effect of Vd, cord current ratings. Selection of flexible cord	65.5	16.5	18
			May 2007	8	Fitting plug to flexible cord, testing of portable oven and RCDs	65.5	23.5	11

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	F2.20	<u>1ph-Motors</u> - Selection, and fault finding			Circuit diagram of cap- start motor, reversing direction, how start winding disconnected, motor fault, reversing universal motor	58	25	17
Q 8	F2.20	<u>1ph-Motors</u> - Selection, and fault finding			<i>Circuit diagram of split- phase motor, reversing direction, how start winding disconnected, reversing universal motor applications for universal motors</i>	29	35.5	35.5
			Sep 2004	20	Reverse Universal motor, applications for universal and shaded pole motors	21	13	66
			May 2005	12	Circuit diagram, rotation and application of single phase motor	41	21	38
			Sep 2005	11	Starting and rotation direction of single phase motor	35	27	38

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	C2.11	a.c. – Measurements V, A, P, pf			Ohmmeter testing heater, calculate current and power at 230V, power at 240V	77	7	16
Q 9	C2.11	a.c. – Measurements V, A, P, pf			Portable water heater, power on high and medium, current on low, fault on heater.	61	18	21
			Nov 2005	11	Meters testing circuit record certain values. Find missing values	88	6	6
			Nov 2005	12	Meters testing circuit record certain values. Find missing values	84.5	9	6.5
			Jun 2006	3	Calculate current and power for heater at 230V. Calculate permitted voltage variation, power at minimum and maximum voltage variations	54	29	17
			Sep 2006	2	Calculate current and power for heater at 230V. Calculate current at max. Volt drop, difference in power dissipated at max. volt drop	66.5	14	19.5
			Nov 2006	9	Portable water heater – calculate current and power in low positions and resistance, current and power in high position	63	13	24

A1.3 - ESTA 1026

A1.3.1 - Moderation

There were two moderators for ESTA 1026.

This paper and ESTA 1027 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted by secure email and the content of both papers was considered reasonable in terms of content and time. Both papers presented a similar degree of difficulty.

A1.3.2 - Marking

There were two markers for ESTA 1026.

Teleconferences were held with the markers on 25 June and 2 July.

Version 2 of the answer schedule was sent to markers on 25 July.

Comments

This was another good broad based paper that offered a fair coverage of the curriculum. Those who had prepared themselves with the knowledge required to present themselves as servicemen in the electrical industry did well.

Although question 3(b) seems somewhat strange it is very important that candidates are aware of the consequences associated with incorrect connections and the dire results that may occur from errors that can be made and the importance of testing. It is worth noting that one exam centre had a 100% pass rate. Does it come down to tutor attitude or basic skills in sitting exams?

Some candidates highlight the important parts of the question which is excellent, while others pay no attention even to the bold references

Candidates must also be taught the value in showing all calculations as vital marks are lost when only part calculations or just the answer are shown.

A1.3.3 - Amendments to ESTA 1026

The significant amendments to <u>ESTA 1026</u> arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	-
2(a)	Editorial amendment	-	-
2(b)	Editorial amendment	-	-
2(c)	Editorial amendment	-	-
3(a)(i)	Was (b). Rewritten to make intention clearer	Amended accordingly	-
3(a)(ii)	Was (a) Rewritten to make intention clearer	Amended accordingly	The 1 st bullet point was deleted as not being relevant to the question
3(a)(iii)	Was (c).	Amended accordingly	Mark allocation corrected
3(b)	Was (d) Rewritten to make intention clearer. Diagram included	Amended accordingly	Replaced with answers that were more accurate in terms of the question
4(a)	Amended to emphasise the ohmmeter was not the correct instrument	-	-
4(b)	Editorial amendment	Editorial amendment	Amended to require testing between the earth pin and exposed metal not all exposed metal
5(a)	Voltage of circuit inserted in the preamble	Answer corrected	-
5(b)	Preamble deleted because of change to (a)	-	-
5(b)(i)	Amended to reflect change in (a)	-	-
6(a)	-	Editorial amendment	-
7(b)	Question relating to Edison screw lampholders deleted as being out-of-date. Replaced with question relating to flexible cords	Amended accordingly	-

The significant amendments to <u>ESTA 1026</u> arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
8(a)(ii)	-	-	Amended to show two distinct options
8(a)(iv)	-	Additional option added	-
9(a)(ii)	-	Answer corrected	-
9(b)	-	Answer corrected	Mark allocation added

A1.4 - ESTA 1027

A1.4.1 - Moderation

There were two moderators for ESTA 1027.

The paper and ESTA 1026 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted by secure email and the content of both papers was considered reasonable in terms of content and time. Both papers presented a similar degree of difficulty.

A1.4.2 - Marking

There were three markers for ESTA 1027.

Teleconferences were held with the markers on 3 and 9 July.

The amendments comprising version 2 of the answer schedule were sent to markers on 3 July.

Comments

There was no indication that the paper was too long or difficult.

A1.4.3 – Amendments to ESTA 1027

The significant amendments to ESTA 1027 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	-
1(c)	Amended to ensure intention is clear	-	-
2(c)	-	Correct answer inserted	3 rd and 4 th bullets points condensed into one answer 2 additional options added
2(d)	-	-	Amended to make more accurate
3(a)	Preamble rewritten to make intention clearer	-	-
3(a)(ii)	-	Answer corrected	-
3(b)	Editorial amendment	1 st bullet point amended to make clearer 2 nd bullet point replaced with a more accurate answer	-
4(b)(iv)	-	Amended to make more accurate	-
5(a)	Rewritten to make intention clearer	-	-
5(b)	Editorial amendment	-	-
6(b)(i)	-	Editorial amendment	-
6(b)(iii)	Made more explicit as to the number of answers required	1 st bullet point deleted. Repeat of following bullet point	-
7(a)(i)	-	Editorial amendment	-
7(a)(ii)	-	Amended to make more accurate	-
7(b)	Wording aligned with Standard	Amended accordingly	-
8(a)(iii)	-	Description of relay inserted	-
8(a)(iv)	Rewritten to make intention clearer	-	-
9(a)	Reference to "blanket" changed to "heater"	-	-
9(c)	Reference to "blanket" changed to "heater"	-	-
9(d)	Rewritten to make intention clearer	-	Additional option added

Appendix 2

Electrical Service Technician B

23, 29 and 30 June 2007

ESTB 2019, a moderated paper, was used for the examination of 23 June 2007.
 ESTB 2021, a composite paper, was used for the examination of 29 June 2007.
 ESTB 2020, a moderated paper, was used for the examination of 30 June 2007.

A2.1 - Overall Candidate Performance

	Number candidates	of	Number candidates passed	of who	Percentage passed
ESTB 2019	38		37		97
ESTB 2020	31		29		94
ESTB 2121	1		1		100
June 2007	70		67		96

Candidate performance – ESTB 2019

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
38	37	Average pass mark	81%
		Median mark	82
	97%	<u>Those who passed</u>	
		Average pass mark	82%
		Median mark	82

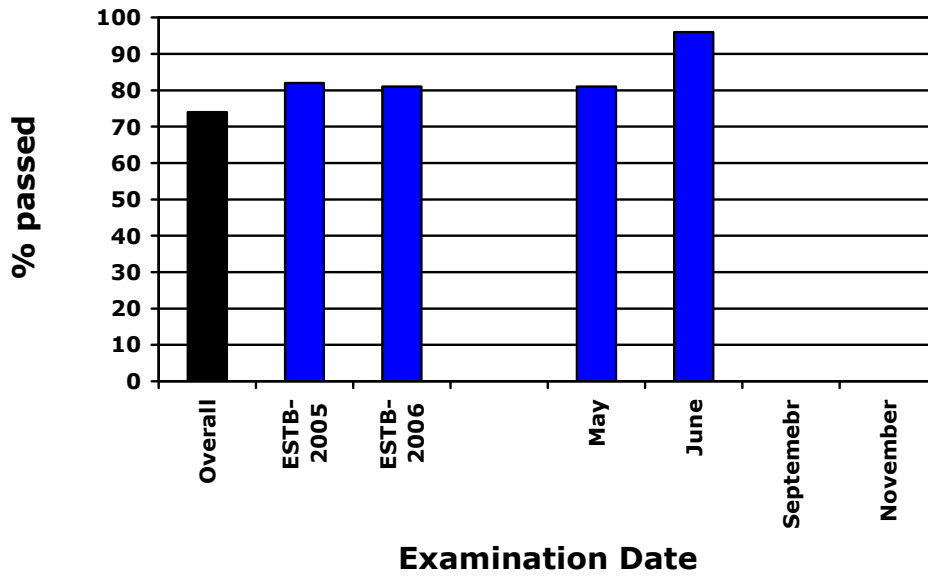
1 candidate gained more than 95 marks.

Candidate performance – ESTB 2020

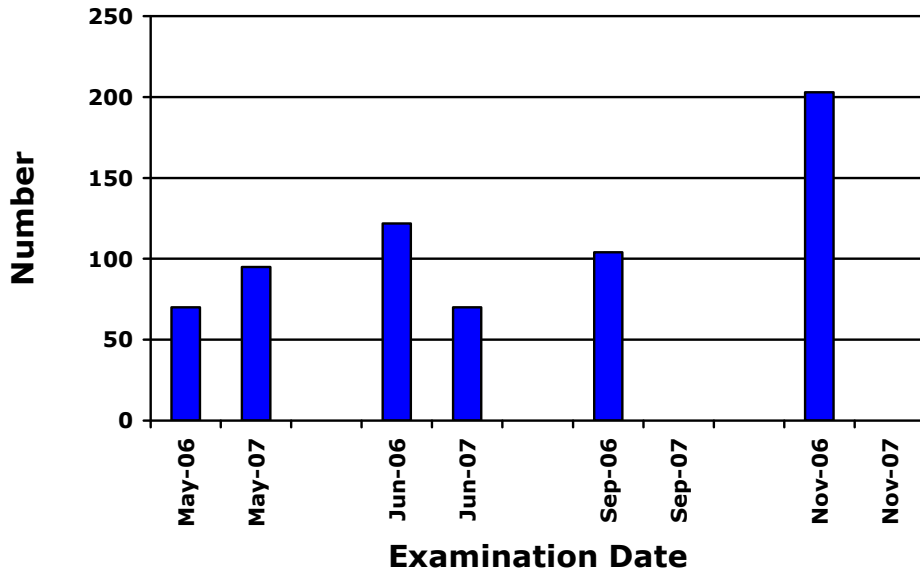
<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
31	29	Average pass mark	78.5%
		Median mark	82
	94%	<u>Those who passed</u>	
		Average pass mark	80.5%
		Median mark	83

1 candidate gained more than 95 marks.

2007 PASS RATES - ESTB



2007 CANDIDATE NUMBERS - ESTB



Mark Ranges

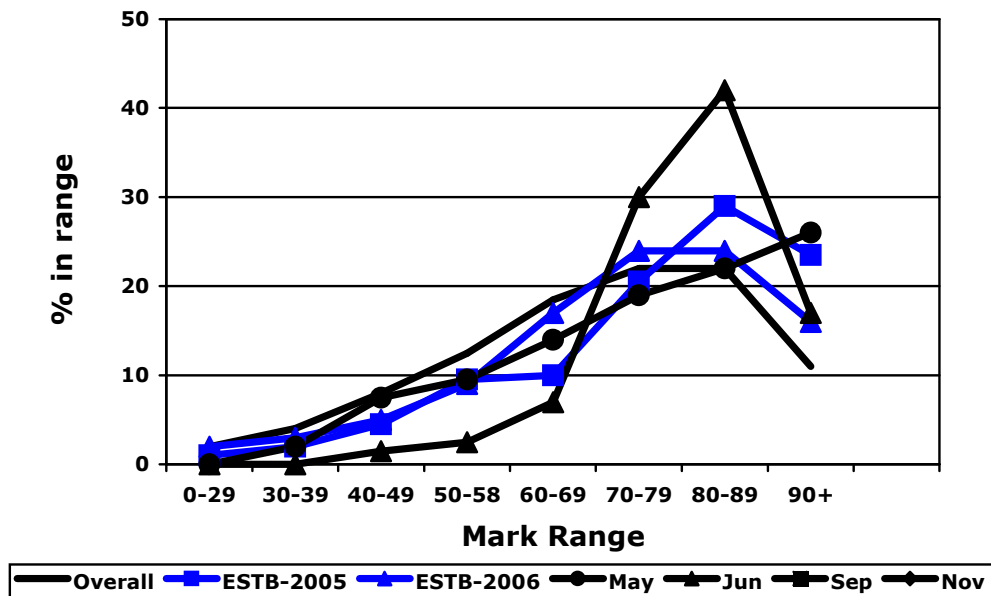
Number of candidates

Range	ESTB 2019	ESTB 2020	ESTB 2021	June 2007	
90 – 100	8	4	0	12	candidates
80 – 89	15	13	1	29	candidates
70 – 79	12	9	0	21	candidates
60 – 69	2	3	0	5	candidates
50 – 58	1	1	0	2	candidates
40 – 49	0	1	0	1	candidates
30 – 39	0	0	0	0	candidates
0 – 29	0	0	0	0	candidates
	38	31	1	70	

% of candidates

Range	ESTB 2019	ESTB 2020	ESTB 2021	June 2007	
90 – 100	21	13	0	17%	of candidates
80 – 89	39.5	42	100	42%	of candidates
70 – 79	31.5	29	0	30%	of candidates
60 – 69	5	10	0	7%	of candidates
50 – 58	3	3	0	2.5%	of candidates
40 – 49	0	3	0	1.5%	of candidates
30 – 39	0	0	0	0%	of candidates
0 – 29	0	0	0	0%	of candidates

2007 MARK RANGE - ESTB



A2.2 - 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.

The questions in bold are from ESTB 2019

The questions in bold/italic are from ESTB 2020

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				89	8	3
Q 1	-	10, 2 mark questions				71	29	0
Q 2	F1.19 F2.20	1ph-Motors – Theory 1ph-Motors - Selection, and fault finding			Reversal of cap start and universal motor, calculate current drawn circuit diagram of split- phase, use of reversing switch while motor running	37	52.5	10.5
Q 2	F1.19 F2.20	1ph-Motors – Theory 1ph-Motors - Selection, and fault finding			Circuit diagram of cap- start motor, reversing, purpose of capacitor, calculate power, faults on single phase motors	55	35.5	9.5
			May 205	4	Circuit diagrams, rotation and applications of single phase motors	62.5	23	14.5
			Sep 2005	3	Circuit diagrams and rotation of single phase motors	77	13	10
			May 2006	4	Circuit diagrams and rotation of single phase motors, advantage of cap- start, replacement for	47	37	16

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
					centrifugal switch			
Q 3	H1a.27	<u>Protection and Control</u> Protection characteristics			Purpose of fuse and RCD on switchboard, current rating of fuses, how internal mechanism operates on thermal and magnetic MCBs	95	5	0
Q 3	H1a.27	<u>Protection and Control</u> Protection characteristics			<i>Current rating of fuse, over-rated and under-rated fuses, use of phase failure and phase reversal relays, reloading rewirable fuses</i>	90.5	6.5	3
			Nov 2004	9	Fuse wire in tortuous path, characteristics of HRC fuses	8	34	58
			May 2005	6	Effect on circuit of using over-rated and under-rated fuses and relays. Describe operation of the 3 types of MCB	60	15	25
			May 2006	9	Term "current rating, over and under rated fuses, how HRC fuses give back-up protection, how RCD works	63	28.5	8.5
			Jun 2006	4	Purpose of fuse, MCB, RCD on switchboard, operation of magnetic/thermal RCD, current ratings, phase failure relays	33.5	41	25.5
			Nov 2006	2	Reversal of supply line to 3 phase motor, reduced voltage starters, sketch 230V control circuit, how thermal overload protects motor			

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	K2.38	<u>Statutory testing and inspection requirements</u>			Testing to AS/NZS 3760, visual checks	81.5	8	10.5
Q 4	K2.38	<u>Statutory testing and inspection requirements</u>			Testing to AS/NZS 3760, polarity tests	94	3	3
			Mar 2004	9	Testing to AS/NZS 3760	83	8	9
			May 2005	9	Testing to AS/NZS 3760	81	15	4
			Jun 2005	4	Testing to AS/NZS 3760	88	10	2
			Nov 2005	7	Testing to AS/NZS 3760	76.5	5.5	18
			Nov 2006	5	Testing to AS/NZS 3760, polarity	84	13	3
Q 5	J.33	<u>Damp and wet areas</u>			Define damp situation, IP rating, 1st an 2nd numbers on an IP rating, IP rating of apparatus in bathroom	95	5	0
Q 5	J.33	<u>Damp and wet areas</u>			Define IP rating, 1st an 2nd numbers on an IP rating, describe protection of IP 56 fitting, IP rating of apparatus in bathroom	71	10	19
			Jun 2004	8	Damp situations and IP ratings	66.5	28	5.5
			Sep 2004	7	IP ratings, replacement of towel rail and switch in bathroom	79	20	1
			Jun 2005	3	Damp situations and IP ratings	94	5	1
			Sep 2005	7	Damp situations and IP ratings	92	7	1
			Jun 2006	5	IP ratings, replacement of towel rail in bathroom	72	24	4

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	H10.66	<u>Fault diagnosis</u>			Faulty washing machine, calculate current and power in PEC, whether fuse would operate, phase/neutral transpositions	63	26.5	10.5
Q 6	H10.66	<u>Fault diagnosis</u>			Faulty hot water cylinder, safely isolate, why cylinder operates on 1 fuse, testing an description of faults	26	58	16
			Nov 2005	4	Locate fault on MCB circuit supplying appliances	48	34	18
			Nov 2005	9	Hot water cylinder, safe disconnection and isolation procedures	27	48	25
			May 2006	3	Safely isolate MCB circuit supplying appliances, locate faults, describe remedial action	53	28.5	18.5
			Sep 2005	5	Faulty three phase hot water cylinder – isolation, reason for fault, testing to locate fault	65	23	12
			May 2007	4	Replacement hot water cylinder, tests before connection, safety precautions before connection	59	20	21
			May 2007	7	Faulty washing machine, calculate current, , power dissipated in PEC and whether fuse will operate, cause of neutral to be switched in an appliance	67	19	14

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	D4.22	<u>System theory</u> - MEN systems			Define term MEN system, why neutral is required or not required on some 3 phase loads, requirements for switching active	42	37	21
Q 7	D4.22	<u>System theory</u> - MEN systems			<i>Define term MEN system, why system is multiple earthed, sketch and label system diagram</i>	61	39	0
			Jun 2004	9	Reasons for earthing MEN system, purpose of neutral, circuit with no neutral	12	44	44
			Nov 2005	10	Reasons for earthing MEN system, purpose of neutral, circuit with no neutral	39.5	30.5	30
			Jun 2006	6	System voltages, reasons for earthing MEN system, purpose of neutral, circuit with no neutral, switching of active	33.5	42.5	24
			Sep 2006	8	Why MEN system multiple earthed, why neutral in unbalanced 3 phase load, situation where neutral not required, purpose of PEC conductor, appliances not to be earthed	64.5	25	10.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	E2.16	<u>3ph-Motor/Alternators</u> Selection, starting, protection			Identify windings, connection to supply, fault diagnosis	55	40	5
Q 8	E2.16	<u>3ph-Motor/Alternators</u> Selection, starting, protection			<i>Purpose of phase failure relay, fault diagnosis, drawing terminal connections</i>	58	32	10
			Sep 2004	9	Faults on motors and starters	18	48.5	33.5
			Jun 2005	7	Faults on motors and starters	42	43	15
			Sep 2005	9	Connections to 3 phase motor, motor reversal	54.5	10	35.5
			Jun 2006	8	Faults on motors and starters	24.5	37	38.5
			Sep 2006	3	Explain different types of protection, identifying and connecting terminals for DOL starting	73	22	5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	H1b.28	<u>Protection and Control</u> RCD characteristics			Draw circuit diagram of RCD, operating times of RCDs, how RCD detects fault	55	37	8
Q 9	H1b.28	<u>Protection and Control</u> RCD characteristics			<i>How RCD operates when there is no fault and when there is a fault, why tested, operating times of RCDs</i>	61	26	13
			Mar 2004	8	Circuit diagram of RCD, operation of RCD under fault	26	31	43
			May 2005	10	Fuse wire in tortuous path; operation of RCD under fault; RCD characteristics	48	29	23
			Sep 2005	4	Explain RCD operation on fault, RCD testing and ratings, rewirable fuses	74	18	8
			Nov 2005	6	Circuit diagram of RCD, operation of RCD under fault	50	30	20

2.3 - ESTB 2109

A2.3.1 - Moderation

There were three moderators for ESTB 2019.

This paper and ESTB 2020 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted by secure email and the content of both papers was considered reasonable in terms of content and time. To ensure the degree of difficulty was relatively the same in both papers, question 8 was swapped between papers.

A2.3.2 - Marking

There was one marker for ESTB 2019.

Teleconferences were held with the marker on 3 and 9 July.

The amendments comprising version 2 of the answer schedule were advised at the teleconference of 3 July.

Comments

The pass rate for this paper was excellent. This is surprising because out of the 38 papers, 85 questions were never attempted. That is, where there were three parts to a question, one part was not answered.

The wording of the questions could not be faulted, but it is evident that some candidates do not read or understand particular questions.

In a number of cases the writing was very poor or was cramped-up and therefore hard to read. This made marking difficult. Similarly, some of the drawings were just “scribble”

A2.3.3 - Amendments to ESTB 2019

The significant amendments to ESTB 2019 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	All calculation changed to two decimal places
1(a)	Split into two parts to make question clearer	Amended accordingly. Additional option added to (i)	-
1(b)	Amended to make intention clearer	Editorial amendment	-
1(f)	Amended to require reference to the Electricity Regulations	-	-
1(e)	-	In the last bullet point, disconnection point changed from load side of isolator to the supply side	-
1(f)	-	Parts required to be covered in the answer underlined	-
2(a)	Reduced to 2 marks from 4	Amended accordingly	-
2(b)	-	Calculation answers changed to three significant figures	-
2(d)	New part relating to a reversing switch on a universal motor	Amended accordingly	-
3(d)	Re-written and split into two parts to make intention clearer	Editorial amendment	-
4(b)	Editorial amendment	Editorial amendment	-
5(a)	New part	Amended accordingly	-
5(b)	Was (a)	Amended accordingly	-
5(c)	Was (b). Marks increased from 2 to 4	Amended accordingly	-
5(d)	Deleted and replaced with part relating to the IP ratings of fittings in a bathroom	Amended accordingly	-
6(a)(ii)	Editorial amendment	Calculation changed to three significant figures	-
6(a)(iii)	-	Calculation changed to three significant figures	-
7(c)	-	Additional option added	-
8	Was originally in ESTB 2020	-	-

A2.4 - ESTB 2020

A2.4.1 - Moderation

There were three moderators for ESTB 2020.

This paper and ESTB 2019 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted by secure email and the content of both papers was considered reasonable in terms of content and time. To ensure the degree of difficulty was relatively the same in both papers, question 8 was swapped between papers.

A2.4.2 - Marking

ESTB 2020

There was one marker for ESTB 2020.

Teleconferences were held with the marker on 10 and 16 July.

The amendments comprising version 2 of the answer schedule were sent to the marker on 10 July

Comments

Overall this was a reasonable examination and this was reflected by a good pass rate.

Generally questions were understood and answered well

A2.4.3 - Amendments to ESTB 2020

The significant amendments to ESTB 2020 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	-
1(b)	Amended to make intention clearer	-	
1(d)	Editorial amendment	-	
1(h)	-	4 th bullet point deleted as being not relevant to question	
1(i)	Amended to make intention clearer	-	
2(a)(iii)	-	Additional option added	
2(b)	Reduced from 2 marks to 1	Amended accordingly	
2(c)	Rewritten to make intention clearer	-	Additional option added
2(d)	Rewritten to make intention clearer. Marks increased from 1 to 2	Amended accordingly	
3(c)	Preamble rewritten to make intention clearer	-	
3(d)	Amended to make intention clearer	-	
4(a)	Amended to be explicit as to what is required	-	
4(b)	Amended to clarify how many answers are required	Editorial amendment	
5(a)(ii)	Amended to make wording consistent with (iii)	-	
6	Preamble amended to make intention clearer	-	
6(a)	Reduced from 5 marks to 4.5	Amended accordingly	
6(b)	Reduced from 2 marks to 1	Amended accordingly	
6(c)(i)	Amended to make intention clearer		
6(c)(ii)	Amended to make intention clearer. Marks increased from 1.5 to 2	Amended accordingly	
6(c)(i)	Marks increased from 1 to 2	Amended accordingly	

The significant amendments to ESTB 2020 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
7(b)	-	Reference to the distribution transformer inserted at the end of the first two bullet points	
8	Was originally in the ESTB 2109 paper		
8(a)	(i) and (iii) deleted as being too similar to other questions in the paper. Reduced from 6 to 2 marks	Amended accordingly	
8(b)(ii)	-	-	Two additional options added
8(c)	New question relating to a motor terminal block added	Amended accordingly	

Appendix 3

Electrician Regulations

15, 22, 23 and 30 June 2007

ER 25, a composite paper, was used for the examination of 15 June 2007.
 ER 26, a composite paper, was used for the examination of 22 June 2007.
 ER 23, a moderated paper, was used for the examination of 23 June 2007.
 ER 24, a moderated paper, was used for the examination of 30 June 2007.

A3.1 - Overall Candidate Performance

	Number candidates	of	Number candidates passed	of who	Percentage passed
ER 23	462		393		85
ER 24	443		368		83
ER 25	2		1		50
ER 26	3		2		67
June 2007	910		764		84

17 candidates gained 95 or more marks.

Candidate performance – ER 23

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
462	393	Average pass mark	71%
		Median mark	73.5
	85%	<u>Those who passed</u>	
		Average pass mark	75%
		Median mark	76

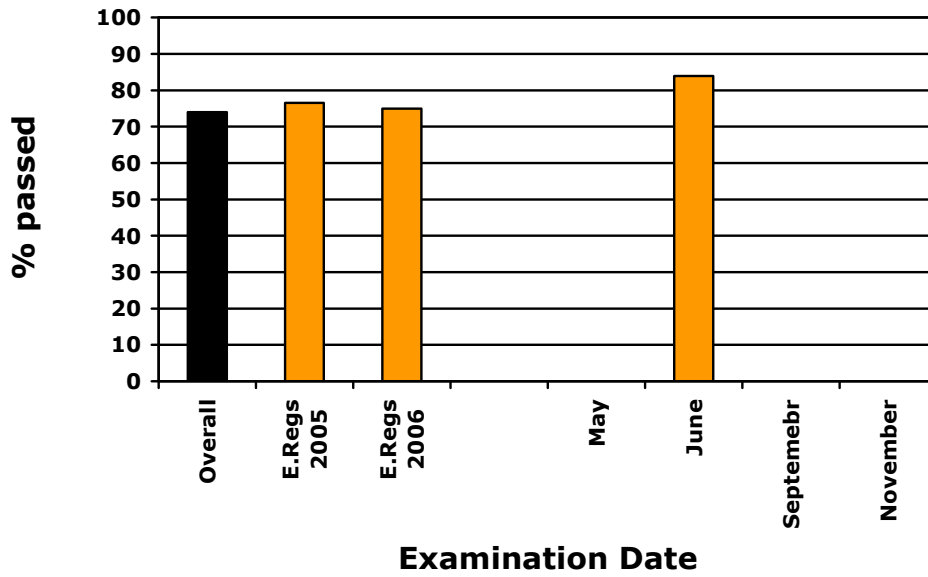
1 candidate gained 95 or more marks.

Candidate performance – ER 24

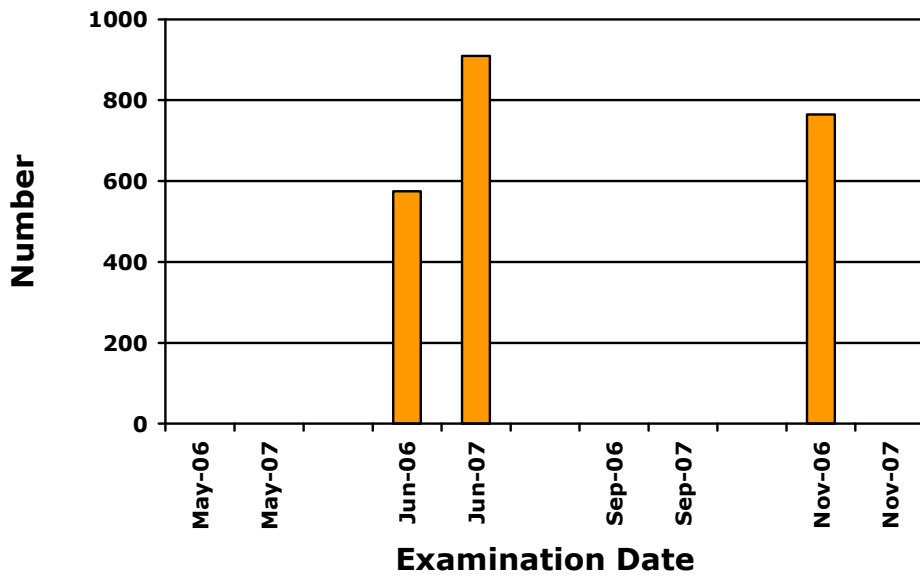
<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
443	368	Average pass mark	72%
		Median mark	73
	83%	<u>Those who passed</u>	
		Average pass mark	76.5%
		Median mark	77

16 candidates gained 95 or more marks.

2007 PASS RATES - ELECTRICIAN REGULATIONS



2007 CANDIDATE NUMBERS - ELECTRICIAN REGULATIONS



Mark Ranges

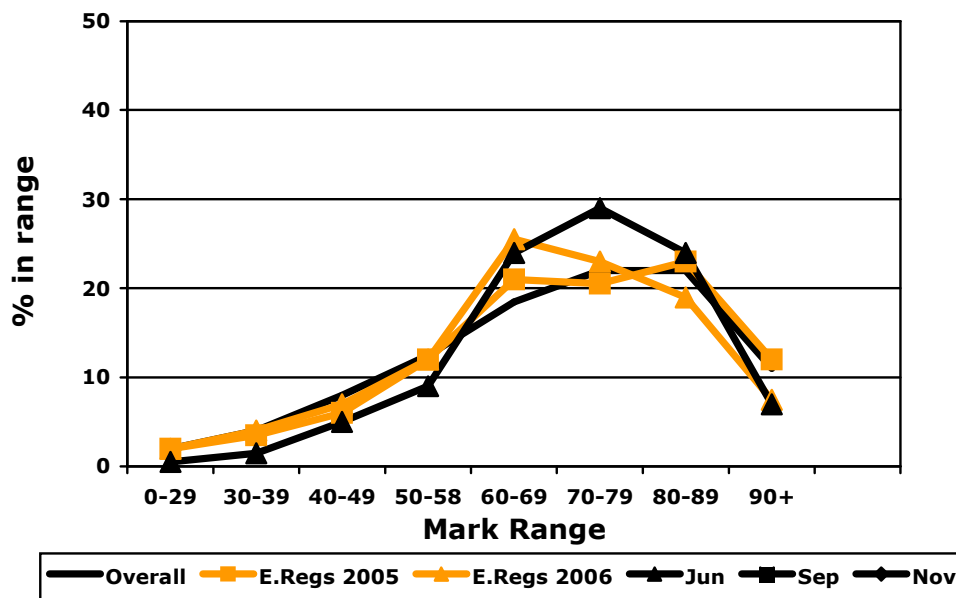
Number of candidates

Range	ER 23	ER 24	ER 25	ER 26	June 2007	
90 – 100	14	52	0	0	66	candidates
80 – 89	122	94	0	0	216	candidates
70 – 79	147	114	1	1	263	candidates
60 – 69	110	108	0	1	219	candidates
50 – 58	35	45	1	1	82	candidates
40 – 49	22	22	0	0	44	candidates
30 – 39	9	5	0	0	14	candidates
0 – 29	3	3	0	0	6	candidates
	462	443	2	3	910	

% of candidates

Range	ER 23	ER 24	ER 25	ER 26	June 2007	
90 – 100	3	12	0	0	7%	of candidates
80 – 89	26	21	0	0	24%	of candidates
70 – 79	32	26	50	50	29%	of candidates
60 – 69	24	24	0	50	24%	of candidates
50 – 58	7.5	10.5	50	0	9%	of candidates
40 – 49	5	5	0	0	5%	of candidates
30 – 39	2	1	0	0	1.5%	of candidates
0 – 29	0.5	0.5	0	0	0.5%	of candidates

2007 MARK RANGE - ELECTRICIAN REGULATIONS



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 similar questions from previous examination papers.

The questions in bold are from ER 23

The questions in bold/italic are from ER 24

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				53	36	11
Q 1	-	10, 2 mark questions				64	29.5	6.5
Q 2	H1b.28	Protection and Control RCD characteristics			Installation of RCDs – domestic installations	21.5	27	51.5
Q 2	H1b.28	Protection and Control RCD characteristics			Installation of RCDs – other installations, domestic installations	60.5	29.5	10
			Nov 2004	28	Installation of RCDs	44.5	33	22.5
			Jun 2005	20	Installation of RCDs	41	26	33
			Nov 2006	8	Installation of RCDs – hotel, with other protection, domestic installations	31	53	16

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	P1.13	<u>Legislation</u> Fundamental principles			Protection against direct contact, construction requirements for barriers, IP ratings of barrier	94	3.5	2.5
Q 3	P1.13	<u>Legislation</u> Fundamental principles			Protection against indirect contact, how automatic disconnection achieved, disconnection of final subcircuits, class II appliances	65	28	7
Q 4	J.33	<u>Damp and wet areas</u>			Determine zones, IP ratings and installation requirements of equipment in bathroom	2	29	69
Q 4	J.33	<u>Damp and wet areas</u>			Swimming and spa pool –method of protection prohibited, socket outlets, wiring systems	54	32	14
			Jun 2004	19	Installing, towel rail, socket outlet and switch in bathroom	42.5	43.5	14
			Jun 2004	28	Electrical equipment in fountains, o/h lines over and luminaires in swimming pools	55	26	19
			Jun 2005	19	Pools - bonding and earthing, degree of protection	80	15	5
			Nov 2005	22	Bathroom –zone dimensions for shower, installing IPX7 equipment in zone 0 of bath	61	26	13
			Jun 2006	4	Determine zones and IP ratings of equipment in bathroom	49	25.5	25.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	H3b.30	<u>Cables and Cords</u> Selection of final subcircuits			1 phase oven - determine cable size by calculating load and volt- drop	44	19	37
Q 5	H3b.30	<u>Cables and Cords</u> Selection of final subcircuits			3 phase outdoor metering unit - determine cable size by calculating load and volt- drop	27.5	7	65.5
			Nov 2003	24	1 phase oven in bakery, determine suitability of proposed cable - Vd and load	28	21	51
			Jun 2004	21	3 phase oven in bakery, determine suitability of proposed cable - Vd and load	27.5	12.5	60
			Nov 2004	21	3 phase plaster mill in bakery, determine cable size - Vd and load	30	14	56
			Jun 2005	23	3 phase commercial freezer - confirm cable size - Vd and load	39	17.5	43.5
			Nov 2006	3	3 phase cable at crushing plant, calculate cable size - Vd and load for two installation options	30	16	54

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	K2.38	<u>Statutory testing and inspection requirements</u>			Four mandatory inspections and tests, CoC for installation with IR of 100 Mohms, inspection of electrical equipment	46	29	25
Q 6	K2.38	<u>Statutory testing and inspection requirements</u>			<i>Sequence of tests for an installation, reasons for carrying out earth continuity and IR tests, CoC for installation with IR less than 1 Mohm</i>	92.5	5.5	2
			Jun 2004	22	3 mandatory checks and tests and 1 reason for each	85	8	7
			Jun 2005	26	PEC and IR test – AS/NZS 3000. How to carry out PEC test	54	22	24
			Jun 2006	5	Installation disconnected for 9 months, tests and inspection required, requirements for connection, responsibility for certification etc.	76	18	6
			Jun 2006	9	Reasons for testing in low voltage installations	79	9.5	11.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	I.32	<u>Switchboards</u>			Switchboard when MEN system used, installing switchboard in cupboard, near shower and swimming pool, restricted locations	88	9	3
Q 7	I.32	<u>Switchboards</u>			<i>Fittings used for protection, access to live part, switchboard locations, protection on motor circuit</i>	39	51	10
			Jun 2004	18	Switchboards – high rise apartment block	78	18	4
			Nov 2004	26	Switchboards – accessibility, area not to be installed	71	18	11
			Nov 2005	25	Switchboards – vicinity of sprinklers, neutral bar or link, access	85	9	6
			Nov 2005	21	Switchboard in storage cupboard in commercial complex – Installation requirements, requirements for live parts, location identification, doorway dimensions	80	17	3

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	D3.21	<u>System theory - Earthing of installations fittings and appliances</u>			Restrictions on PEC at distribution board, three methods of mechanical protection, how minimum size of earth determined in multi-phase installation, components of MEN system	86	8.5	5.5
Q 8	D3.21	<u>System theory - Earthing of installations fittings and appliances</u>			Draw and label earth fault loop, why impedance must be low, protection of 10A final subcircuit	51.5	26	22.5
			Nov 2004	18	3 Operational results for earthing	77	1	22
			Jun 2005	22	AS/NZS 3760 –max resistance, why no grater than stated value. Procedure to ensure resistance value complies	24	37	39
			Jun 2006	6	Operational results of earthing, minimum size of earth, protection against mechanical damage, restrictions on PEC	66.5	20.5	13
			Nov 2006	2	Earthing conductors for 16mm ² cable. Pipes not to be used for earthing. When pipes must be earthed. Why equipotential bonding carried out. Why fault loop impedance must be low, restriction placed on PEC on distribution board	57	32	11

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	H3a.29	<u>Cables and Cords</u> Selection of mains and submains			Maximum demand of 230 V domestic installation	78	14	8
Q 9	H3a.29	<i>Cables and Cords</i> <i>Selection of mains</i> <i>and submains</i>			<i>Maximum demand of 230 V domestic installation</i>	71	9	20
			Nov 2003	22	Maximum demand of 230v domestic installation	59	23	18
			Jun 2004	27	Maximum demand of 230v domestic installation	59	25	16
			Jun 2005	24	Maximum demand of 230v domestic installation	36	38	26
			Nov 2005	27	Maximum demand of 230v domestic installation	55	23	22
			Jun 2006	8	Define maximum demand, maximum demand of 230v domestic installation, other methods of calculating maximum demand	29	32	39

A3.4 – ER 24

A3.4.1 - Moderation

There were three moderators for ER 24.

This papers and ER 23 were “parallel”. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted through a meeting held on 6 June and the content of both papers was considered reasonable in terms of content and time. Both papers presented a similar degree of difficulty.

A3.4.2 - Marking

There were three markers for ER 24.

Teleconferences were held with the markers on 10 and 16 July.

Version 2 of the answer schedule was sent to markers on 5 July. An additional amendment incorporated in version 2 was sent to markers on 6 July.

Version 3 of the answer schedule was sent to markers on 10 July.

The additional amendments incorporated in version 4 of the answer schedule were sent to markers on 16 July.

Comments

This was a good and very fair exam paper and was generally well done by the candidates. The standard of writing and the quality of the answers were of a high standard. The exam covered a broad section of the electrical industry in terms of wet areas Zone1, cable protection, switchboard locations, practical wiring solutions, testing and voltage drop, power load requirements and legal compliance.

The questions which the candidates found difficult were question 4 (damp areas) and question 5 (volt-drop and load calculations).

The paper was well laid out with plenty of space for candidate answers. In general marks were appropriately allocated. Some improvement in the allocation of marks for question 8(a) was negotiated at the marking teleconference to include marks for the correct drawing of the appliance fault.

Candidates were assisted in questions 1(b) and 9 where the units were stated for them on the examination paper. Since many candidates are prone to either leave units out or state incorrect units, it could be argued that the examiner is being too helpful. The purpose of the exam is to check whether candidates know what they are doing rather than hand information to them on a plate.

It was noticed that the word "trip" was missing on the third line of question 8 (c)(iii) of the examination paper. Candidates did not appear to be disadvantaged by this omission since the rest of the sentence made sense.

A3.4.3 - Amendments to ER 24

The significant amendments to ER 24 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	All calculations changed to two decimal places
1(h)	-	-	Two additional options added
2(a)	Rewritten to make intention clearer	-	Amended to include original general knowledge answers and answers from AS/NZS 3000
2(b)(i)	-	-	Correct references inserted for existing answers
2(b)(ii)	Reference to switchboard not being replaced inserted	-	Two additional options added and note to the effect that either of the additional options gain only 1 mark.
3	Question rewritten to make intention clearer and to change some aspects to relate to more topical requirements	Amended accordingly	-
3(b)(i)	-	-	Two additional options added
3(c)	-	-	Four additional options added
4(c)	Was (b)(ii). Rewritten to make intention clearer	Amended accordingly	-
4(c)(iii)	-	-	Additional option added
4(d)	Was (c)	Amended accordingly	-
5	Preamble amended to make intention clearer.	-	-
5(a)	-	Answer corrected	-
6(a)	Reference to "testing sequence" changed to "sequence of tests"	Answer corrected	-
6(b)	"Two reasons" replaced with "the primary reason"	Amended accordingly	Additional option added
6(c)	"Two reasons" replaced with "the primary reason"	Amended accordingly	-
6(d)	-	-	Correct reference inserted

The significant amendments to ER 24 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
7(b)	Replaced with (c). Rewritten to make intention clearer	Amended accordingly	Additional option added
7(c)	Was (d)	Amended accordingly	-
7(c)(ii)	-	-	Additional option added
7(d)	New question relating to the placement of protection for a motor circuit.	Amended accordingly	-
8(a)(i)	Amended to make intention clearer	-	Mark allocation altered to award marks for correctly showing the Class I appliance and the fault
8(c)	Reference to a "10 A socket outlet" inserted	-	-
8(c)(iii)	New question relating to the length of run and fault loop impedance	Amended accordingly	-
8(d)	Deleted	-	-
9	Reference to 27 socket outlets changed to 10 double socket outlets and 9 single	Amended accordingly	-

Appendix 4

Electrician Theory

15, 16 and 23 June 2007

ET 21, a moderated paper, was used for the examination of 23 June 2007.

ET 22, a moderated paper, was used for the examination of 16 June 2007.

ET 23, , a composite paper, was used for the examination of 15 June 2007.

A4.1 - Overall Candidate Performance

	Number of candidates	of	Number of candidates who passed	Percentage passed
ET 21	237		183	77
ET 22	125		89	71
ET 23	1		1	100
June 2007	363		273	75

Candidate performance – ET 21

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
237	183	Average pass mark	67.5%
		Median mark	70
	77%	<u>Those who passed</u>	
		Average pass mark	74%
		Median mark	74

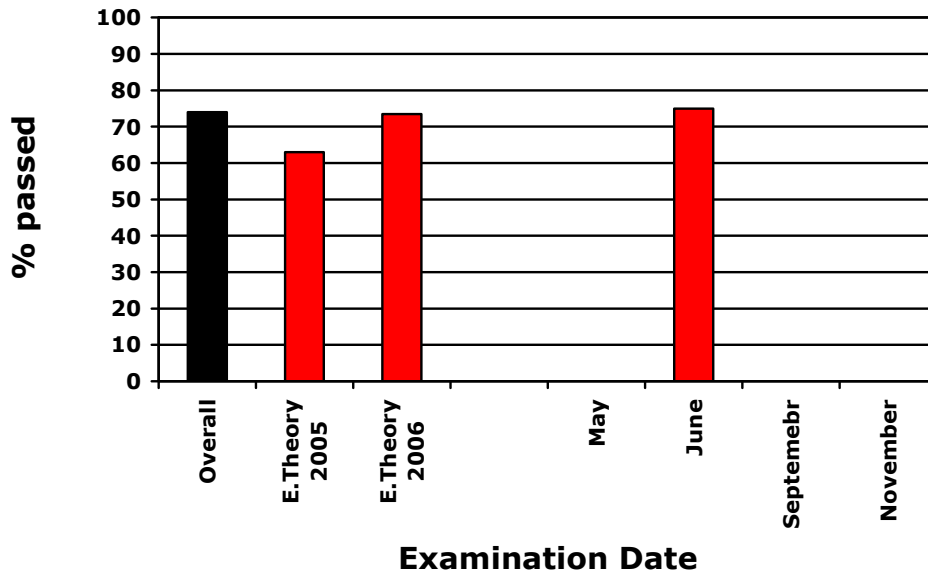
3 Candidates gained 95 or more marks.

Candidate performance – ET 22

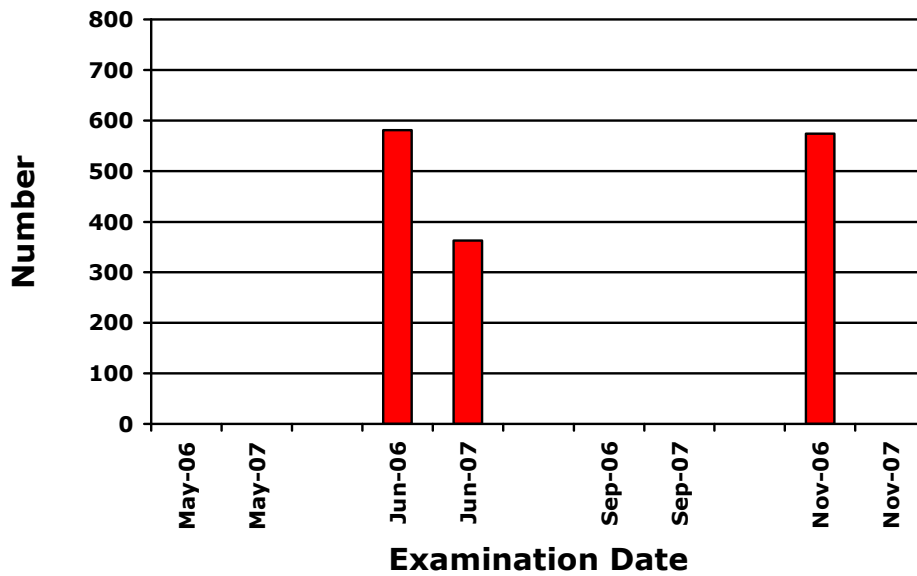
<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
125	89	Average pass mark	68%
		Median mark	70
	71%	<u>Those who passed</u>	
		Average pass mark	76%
		Median mark	77

8 Candidates gained 95 or more marks.

2007 PASS RATES - ELECTRICIAN THEORY



2007 CANDIDATE NUMBERS - ELECTRICIAN THEORY



Mark Ranges

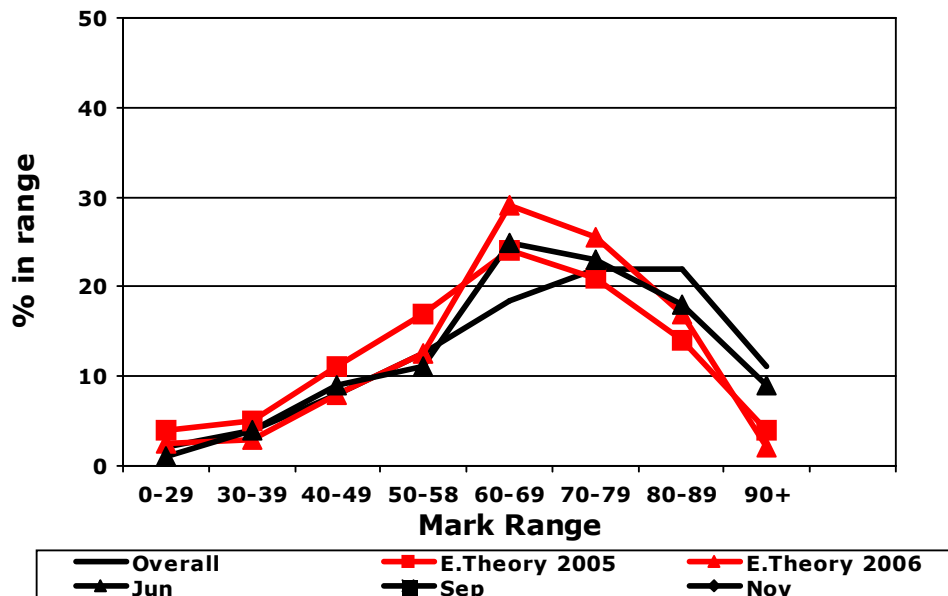
Number of candidates

Range	ET 21	ET 22	ET 23	June 2007	
90 – 100	16	16	1	33	candidates
80 – 89	43	23	0	66	candidates
70 – 79	60	24	0	84	candidates
60 – 69	64	26	0	90	candidates
50 – 58	22	18	0	40	candidates
40 – 49	21	11	0	32	candidates
30 – 39	9	5	0	14	candidates
0 – 29	2	2	0	4	candidates
	237	125	1	363	

% of candidates

Range	ET 21	ET 22	ET 23	June 2007	
90 – 100	7	13	100	9%	of candidates
80 – 89	18	18	0	18%	of candidates
70 – 79	25	19	0	23%	of candidates
60 – 69	27	21	0	25%	of candidates
50 – 58	9	14.5	0	11%	of candidates
40 – 49	9	9	0	9%	of candidates
30 – 39	4	4	0	4%	of candidates
0 – 29	1	1.5	0	1%	of candidates

2007 MARK RANGE - ELECTRICIAN THEORY



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.

The questions in bold are from ET 21

The questions in bold/italic are from ET 22

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 questions	mark			57	37.5	5.5
<i>Q 1</i>	-	<i>10, 2 questions</i>	<i>mark</i>			<i>50.5</i>	<i>37.5</i>	<i>12</i>

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 2	D4.22	<u>System theory</u> - MEN systems			Draw a MEN distribution system with one and three phase installations, why MEN system used, differences between MEN and distribution switchboards, which must be closest to supply	77.5	18.5	4
Q 2	D4.22	<u>System theory</u> - MEN systems			<i>Why neutral required supplying three phase unbalanced load, draw fault impedance path, why neutral earthed in MEN system</i>	72	21.5	6.5
			Nov 2003	5	Sketch MEN system, 3 advantage of 3 phase over 1 phase, MEN and dist. switchboards	53	34.5	12.5
			Jun 2004	10	Sketch MEN system, 3 advantage of 3 phase over 1 phase, MEN and dist. switchboards	70	25.5	4.5
			Jun 2005	3	Why neutral required on unbalanced circuit, sketch fault path, why neutral is earthed in MEN system	29	37	34

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	H1b.28	<u>Protection and Control</u> RCD characteristics			Draw diagram of RCD, describe operation of RCD under fault, explain PRCD and RCBO	79	14	7
Q 3	H1b.28	<u>Protection and Control</u> RCD characteristics			<i>Describe operation of RCD under fault, RCD rating for personal protection, why no shock with RCD and extra protection required, why PRCDs voltage dependent</i>	62.5	29.5	8
			Jun 2005	5	Sketch circuit diagram of RCD, how RCD operates on fault, types of RCD	32	35.5	32.5
			Nov 2005	4	Operation of RCD under fault, RCD ratings, RCD characteristics, PRCDs	43	42	15
			Jun 2006	3	Sketch circuit diagram of RCD, how RCD operates on fault, types of RCD	65	23	12

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	E2.16	<u>3ph-Motor/Alternators</u> Selection, starting, protection			Draw stop/start for motor control circuit. Three phase motor, calculate input power, kVA and line current. Why reduced voltage starting required	38	18	44
Q 4	E2.16	<u>3ph-Motor/Alternators</u> Selection, starting, protection			Calculate motor efficiency, slip from motor name plate. Star/delta starter - % of torque on starting, types of protection, interlocks	32	28	40
			Jun 2004	6	Connect remote stop/start station; 3 phase motor – calculate input power, kVA, kVAR, phase angle, line current	37	25	38
			Jun 2004	7	3 phase motor – calculate rotor currents and frequency, synch speed efficiency. Calculate current star/delta starter	31	34	35
			Nov 2004	5	Motor nameplate – calculate efficiency & slip, meaning of IP, why both thermal and HRC protection required	37.5	36.5	26

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	H9.62	<u>Commission and decommission equipment and appliances</u>			Connect new hot water cylinder – instrument tests before connection, safe procedures prior to connection	40.5	35	24.5
Q 5	H9.62	<u>Commission and decommission equipment and appliances</u>			Faulty refrigeration plant – safe isolation procedures, leaving work safe, other electrician actions	63	24	13
			Nov 2006	7	Faulty single phase circuit with outlets – describe safe isolation, types of faults, action to repair fault.	38	41	21
			Nov 2006	8	Replacement of kiln isolator –effect of various transpositions, testing for transposition	12	43	45
			Jun 2006	9	Hot water cylinder, safe disconnection and isolation procedures	63	29	8

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	H10.66	<u>Fault diagnosis</u>			MCB socket outlet circuit – three possible causes of fault, for each fault, action to find cause and remedial action	32	55	13
Q 6	H10.66	<u>Fault diagnosis</u>			<i>Hazards of mains transposition, testing for transposition</i>	61	13.5	25.5
			Jun 2006	4	Hazards of mains transposition, testing for transposition	14	10	76
			Nov 2006	7	Faulty single phase circuit with outlets – describe safe isolation, types of faults, action to repair fault.	38	41	21

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	G2.24	<u>Transformers</u> Operating principles			Draw diagram of wattmeter. Three phase transformer – calculate secondary phase and line voltage, primary line current	40.5	28.5	31
Q 7	G2.24	<u>Transformers</u> Operating principles			Three phase transformer - calculate primary and secondary line currents, total kVA. Why no fuses on CT secondary	37.5	8	54.5
			Jun 2005	8	3 phase transformer – sketch circuit, calculate primary and secondary line currents, kVA rating. Two methods to cool transformers.	34	12	54
			Nov 2005	7	3 phase transformer – calculate secondary phase and line voltages, primary and secondary line currents	39	25	36
			Nov 2006	5	3 phase transformer – calculate secondary phase and line voltages, primary and secondary line currents, why CT is dangerous on open circuit, method to reduce iron losses	43.5	35	21.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	D3.21	<u>System theory - Earthing of installations fittings and appliances</u>			Faulty three phase lathe – calculate current in faulty line, effect on protection, hazard if PEC was 10Ω	31	23	46
Q 8	D3.21	<i>System theory - Earthing of installations fittings and appliances</i>			<i>Faulty heater. Draw circuit diagram, calculate power dissipated in PEC. How effective earthing provides protection against shock, how high resistance earth increases risk of shock,</i>	27	39	34
			Nov 2004	2	Fault on single phase appliance, sketch diagram calculate phase current, explain benefit of effective earthing and hazard of high resistance earth	55	31	14
			Nov 2005	2	Fault on 3 phase pottery kiln, calculate current in faulty line, effect on protection, hazard to user	39.5	36.5	24
			Jun 2006	5	Fault on 3 phase pottery kiln, calculate current in faulty line, effect on protection, hazard to user	66	12	22

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	H3a.29	E2.16			3ph- Motor/Alternators Selection, starting, protection	35	45	20
Q 9	H3a.29	E2.16			3ph- Motor/Alternators Selection, starting, protection	55	28	17
			Nov 2004	7	Difference between speed controller and soft start; principles of speed controller; advantages of electronic starters	18	27	55
			Jun 2006	6	400V DOL starter circuit with remote stop/start, use of reduced voltage starters	37.5	5	57.5

A4.3 - ET 21

A4.3.1 - Moderation

There were three moderators for ET 21.

This paper and ET 22 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted through a meeting held on 5 June and the content of both papers was considered reasonable in terms of content and time. To ensure the degree of difficulty was relatively the same in both papers, questions 7 and 8 were swapped between papers.

A4.3.2. - Marking

There were four markers for ET 21.

Teleconferences were held with the markers on 3 and 9 July.

Version 2 of the answer schedule was sent to markers on 3 July.

Comment

The question range in the paper was broad, well structured and pitched at level suitable for testing the ability expected of an electrician within the electrical industry. Most candidates appeared to have adequate time as the majority of papers were completed in full.

Once again, those who are going to pass can, in most cases, be determined from the marks gained in the first question. Those who could not achieve at least 15 marks found it difficult to pass. (Chief Examiners note: 135 candidates gained 15 or more marks for question one and 6 failed. 102 candidates gained 14.5 marks or less and 48 failed.)

A4.3.3 - Amendments to ET 21

The significant amendments to <u>ET 21</u> arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	All calculation answers were changed to two decimal places where applicable
1(a)	Editorial amendment	-	-
1(c)	"Before every use" changed to "at regular intervals"	-	-
1(d)	-	Amended to ensure a more accurate answer	-
1(i)	-	Marks allocated inserted	-
2(b)	Rewritten because original question was too vague	Amended accordingly	-
3(a)	Marks inserted	-	-
6	Preamble rewritten to make intention clearer	-	-
6(a)	Editorial amendment	-	-
6(b)	Marks allocated across the entire question, instead of being at the beginning	Note added to the effect that reclosing the MCB before determining the fault is hazardous	-
7(b)	-	Marks allocated inserted	-
8	Preamble - "earth continuity" changed to "protective earthing conductor"	-	-
9(a)	"Advantages" changed to "technical advantages"	1 st and 4 th bullet points deleted as not being relevant to the question	-
9(c)(ii)	-	Amended to accurately reflect the question	-
9(c)(iii)	-	Amended to accurately reflect the question	-

A4.4 - ET 22

A4.4.1 - Moderation

There were three moderators for ET 22.

This paper and ET 21 were “parallel” papers. That is, the same topic (albeit different questions) was covered in the same numbered question in both papers. Moderation was conducted through a meeting held on 5 June and the content of both papers was considered reasonable in terms of content and time. To ensure the degree of difficulty was relatively the same in both papers, questions 7 and 8 were swapped between papers.

A4.4.2 - Marking

ET 22

There were three markers for ET 22.

Teleconferences were held with the markers on 22 June and 2 July.

Version 2 of the answer schedule was sent to markers on 25 June. An additional amendment incorporated in version 2 was sent to markers on 29 June.

Comments

A fairly-well moderated paper with no major problems with either student understanding or marking answers given

There seem to have been a number of “model answers” tendered in recent exam papers – word for word (or near enough) to the answer schedule. There were a few of these in this round of marking. Is this the result of making all of the questions and answers available on the website?

A4.4.3 - Amendments to ET 22

The significant amendments to ET 22 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	-
1(c)	-	-	Two additional options added
1(e)	-	Marks allocated inserted	-
1(h)	Amended to make intention clearer	Amended to provide for a more general answer	-
1(j)	Second sentence rewritten to make intention clearer	-	-
2(a)	Editorial amendment	Amended to better reflect the question asked.	-
2(b)	Second paragraph rewritten to make instruction clearer	-	Reference to the fault path between the star point and the installation earth included in the 2 nd bullet point
2(c)	-	3 rd bullet point amended to better reflect the question asked.	-
3(c)	-	Reference to current passing through a body deleted as being not consistent with the question asked	-
3(d)	Second part of question rewritten to make intention clearer	Amended accordingly	-
4(a)(ii)	-	-	Amended to place the slip speed calculation first. Reformatted to make it clear that there are two acceptable answers
4(b)(ii)	Editorial amendment	Amended to better reflect the question asked	Four additional options added
	-		-
4(b)(iii)	Reference to the motor starter included to make intention clearer	Amended to provide a more accurate answer	-

The significant amendments to ET 22 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
5	Preamble – First two paragraphs rewritten to make intention clearer	-	-
5(a)	-	Reference to removal of fuses inserted Steps taken to prevent reconnection amended to better reflect the question asked	Mark allocation for the last bullet point inserted
5(b)	-	-	Amended to require only two answers as reflected in the format of the question
6(b)	-	Reference to alternative methods for testing for a mains transposition removed from the note because this is not consistent with the question asked.	-
7(a)	Editorial amendment		
8(a)	Reference to the circuit breaker included as required by the answer		
8(d)	-		The existing answer shows the total power dissipated in the fault. The question asks for the power dissipated in the PEC. This solution was included as an alternative answer
9(a)	Editorial amendments	-	-
9(b)	Amended to make intention clearer	-	-
9(c)	-	-	Answers amended to better reflect the question asked.

Appendix 5

Tradesperson Electrical Work Certificate

30 June 2007

TEWC 143, a moderated paper, was used for the plumbers and gasfitters examination.

- Parts 1 and 2 (questions 1-9) are completed by plumbers.
- Parts 1 and 3 (questions 1-4 and 10-14) are completed by gasfitters.

Plumber/gasfitters complete TEWC 143A which comprised questions 1 to 4, 5, 6, 7, 8, 10 and 11 of TEWC 143.

A5.1 - Moderation

There were two moderators for TEWC 143.

A5.2. - Marking

There was one marker for TEWC 143 and 143A.

A5.3 - Amendments to TEWC 143

The significant amendments to TEWC 143 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	
1(b)	Editorial amendment	Additional option added	-
1(d)	Editorial amendment	Additional option added	-
1(e)	Editorial amendment	-	-
1(g)	Editorial amendment	-	-
1(h)	Editorial amendment	-	-
6(a)	-	Editorial amendment	-
6(c)	Additional lines added	-	-
8(c)	Marks allocated inserted	-	-
9(b)	Rewritten to make intention clearer	Amended accordingly	-
9(d)	Rewritten to make intention clearer	Amended accordingly	-
10(b)	-	Two additional options added	-
10(d)	Editorial amendment	Additional option added	-
11(b)	Editorial amendment	-	-
13(b)	Rewritten to make intention clearer	Two additional options added	-
13(d)	Rewritten to make intention clearer	Additional option added	-

Appendix 6

Electrical Inspector

There was no Electrical Inspector Examination in June 2007.

Appendix 7

Electronic Security

23 June 2007

ES 11, a moderated paper, was used for this examination.

A7.1 - Moderation

There were three moderators for ES 11.

A7.2. - Marking

There was one marker for ES 11.

One candidate sat and passed this examination with a mark of 87.

A7.3 - Amendments to ES 11

The significant amendments to ES 11 arising from the moderation and marking were as follows:			
No.	Question (Moderation)	Answer (Moderation)	Answer (Marking)
Cover	Instruction for calculations amended from "two decimal places" to "three significant figures."	-	
1(b)	The words "plug-in" was inserted after "Class I"	-	-
1(c)	-	Additional option added	-
1(e)	Rewritten to make intention clearer	-	-
2(a)	Rewritten to make intention clearer	-	-
2(c)	Editorial amendment	Amended to be more accurate	-
2(d)	Rewritten to make intention clearer	Two additional options added	-
3(a)	Editorial amendments	-	-
3(b)(ii)	-	Editorial amendment	-
3(b)(iii)	-	Amended to cover area cover by ES registration.	-
4(a)	Rewritten to make intention clearer	-	-
4(b)	Editorial amendment	-	-
5(b)	Order changed to reflect sequence of testing	Amended accordingly	-
6(a)	New question. Original outside scope of registration.	Amended accordingly	-
7(b)	Editorial amendment	-	-
9(a)	Editorial amendment	-	-
9(b)	Rewritten to make intention clearer	Amended to concentrate on principle requirements	-
9(e)	-	Amended to concentrate on principle requirements	-