ELECTRICAL WORKERS REGISTRATION BOARD

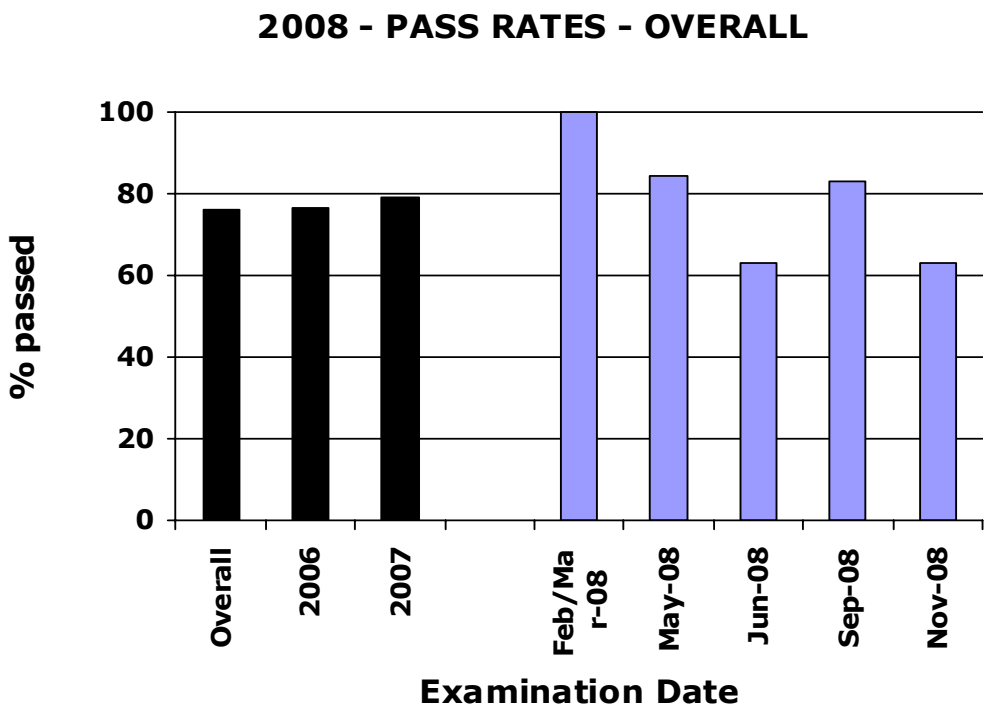
SUMMARY OF

NOVEMBER 2008 EXAMINATION ROUND

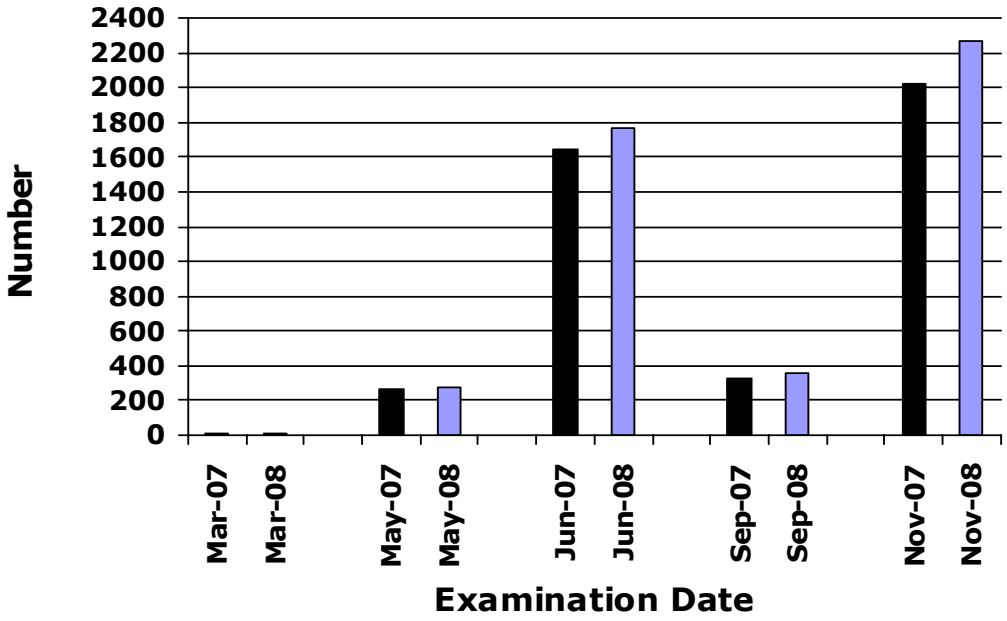
John Sickels
Registrar
21 May 2009

1. Summary of Examinations

	Number of candidates	Number of candidates who passed	Percentage passed
ESTA	428	324	76
ESTB	212	161	76
Elec. Regulations	754	494	65
Elec. Theory	780	380	48.5
Elec. Inspector	89	66	74
TEWC	0	0	0
E Security	1	1	100
November 2008	**2264**	**1426**	**63**



2008 - CANDIDATE NUMBERS - OVERALL



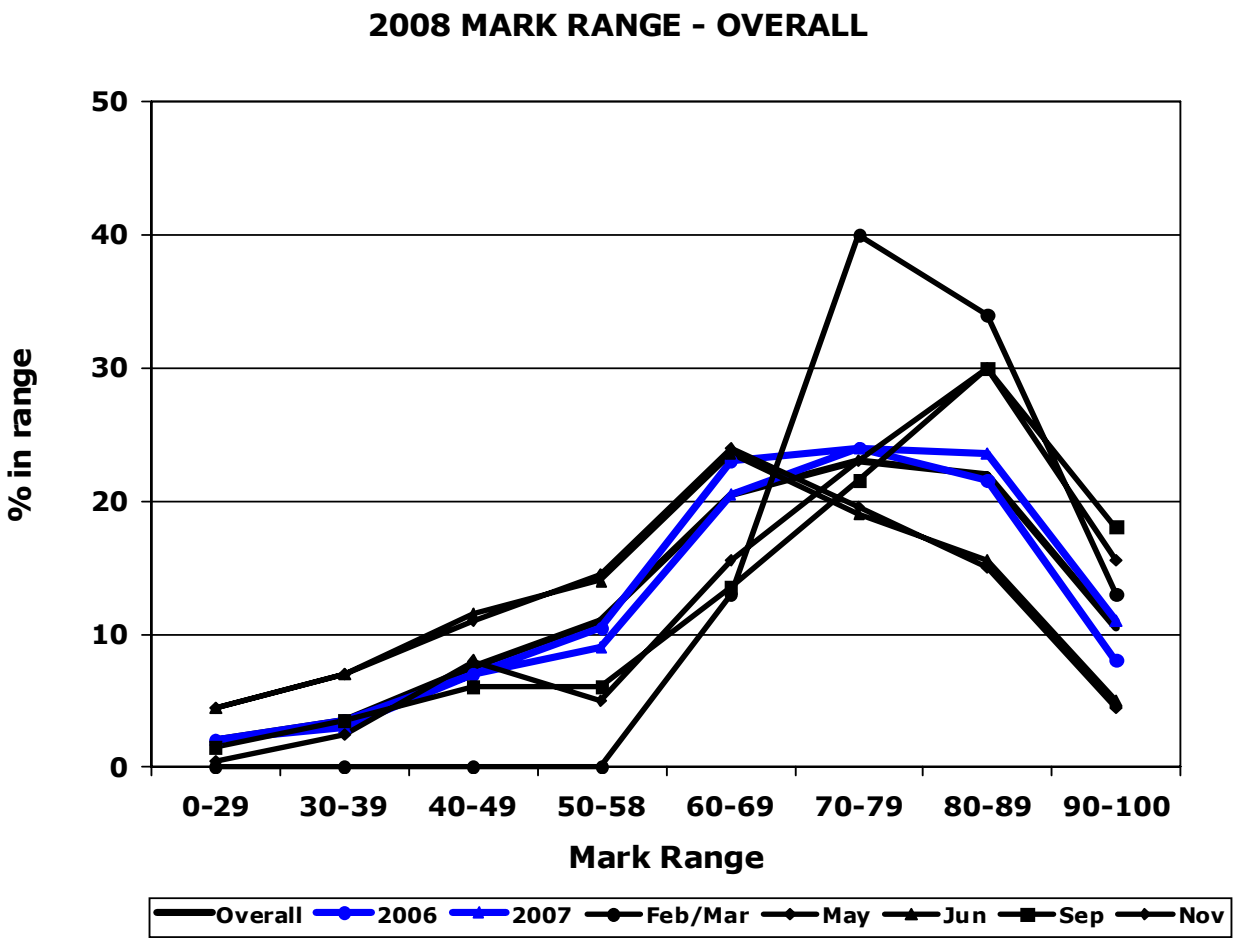
Mark Ranges

Number of candidates

Range	ESTA	ESTB	ER	ET	EI	TEWC	ES	**November 2008**	
90 – 100	42	17	18	17	5	0	1	**100**	**candidates**
80 – 89	110	59	99	65	13	0	0	**346**	**candidates**
70 – 79	86	46	171	112	23	0	0	**438**	**candidates**
60 – 69	86	39	206	186	25	0	0	**542**	**candidates**
50 – 58	36	25	124	132	15	0	0	**332**	**candidates**
40 – 49	31	15	75	126	4	0	0	**251**	**candidates**
30 – 39	16	7	40	91	2	0	0	**156**	**candidates**
0 – 29	21	4	21	51	2	0	0	**99**	**candidates**
	428	**212**	**754**	**780**	**89**	**0**	**1**	**2264**	

% of candidates

Range	ESTA	ESTB	ER	ET	EI	TEWC	ES	**November 2008**	
90 – 100	10	8	2.5	2	5.5	0	100	**4.5**	**% of candidates**
80 – 89	26	28	13	8	14.5	0	0	**15**	**% of candidates**
70 – 79	20	21.5	22.5	14.5	26	0	0	**19.5**	**% of candidates**
60 – 69	20	18.5	27	24	28	0	0	**24**	**% of candidates**
50 – 58	8.5	12	16.5	17	17	0	0	**14.5**	**% of candidates**
40 – 49	7	7	10	16	5	0	0	**11**	**% of candidates**
30 – 39	3.5	3	5.5	12	2	0	0	**7**	**% of candidates**
0 – 29	5	2	3	6.5	2	0	0	**4.5**	**% of candidates**


2008 MARK RANGE - OVERALL
% in range
50
40
30
20
10
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90-100
Mark Range
Overall
2006
2007
Feb/Mar
May
Jun
Sep
Nov

2. General Comments

The overall pass rate of 63% was the same as in the June 2008 examinations, but lower than most other recent examination rounds. This was due mainly to the average results for the Electrician Theory Examinations.

The candidate numbers of 2264 is the highest of any examination round since combined statistics of all examinations have been kept.

Question 6 of the Electrician Theory examination and question 9 of the Electrician Regulations Examination.

It is interesting to note the differing results for similar questions in the Electrician Theory and Regulations examinations.

- In question 6 of the Theory examination, part (a) required candidates to state three hazards that could arise with a phase/neutral transposition in a single-phase electrical installation. Part (b) required candidates to describe how they would test for a transposition and the expected test results.

- In question 9 of the Regulations examination, part (a) required candidates to state - from AS/NZS 3000 - three reasons why polarity testing is necessary in a single-phase electrical installation. Part (b) required candidates to describe how they would test for a transposition and the expected test results.

The results were very dissimilar and there appears to be no explanation for this. In the Theory examination, 58% of candidates gained 7.5 or more marks, 22% between 5 and 7 marks and 20% gained less than 5 marks.

However, in the Regulations examination, 37% of candidates gained 7.5 or more marks, 12% between 5 and 7 marks and 51 % gained less than 5 marks.

The Examinations Officer kindly extracted from the Board's database data relating to 114 candidates who sat both examinations. Analysis of the marks showed the following:

Of the 114 candidates who sat both examinations:

	% of Theory Candidates	**% of Regulations Candidates**
7.5- 10 marks	**57** (58)	**52** (37)
5-7 marks	**13** (22)	**13** (12)
0-4.5 marks	**30** (20)	**35** (51)

The numbers in brackets are the overall percentages. The performance in question 6 of the Theory examination of candidates who sat both examinations was generally consistent with the performance of candidates as a whole. However, the performance in question 8 of the Regulations examination of candidates who sat both examinations was better than the performance of candidates as a whole

Part (a) of both question 6 of the Theory examination and question 8 of the Regulations examination were different, but were worth 3 marks. Part (b) of both questions were essentially the same and worth 7 marks. Therefore, if there was to be and difference in marks between questions if should have been a maximum of 3 for part (a) (assuming that candidates should have the same answer for part (b) in both papers). Based on that, there were 19 Regulations examination candidates whose mark for question 9 differed by 3 or more marks from their mark for question 6 of the Theory examination.

Conversely, there were 21 Theory examination candidates whose mark for question 6 differed by 3 or more marks from their mark for question 9 of the Regulations examination.

Terminology for test instruments

One issue that arose in question 9 of the Electrician Regulations examination was terminology in respect to test instruments. A candidate stated that they would use an insulation resistance tester, trailing lead and remote earth to take a voltage test for a transposition. This prompted much discussion amongst markers until one stated that they had an insulation resistance tester that could do voltage testing. Research confirmed that there are models of test instruments referred to as "insulation resistance testers" that can also function as voltage testers.

The main issue was that whether referring to an insulation resistance tester in that context was correct. From a marking point of view the following problems arise:

- Was the candidate referring to a multi-function "insulation resistance tester" that was capable of functioning as a voltage tester.
- Was the candidate referring to a multi-function "insulation resistance tester" that was not capable of functioning as a voltage tester.
- Was the candidate referring to an "insulation resistance tester" that only tested insulation resistance.

Multi-functional test instruments are more common than not and the multi-functionality seems to be getting broader. The existence of an insulation resistance tester capable of carrying out voltage testing was not known by most markers, but then most would not be looking for one either.

The issue with the insulation resistance tester is the most recent in a series of issues relating to multi-function test instruments that have arisen over recent times. The others include:

- Using a multi-function meter as an alternative to an ohmmeter by stating that the meter is set on the lowest ohms range. The issue is that some multi-function meters cannot accurately read values of less than 1 ohm.
- Using a multi-function insulation resistance tester as an alternative to an ohmmeter by stating that the meter is set on the lowest ohms range. The issues are:
  - some multi-function insulation resistance testers can also function as an ohmmeter and can accurately read values lower than 1 ohm.
  - Some multi-function insulation resistance testers can also function as an ohmmeter but cannot accurately read values lower than 1 ohm.
  - Some multi-function insulation resistance testers cannot function as an ohmmeter even when set to the lowest ohm range.
- Using a PAT tester to test the earth leakage on a plug-in appliance as an alternative to an insulation resistance test. The issue is that some models of PAT testers are not capable of performing earth leakage tests on plug-in appliances.

The issue here is one of certainty. If a marker can take two (or more meanings) from an answer they will invariably mark it incorrect on the basis that it is not clear what a candidate actually means.

I recommend that the Board send an information circular to all training providers on this issue. The circular should state:

> *Examination questions often require a candidate to state the test instrument they would use for a type of test. In recent times some candidates have stated that they would use an instrument with multi-functions without qualifying the statement. The most recent instance being a candidate stating that they would "use an insulation resistance tester, trailing lead and remote earth to take voltage tests" to establish whether or not a phase/neutral transposition had taken place on the mains of a single-phase electrical installation.*
>
> *The problem with this answer is that there are instruments referred to as "insulation resistance testers" that are not multi-function and some that are. Those that are multi-function can have:*
> - *A voltage testing function.*
> - *An ohmmeter function*
>
> *So the marker faces a dilemma – which type of insulation resistance tester is being referred to in the answer? In the absence of any qualifying statement, that answer is marked incorrect.*
>
> *Please advise your students that when answering examination questions that require them to state the type of test instrument they would use, that they be explicit in their answer. It is recommended that they use basic terminology such as "ohmmeter", "voltmeter", "ammeter", "insulation resistance tester" etc.*

If they use a multi-function meter in response to a question then they need to qualify it. For example:

- *Using a multi-function tester as an ohmmeter would have to be qualified by stating the function and the range selected and that the meter is capable of accurately reading values of less than 1 ohm.*
- *Using a multi-function meter as a voltmeter would have to be qualified by stating the function and the range selected relative to the question asked.*

3. Moderation

The moderation went well with all moderators having valuable input. For all examination papers, the initial part of the moderation was carried out via secure email. All papers were moderated via meetings with one moderator from each team checking the final draft.

Within this moderation exercise emphasis was placed on amending marks for questions that included drawings to ensure that marks were awarded for completing a working drawing. This occurred in most cases.

With the Electrical Inspectors examination the original draft of question 1 contained 20, 1 mark questions – 10 of which were in two parts. The moderators thought that the paper was too long and consequently amended question 1 to comprise the 10, two part questions each worth 2 marks.

4. Marking

The marking went very well with all markers returning marked papers by the required dates.

Other than questions 2 and 8 of the Electrician Theory examination paper, there were no substantive issues raised with the moderation exercise. See part 8 for further comment.

5. Electrical Service Technician A

The pass rate of 76% was a very good result and the candidate numbers were the highest in any examination round since statistics were kept from 2003.

Candidates generally performed well in all questions other than questions 6 and 9.

In questions 1 to 5 and 7 and 8 at least 75% of candidates were able to gain 5 or more marks.

In questions 1, 2, 3, 5, 7 and 8 at least 50% of candidates were able to gain 7.5 or more marks

Question 6 posed some problems for candidates with 40% able to gain 7.5 or more marks for this question, while a further 31% were able to gain between 5 and 7 marks. The question required candidates to "calculate voltage drop permitted at socket outlet. Calculate power consumed by heater and at minimum permitted voltage." Many candidates were unsure how to calculate the voltage drop components of this question

Question 9 also posed problems for candidates with 15% able to gain 7.5 or more marks for this question, while a further 28.5% were able to gain between 5 and 7 marks. The question required candidates to "state the precautions when testing. Why bonding necessary on isolating transformer. Insert fuse link, cannot turn off main switch – two precautions. Fault in wiring." Most candidates had little understanding of isolating transformers and how they work. This could reflect the fact that RCDs are the more common devices used for personnel protection.

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

6. Electrical Service Technician B

The pass rate of 76% was a very good result and the candidate numbers were the highest in any examination round since combined statistics were kept from 2003.

Candidates generally performed well all questions other than question 9.

- In questions 1 to 8 at least 75% of candidates were able to gain 5 or more marks

- In questions 1, 3, 4, 5, 7 and 8 at least 50% of candidates were able to gain 7.5 or more marks

Question 9 posed the most problems for candidates with 33% able to gain 7.5 or more marks for this question, while a further 12% were able to gain between 5 and 7 marks. The question required "a circuit diagram of universal motor with reverse switch. Why universal motors are more suitable for some applications. Draw a circuit diagram of cap-start motor, reversing motor."

Candidates seem to be unfamiliar with aspects of universal motors. Many seemed to know how to reverse a universal motor but few understood how a reversing switch in this type of motor worked.

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

7. Electrician Regulations

The pass rate of 65% was slightly lower than previous examination results - apart from June 2008 when the pass rate was 60.5%. However, it is still a good pass rate.

Candidates coped well in the following questions:

- Question 1 - Short answer questions
  56% of candidates were able to gain 7.5 or more marks for this question, while a further 32% were able to gain between 5 and 7 marks.

- Question 2 - Protection and control – RCD characteristics
  Draw connections on switchboard for mains, main earth, RCDs and final subcircuits
  52% of candidates were able to gain 7.5 or more marks for this question, while a further 12% were able to gain between 5 and 7 marks.

  This question was well done by most candidates and it shows that, generally, there is a sound knowledge of switchboards and RCDs. A question in this form has not been set for a number of years and this is the first of its type to include RCDs. However, it is of concern that 23% of candidates gained no marks for this question which indicates a high level of dangerous answers.

  This question prompted much discussion among the markers, primarily because of the high number of dangerous answers that were provided. There were markers who considered that producing a hazardous answer for this type of question should disqualify a candidate from an examination. They were concerned that a candidate could produce hazardous work and still pass the examination.

- Question 3 - Protection and control – Selection of equipment
  Main switches - fittings not controlled by; requirements for two points of supply; remote control. Functional switching. Switching of neutral
  64% of candidates were able to gain 7.5 or more marks for this question, while a further 25% were able to gain between 5 and 7 marks.

- Question 4 - Cables and cords – Selection of mains and submains
  Cable size of 3 phase supply to building, volt drop and load
  42% of candidates were able to gain 7.5 or more marks for this question, while a further 19% were able to gain between 5 and 7 marks.

  This is the best result for this type of question for some time.

- Question 5 - System theory – Earthing of fittings and installations
  Determine size of main earth; Types of earthing conductors not required to be insulated. Whether RCCB can be only circuit protection. PECs at distribution board
  59% of candidates were able to gain 7.5 or more marks for this question, while a further 31% were able to gain between 5 and 7 marks.

Question 6 to 9 posed most problems for candidates.

- Question 6 - Statutory testing and inspection requirements – IR testing
  IR testing requirements. Carrying out IR test

  36.5% of candidates were able to gain 7.5 or more marks for this question, while a further 43% were able to gain between 5 and 7 marks.

  This question was in two parts; the first related to the requirements of AS/NZS 3000; and the second to describing how to carry out a test. 63.5% of candidates gained 7 marks or less and most were not able to adequately describe how to carry out an insulation resistance test of an electrical installation. Once again, many candidates understand the requirements of AS/NZS 3000 but are not able to describe the tests that meet those requirements

- Question 7 - Protection and control – Selection of equipment
  Hazards if impedance of neutral is higher than earth. Switching of ranges. Mechanical stress on socket outlets

  12.5% of candidates were able to gain 7.5 or more marks for this question, while a further 35% were able to gain between 5 and 7 marks. Most candidates had very little knowledge of the effects if a main neutral impedance is higher than that of a main earth.

- Question 8 - Cables and cords – Determining maximum demand
  Maximum demand of 230 V domestic installation

  27% of candidates were able to gain 7.5 or more marks for this question, while a further 47% were able to gain between 5 and 7 marks. Most candidates had difficulty with calculating the lighting maximum demand for this question. AS/NZS 3000 is not particularly specific in this area.

  This type of question is starting to become problematic at this level and, possibly, at the Inspector level as well. The main issue here is that the tables in Appendix C of AS/NZS 3000 cannot be taken at "face value". Often there is need to assess the preamble, the tables, the notes, and the examples to gain an understanding of what is intended. This was the method I used in arriving at the two solutions in the answer schedule. I consider that it is unreasonable to have examination candidates use this process under examination conditions.

- Question 9 - Statutory testing and inspection– Polarity testing
  Why polarity testing necessary, testing for phase/neutral transpositions

  37% of candidates were able to gain 7.5 or more marks for this question, while a further 12% were able to gain between 5 and 7 marks.

  This is in contrast to the results of a very similar question in the theory examination where 58% of candidates were able to gain 7.5 or more marks for this question, while a further 22% were able to gain between 5 and 7 marks.

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

8. Electrician Theory

The pass rate of 48.5% is very disappointing. There is nothing in this examination – aside from question 2(a) that would have caused any major problems or candidates. However, like a number of other questions, question 2(a) was asked previously, albeit in a different form. If they had seen previous regulations examination papers, they would have seen very similar diagrams. In addition:

- Most of the short-answer questions in question 1 have been set before in the exact same form.

- Each part of question 3 has been regularly set as questions over the previous three years, although this is the first time candidates had to draw a three-phase RCD (they have all been single-phase in the past).

- With question 4, single and three-phase power calculations have been regularly set in recent times. Resolution of the neutral current by vectors was a question set in June 2008.

- With question 5, motor diagrams and circuits, particularly DOL control circuits are questions that have been set regularly. This question related to drawing the power and control circuits for a star/delta starter. The June 2008 examination contained a similar question relating to a DOL forward/reverse motor and control circuit.

- Question 6 has been asked on a regular basis, the last time being in November 2007.

- Question 7 is a type that has been set in the previous 3 examinations. A diagram was added on this occasions to prompt candidates into seeing this as a single-phase issue.

- Question 8 relates to fault location this type of question has been set in the previous 2 years.

- Question 9 relates to transformers and this type of question was set in both 2007 examinations.

Candidates coped well in the following questions:

- Question 3 - Protection and control – RCD characteristics
  Draw circuit diagram of three-phase RCD. Describe operation of RCD on earth fault. Define RCBO.

  47% of candidates were able to gain 7.5 or more marks for this question, while a further 32% were able to gain between 5 and 7 marks.

  Candidates did well in this question even though this is the first time an RCD question has involved drawing a three-phase RCD. This part constituted the largest part of the question.

- Question 6 - Fault diagnosis – Mains transposition
  Hazards of mains transposition, testing for transpositions.

  58% of candidates were able to gain 7.5 or more marks for this question, while a further 22% were able to gain between 5 and 7 marks.

  This is in contrast to the results of a very similar question in the regulations examination where only 37% of candidates were able to gain 7.5 or more marks for this question, while a further 12% were able to gain between 5 and 7 marks.

- Question 8 - Fault diagnosis – Faulty hot water cylinder
  Faulty hot water cylinder, safely isolate, why cylinder operates on 1 fuse, testing an description of faults
  33% of candidates were able to gain 7.5 or more marks for this question, while a further 43.5% were able to gain between 5 and 7 marks.

  The markers pointed out that the diagram supporting this question showed a neutral being switched which they thought was a dangerous precedent to set. The diagram showed the thermostat between the contactor coil and neutral. They thought this should have been detected at the moderation stage.

  Note that for this report and for the document for the Board's website, this diagram has been amended to show the contactor coil between the thermostat and neutral.

- Question 9 - Transformers – Operating principles
  Three- phase transformer – calculate secondary phase and line voltages, full load current and secondary line current. Calculate percentage regulation.
  49.5% of candidates were able to gain 7.5 or more marks for this question, while a further 21% were able to gain between 5 and 7 marks.

Candidates struggled with question 2 which related to describing the circuit used by an earth fault loop impedance tester. Markers found this question difficult to mark and some latitude was allowed in letting markers look at the entire answer given for part (a) and awarding marks on that basis.

Markers comments included "This was a difficult question to mark in an objective way. Many of the participants did not seem to understand the type of answer required by the examiner. Maybe if we want to explore the knowledge of the fault loop impedance pathway, we need to frame the question differently."

"Very few candidates knew anything about an Earth Loop Impedance Tester to the extent that one wonders if it was actually in the syllabus."

It is acknowledged that, at this level, posing a question such as this supported by diagrams would probably better serve candidates rather than just a written question.

Question 4 should have been very straight-forward for candidates with mainly simple power calculations involved yet 51% of candidates gained less than 5 marks.

Substantial questions relating to motors – such as question 5 – continue to pose problems for most candidates with 20% of candidates gaining no marks which indicates a high level of dangerous answers. 60% of candidates gained less than 5 marks. As a marker commented "This question was poorly answered and better teaching needs to go into this area, particularly as a lot of apprentices don't seem to get the necessary work experience."

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

9. Electrical Inspector

The pass rate of 74% was very good and was consistent with previous examinations except for June 2008 where the pass rate was 50%. As in past years the majority of candidates passed this examination with marks in the range 60 to 79.

Candidates coped well in the following questions:

- Question 2 - System theory – MEN systems
  Describe the circuit tested by an earth fault loop impedance tester. Why installation requires larger earthing lead. Why path through main neutral more important. Main switch requirements with two points of supply
  50.5% of candidates were able to gain 7.5 or more marks for this question, while a further 28% were able to gain between 5 and 7 marks.

- Question 3 - Cables and cords – Selection of final subcircuits
  Maximum volt drop permitted; options for calculating voltage drop. Calculate cable size so volt drop does not exceed 2.5%.
  59.5% of candidates were able to gain 7.5 or more marks for this question, while a further 28% were able to gain between 5 and 7 marks.

- Question 4 - Protection and control – RCD characteristics
  Four situations where RCD protection not required. Identifying Type A RCDs. Describe operation of RCD when earth fault occurs
  47% of candidates were able to gain 7.5 or more marks for this question, while a further 42% were able to gain between 5 and 7 marks.

- Question 5 - Certification, verification WOEF
  Three different installations. Testing and inspection Standards. Connection requirements. Certification and inspection requirements.
  56% of candidates were able to gain 7.5 or more marks for this question, while a further 25% were able to gain between 5 and 7 marks.

- Question 7 - Testing and inspection methods
  Landlord requests inspection – which Standard used; inspection of fixed-wired appliances and MEN system. Four instrument tests. Document to be provided

  77.5% of candidates were able to gain 7.5 or more marks for this question, while a further 14.5% were able to gain between 5 and 7 marks.

- Question 9 - Protection and control – Protection characteristics
  Two terms relating to current rating. Characteristics of short circuit devices. Maximum touch voltage. Final subcircuits and disconnection times

  46% of candidates were able to gain 7.5 or more marks for this question, while a further 27% were able to gain between 5 and 7 marks.

Candidates had most difficulty with questions 6 and 8. Both were similar in that both required candidates to calculate the size of transformers. Question 6 required calculations to be carried out to determine the heaviest loaded phase and determine the transformer size from the result. This type of question has not been set for inspectors for some time (although it is common in electrician examinations). In fact this question was contained in the June 2008 Electrician Theory examination.

Question 8 required candidates to determine the loading through use of AS/NZS 3000.

It is disconcerting that candidates at inspectors level cannot perform – what for them should be - basic calculations.

An abridged analysis is contained in Appendix 5 of this paper. The full analysis is contained in Attachment 5.

10. Tradespersons Electrical Work Certificate

There were no candidates for the Tradesperson Electrical Work Certificate examination

An abridged analysis is contained in Appendix 6 of this paper

11. Electronic Security Alarm Installer

There was 1 candidate for the Electronic Security Alarm Installer examination who passed with a mark of 94.

An abridged analysis is contained in Appendix 7 of this paper

Appendix 1

Electrical Service Technician A Examinations

14 and 15 November 2008

ESTA 1042, a moderated paper, was used for the examination of 15 November 2008.
ESTA 1043, a moderated paper, was used for the examination of 14 November 2008

A1.1 - Overall Candidate Performance

	Number of candidates	**Number of candidates who passed**	**Percentage passed**
ESTA 1042	427	324	76
ESTA 1043	1	0	0
November 2008	**428**	**324**	**76**

ESTA 1042

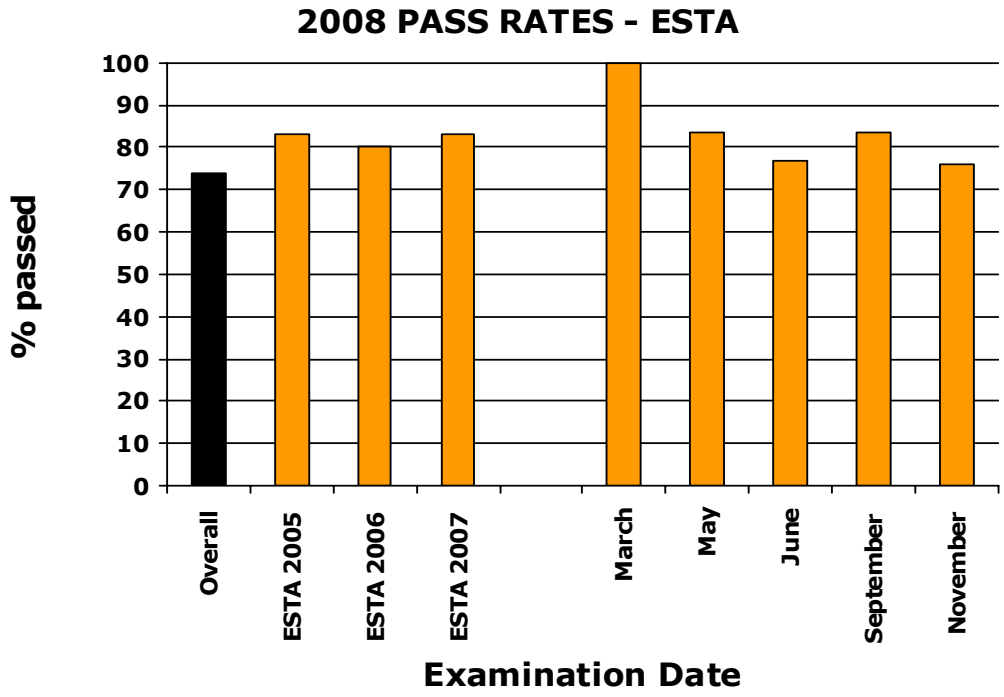
All candidates

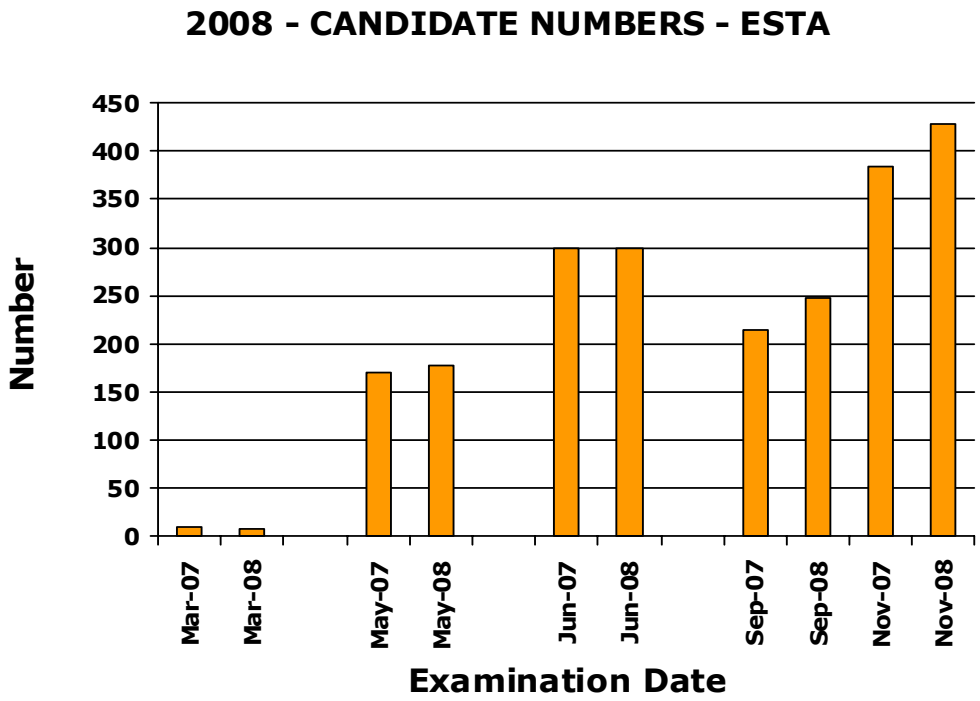
Average pass mark 68 %
Median mark 73

Those who passed

Average pass mark 77
Median mark 78.5

13 Candidates gained 95 or more marks


2008 PASS RATES - ESTA
% passed
100
90
80
70
60
50
40
30
20
10
0
Overall
ESTA 2005
ESTA 2006
ESTA 2007
March
May
June
September
November
Examination Date


2008 - CANDIDATE NUMBERS - ESTA
Number
450
400
350
300
250
200
150
100
50
0
Mar-07
Mar-08
May-07
May-08
Jun-07
Jun-08
Sep-07
Sep-08
Nov-07
Nov-08
Examination Date

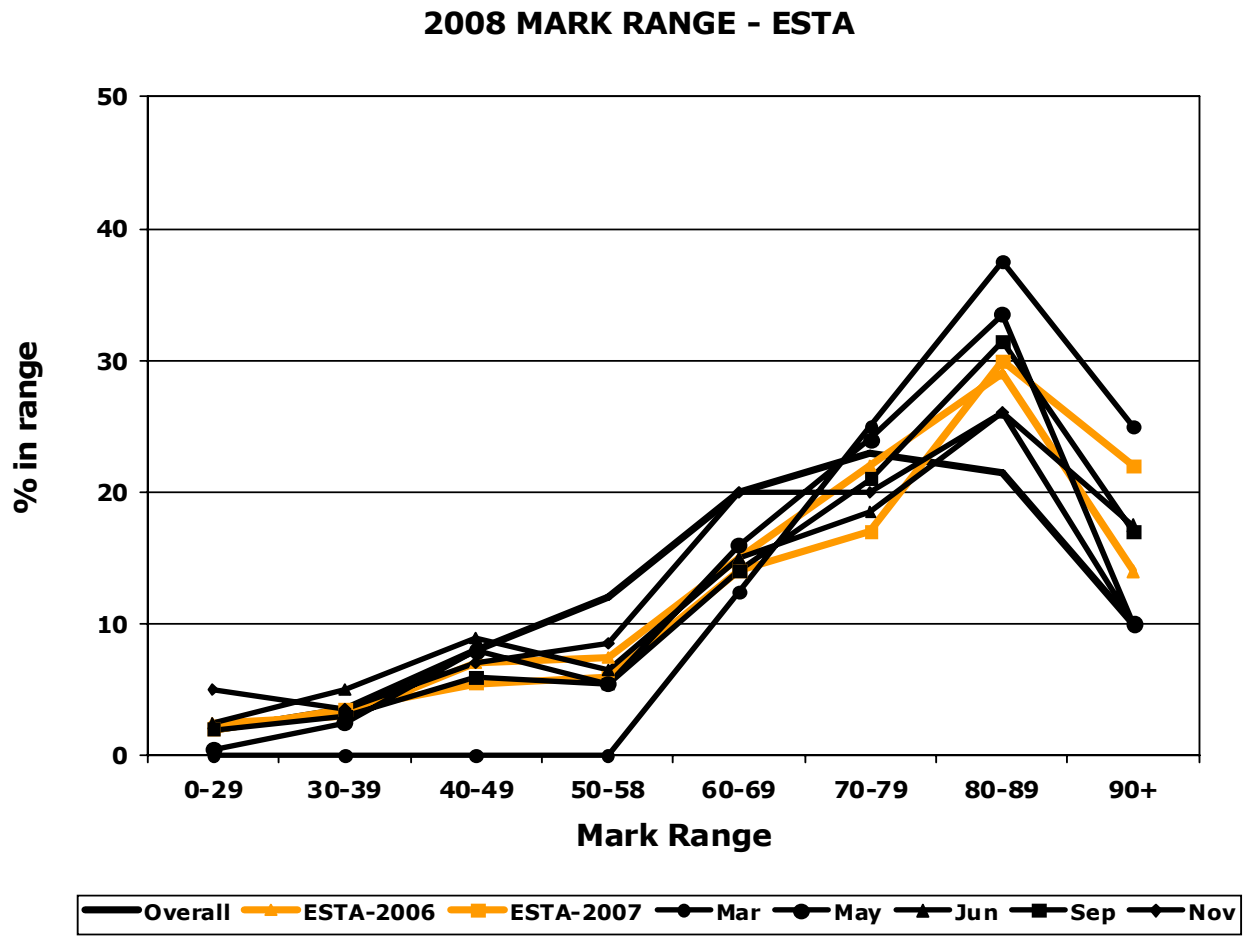
Mark Ranges

Number of candidates

Range	ESTA 1042	ESTA 1043				November 2008	
90 – 100	42	0				**42**	**candidates**
80 – 89	110	0				**110**	**candidates**
70 – 79	86	0				**86**	**candidates**
60 – 69	86	0				**86**	**candidates**
50 – 58	36	0				**36**	**candidates**
40 – 49	30	1				**31**	**candidates**
30 – 39	16	0				**16**	**candidates**
0 – 29	21	0				**21**	**candidates**
	427	**1**				**428**	

% of candidates

Range	ESTA 1042	ESTA 1043				November 2008	
90 – 100	10	0				**10**	**% of candidates**
80 – 89	26	0				**26**	**% of candidates**
70 – 79	20	0				**20**	**% of candidates**
60 – 69	20	0				**20**	**% of candidates**
50 – 58	8.5	0				**8.5**	**% of candidates**
40 – 49	7	100				**7**	**% of candidates**
30 – 39	3.5	0				**3.5**	**% of candidates**
0 – 29	5	0				**5**	**% of candidates**


2008 MARK RANGE - ESTA
% in range
50
40
30
20
10
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
Overall
ESTA-2006
ESTA-2007
Mar
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**				**60**	**35**	**5**
Q 2	**K4.46**	**Testing and inspection methods**			**IR testing of appliance with semi-conductors. IR testing of dishwasher. Why ohmmeter not used for IR test. Other IR test instruments.**	**50**	**34**	**16**
			Mar 2008	2	IR testing and earth leakage testing, IR testing and avoid damage to semi-conductor devices, IR test of concrete mixer	75	25	0
			May 2008	6	IR testing and earth leakage testing, IR testing and avoid damage to semi-conductor devices, IR test of concrete mixer	55	29	16
			Sep 2008	6	IR test of appliance with MOV. Alternative to IR test. IR test of appliance with semi-conductors. IR test of concrete mixer.	69	19	12

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**H3d.41**	**<u>Cables and Cords</u> Specifications**			**Precautions with flexible cord would on drum. Voltage drip in flexible cords. Flexible cord current ratings.**	**50**	**32**	**18**
			May 2007	7	Why volt drop in cord, effect of Vd, cord current ratings. Selection of flexible cord	65.5	16.5	18
			Jun 2007	7	Cord current ratings, colour coding	37	40	23
			Sep 2007	2	Core & colour coding of cords, vd in cords	75	19	6
			Sep 2007	2	Core & colour coding of cords, cord wound on drum	93	5	2
			Nov 2007	8	Effect of cord would on drum, why voltage drops in cord, current ratings	56	27	17
			Mar 2008	8	Effect of cord would on drum. Measures to prevent cord failing, why voltage drops in cord, current ratings	50	50	0

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**K4.46**	**Testing and inspection methods**			**PEC testing of electrical appliance. Retesting repaired appliance. Flexible cord insulation characteristics**	**48.5**	**34**	**17.5**
			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
			Sep 2008	6	IR test of appliance with MOV. Alternative to IR test. IR test of appliance with semi-conductors. IR test of concrete mixer.	69	19	12
Q 5	**H6.43**	**Selection of fittings and Appliances**			**Use of bayonet caps, terminating ES lampholders, microgap switches. Visual inspection of parts of an appliance.**	**59**	**29**	**12**
			Sep 2004	15	Use of bayonet caps, terminating ES lampholders, microgap switches	53	22.5	24.5
			Nov 2005	14	Use of bayonet caps, terminating ES lampholders, microgap switches	58	23	19
			Mar 2008	7	Use of bayonet caps, terminating ES lampholders, microgap switches, specific inspections of plug and flexible cord and appliance	75	25	0

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**C2.11**	**a.c. – Measurements V, A, P, pf**			**Calculate voltage drop permitted at socket outlet. Calculate power consumed by heater and at minimum permitted voltage.**	**40**	**31**	**29**
			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
			Jun 2008	2	Calculate current for heater at 230V. Calculate permitted voltage variation, power at minimum and maximum voltage variations. Faults on identical heaters	43	21	36
			Sep 2008	8	Portable water heater – calculate current and power in low positions and resistance, current and power in high position	72.5	7.5	20
			Sep 2008	8	Calculate voltage drop permitted at socket outlet. Calculate power consumed by heater and at minimum permitted voltage.	44	37	19

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**H10.66**	**<u>Fault diagnosis</u>**			**Fan heater used when faulty – calculate current in PEC, effect on operation of fuse. Phase/neutral transpositions. Why low PEC value contributes to safety**	**53**	**26.5**	**20.5**
			Sep 2007	3	Faulty heater. Draw circuit diagram, calculate fault current, whether fuse will blow. Phase, neutral transpositions.	56.5	20.5	23
			Nov 2007	4	Faulty heater. Calculate fault current, whether fuse will blow, power dissipated. Phase, neutral transpositions.	62.5	16	21.5
			May 2008	5	Appliances plugged in socket out – fuse blows. Describe how to determine if socket outlet overloaded, describe tests to determine if faulty appliance	14	22	64
			Jun 2008	5	Faulty dishwasher, calculate current and power in PEC and whether fuse would operate, effect of transpositions	68	22	10
			Sep 2008	7	Appliances plugged in socket out – fuse blows. Describe how to determine if socket outlet overloaded, describe tests to determine if faulty appliance	50	19	31

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**H1c.31**	**<u>Protection and Control</u> Selection of control and protection equipment**			**Under-rated and over-rated fuses. Advantages of HRC fuse over rewireable fuses. Why not permitted to bridge HRC fuse with fuse wire. Types of faults on MCBs and HRC fuses**	**54.5**	**27**	**18.5**
			Nov 2006	4	Characteristics of HRC fuses, advantages of HRC fuses over rewireable fuses, why not permitted to bridge HRC fuse carrier with fuse wire	55	31	14
			Jun 2007	2	Four characteristics of replacement HRC fuse, under-rated and over-rated fuses, technical advantages of HRC over rewireable fuses	78	14	8
			Jun 2007	2	How RCD operates on fault, meaning of PRCD, why not permitted to use fuse wire on HRC fuse	37	40	23
			Nov 2007	5	What thermal overload detects, HRC fuse characteristics, how RCD operates, define PRCD	57	24	19
			Jun 2008	8	Three advantages of HRC fuses when compared to rewireable fuses. Why HRC fuse is not to be replaced with fuse wire. How RCD operates when there is a fault, PRCDs	59	21	20

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**L1.40/54**	**<u>Isolation</u> Equipment and Personal safety**			**Precautions when testing. Why bonding necessary on isolating transformer. Insert fuse link, cannot turn off main switch – two precautions. Fault in wiring.**	**15**	**28.5**	**56.5**
			Nov 2004	16	Personal safety when connecting test instruments	15	26	59
			May 2005	19	Safety reasons why need to turn off main switch before inserting fuse	61	25	14
			May 2007	5	Safety, replacing a blown fuse, continued isolation, switching off and isolating, PPE and its use	54	31	15
			Nov 2007	2	Check before turning off main switch, define PPE, switching off and isolating, precautions when connecting test instruments	42	38	20
			Jun 2008	9	Why recommended to turn off main switch. Isolation of appliances. Personal protective safety equipment.	54	33	13
			Sep 2008	2	Insert fuse link, cannot turn off main switch – two precautions. Fault in wiring. Difference between switching off and isolation. Continued isolation	49.5	42	8.5

A1.3 - ESTA 1042

A1.3.1 - Moderation

There were two moderators for ESTA 1042.

ESTA 1042 was moderated in a meeting of 28 October.

A1.3.2 - Marking

There were three markers for ESTA 1042.

Teleconferences were held with the markers on 25 November and 5 December.

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

Comments

Overall, the examination was fair and balanced. As with most examinations, if the theory was known, the answers were easy, and this clearly showed in some papers. The questions regarding fault finding techniques and principles were sometimes not all that well answered.

The moderation of question 4(b) could have been more specific as some answers stated testing for compliance with AS/NZS 3760, whereas the answer schedule detailed the actions required to remedy the faulty earth connection.

Question 9(c) was ambiguous. The three actions accepted for the answer, (only two required for the answer) were narrow in concept and there should have been more acceptable answers.

The writing and grammar of a number of candidates (some appear would appear to have English as a second language) made it difficult to read and understand some of the answers. Some of the calculations in question 6 were not very well set out which made it difficult to follow; especially when some parts are correct and others were not.

A1.3.3 - Amendments to ESTA 1042

The significant amendments to ESTA 1042 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
2(a)	Preamble rewritten to make intention clearer	-	-
2(b)(ii)	-	-	Additional option added
3(b)	-	-	2nd bullet point rewritten to be more accurate
4(a)(i)	-	Additional option added	-
4(b)	-	Amended to be more specific	-
7(b)(ii)	-	-	Additional option added
9(a)	-	Two additional options added	3rd bullet point deleted – not relevant to question

Appendix 2

Electrical Service Technician B Examinations

21 and 22 November 2008

ESTB 2033, a moderated paper, was used for the examination of 22 November 2008.
ESTB 2034, a composite paper, was used for the examination of 21 November 2008.

A2.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
ESTB 2033	211	160	76
ESTB 2034	1	1	100
November 2008	**212**	**161**	**76**

ESTB 2033

All candidates

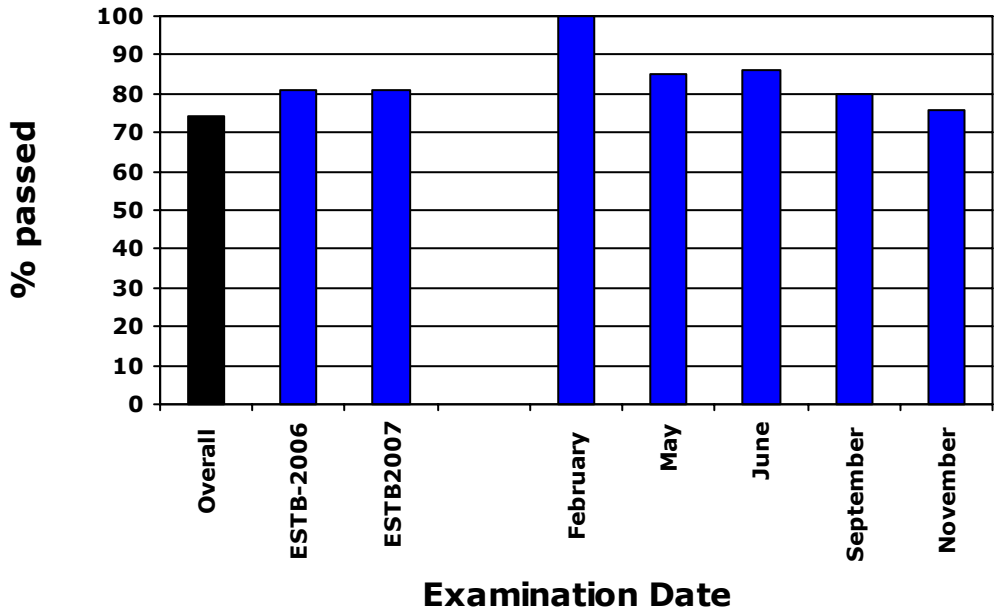
Average pass mark 69.5 %
Median mark 73

Those who passed

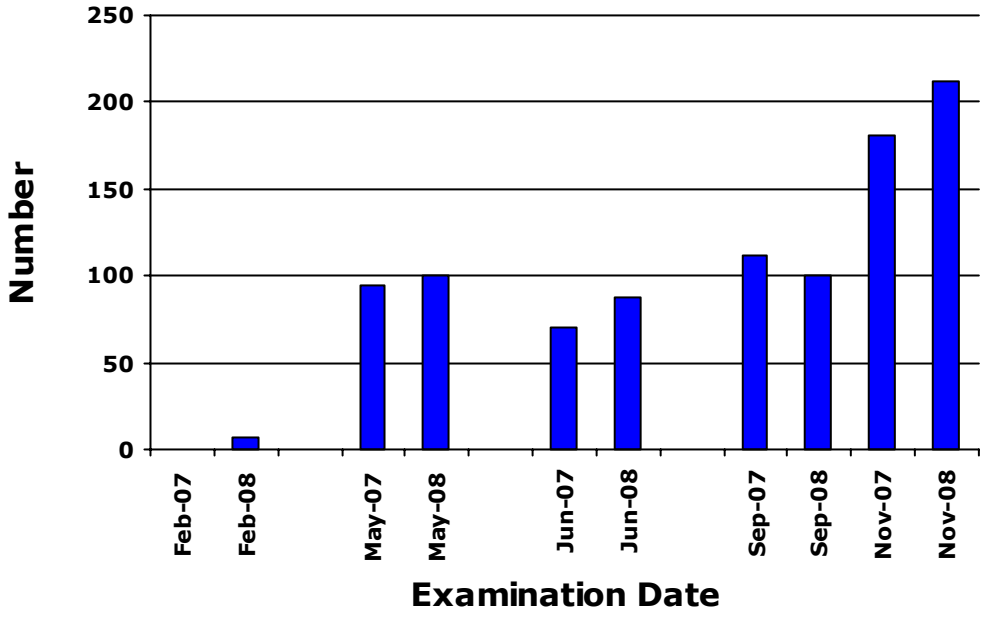
Average pass mark 77 %
Median mark 78

17 candidates gained 90 or more marks

2008 PASS RATES - ESTB



2008 CANDIDATE NUMBERS - ESTB



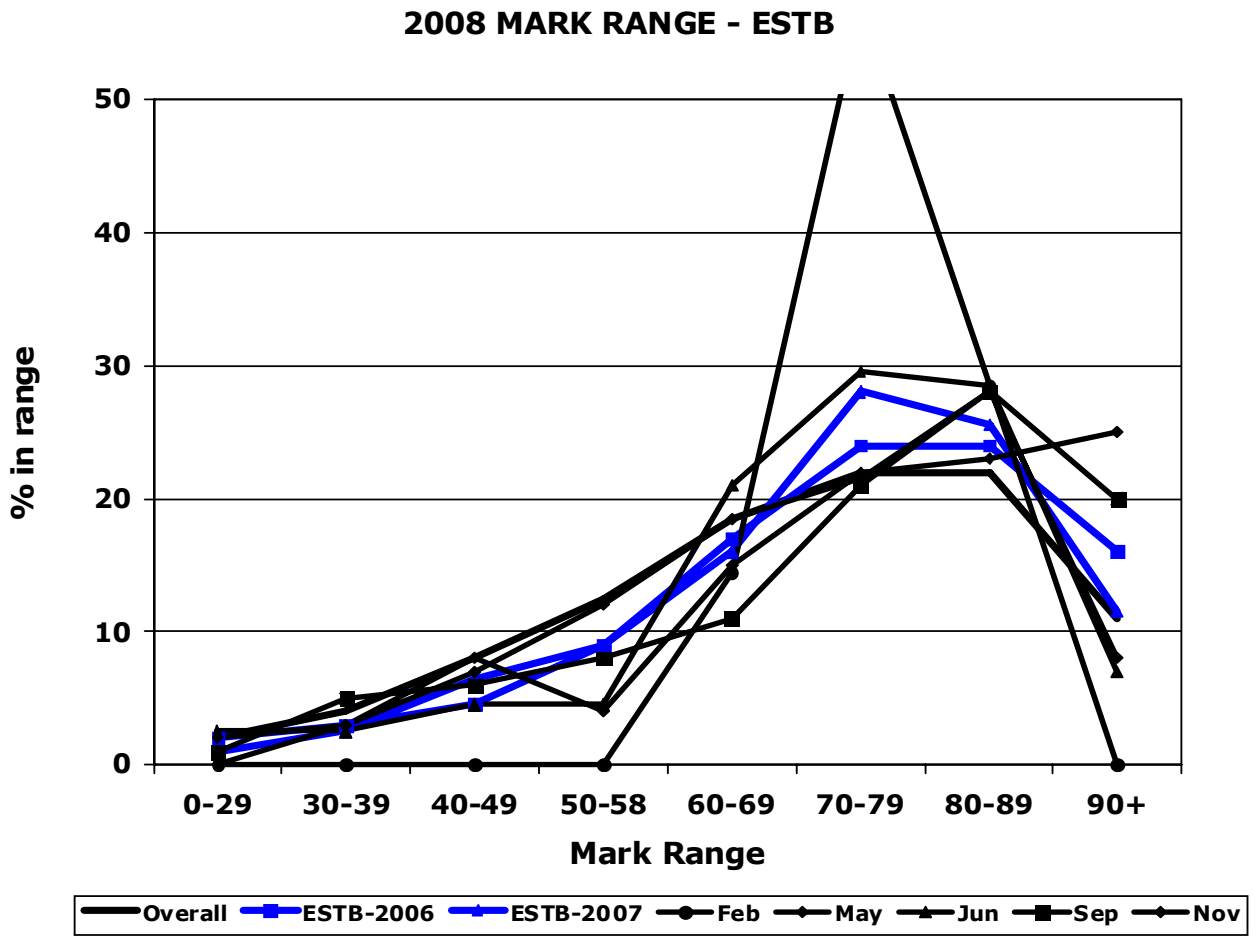
Mark Ranges

Number of candidates

Range	ESTB 2033	ESTB 2034		**November 2008**	
90 – 100	17	0		**17**	**candidates**
80 – 89	59	0		**59**	**candidates**
70 – 79	45	1		**46**	**candidates**
60 – 69	39	0		**39**	**candidates**
50 – 58	25	0		**25**	**candidates**
40 – 49	15	0		**15**	**candidates**
30 – 39	7	0		**7**	**candidates**
0 – 29	4	0		**4**	**candidates**
	211	**1**		**212**	

% of candidates

Range	ESTB 2033	ESTB 2034		**November 2008**	
90 – 100	8	0		**8**	**% of candidates**
80 – 89	28	0		**28**	**% of candidates**
70 – 79	21.5	100		**21.5**	**% of candidates**
60 – 69	18.5	0		**18.5**	**% of candidates**
50 – 58	12	0		**12**	**% of candidates**
40 – 49	7	0		**7**	**% of candidates**
30 – 39	3	0		**3**	**% of candidates**
0 – 29	2	0		**2**	**% of candidates**


2008 MARK RANGE - ESTB
% in range
50
40
30
20
10
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
Overall
ESTB-2006
ESTB-2007
Feb
May
Jun
Sep
Nov

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 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**				**58**	**33.5**	**8.5**
Q 2	**K4.46**	**Testing and inspection methods**			**Main safety issues – connecting ammeter in parallel, connecting voltmeter in series. Safety precautions when testing. Testing to ensure appliance is electrically safe.**	**42**	**32**	**26**
			Jun 2008	4	Connecting ammeter in parallel and voltmeter in series, carrying out IR test.	68	19.5	12.5
			Sep 2008	5	Main safety issues – connecting ammeter in parallel, connecting voltmeter in series. Safety precautions when testing. Testing to ensure appliance is electrically safe.	46	27	27
			Sep 2008	5	Main safety issues – connecting ammeter in parallel, connecting voltmeter in series. Safety precautions when testing. Testing to ensure appliance is electrically safe.	38	29	33

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**D4.22**	**<u>System theory</u> - MEN systems**			**List nominal voltage in MEN system. Define term MEN system. Situations where no neutral required. Frequency and peak voltage**	**52.5**	**27**	**20.5**
			Feb 2008	7	Define term MEN system, why neutral is required. Draw circuit diagram of 3 phase and single phase consumers connected to distribution system.	100	0	0
			May 2008	4	Circumstances in which neutral is required and not required in three phase final subcircuit. Diagram of MEN system arrangement	56	21	23
			Jun 2008	8	Why PEC is needed and must be secure, why neutral conductor is required, and situations where it is not required. Define MEN	45	32	23
			Sep 2008	8	List nominal voltage in MEN system. Define term MEN system. Situations where no neutral required. Frequency and peak voltage	55	28	17
			Sep 2008	8	Diagram of MEN system with single and three phase installations. Why PEC is required. Why neutral required with different heating loads.	62	9.5	28.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**H3d.41**	**<u>Cables and Cords</u> Specifications**			**Flexible cords - four factors when selecting. Colours of three-phase cable, fitting plug to flexible cord, current rating of cords**	**57.5**	**33.5**	**9**
			May 2007	9	Factors in selecting cord, colour coding, volt drop in cords, current rating of cords	75	20	5
			Sep 2007	6	Four physical factors when selecting cord, why voltage less and load end of cord, define current rating of cord, colours coding for three-phase cord.	80	20	0
			Sep 2007	6	Six factors when selecting cord, colour coding of single phase cord. Two ways of identifying double insulated appliance	83	14	3
			Nov 2007	7	Flexible cords - volt drop, reduce effect of volt drop, colour coding	69	26	5
			Feb 2008	4	Flexible cords - four factors when selecting, volt drop and reducing the effect of voltage drop, colour coding	57	43	0
			May 2008	9	Flexible cords - four factors when selecting. Colours of three-phase cable, volt drop and reducing the effect of voltage drop, current rating of cords	64	33	3

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	**K2.38**	**Statutory testing and inspection requirements**			**Testing of portable water heater. Visual checks.**	**68**	**21.5**	**10.5**
			Jun 2007	4	Testing to AS/NZS 3760, polarity tests	94	3	3
			Sep 2007	7	Standard to which appliance must be tested, testing requirements and visual checks to Standard	56	38	6
			Sep 2007	7	Standard to which appliance must be tested, three checks and tests to be carried out, testing requirements of Standard, polarity testing	34.5	38	27.5
			Feb 2008	6	Testing to AS/NZS 3760, inspections and tests. Polarity testing	72	28	0
			May 2008	3	Testing to AS/NZS 3000. PEC tests, testing to check integrity of insulation	80	16	4
			Sep 2008	9	AS/NZS 3760 – test on an appliance. IR values for isolating transformer. Polarity testing	69	17	14
			Sep 2008	9	Testing of portable water heater. Visual checks.	43	33	24

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**E2.16**	**<u>3ph-Motor/Alternators</u> Selection, starting, protection**			**Diagram of 230V control circuit. How thermal overload and HRC fuse protect motor.**	**46**	**30**	**24**
			Sep 2007	8	Draw and label circuit diagram of 230V motor control circuit, protection other than thermal overload, two causes for fault.	50	25	25
			Sep 2007	8	Name numbered parts of 230V motor control circuit, two typical operating voltages, how thermal overload and HRC fuse protects motor, reveal of supply to motor	72	23	5
			Nov 2007	6	Draw and label circuit diagram of 230V motor control circuit, finding motor winding, connecting motor	60.5	25	14.5
			May 2008	9	Draw 400V control circuit, motor faults.	59	20	21
			Jun 2008	9	Draw 400V control circuit, motor faults.	58.5	19.5	22
			Sep 2008	2	Diagram of 230V control circuit. How thermal overload and HRC fuse protect motor. Starter fault	55	23	22
			Sep 2008	2	Diagram of 230V control circuit. What faults thermal overload and HRC fuses detect. Motor faults	33	29	38

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**H1a.27**	**<u>Protection and Control</u> Protection characteristics**			**Current rating of fuses, why fuses blow, characteristics of protection devices, , reloading rewireable fuses, thermal overloads**	**61**	**24**	**15**
			Jun 2007	3	Current rating of fuse, over-rated and under-rated fuses, use of phase failure and phase reversal relays, reloading rewireable fuses	90.5	6.5	3
			Sep 2007	4	Why important to thread fuse wire through tortuous path, What is utilisation category (fusing factor) and how it influences fuse operation, why important to select correct rupturing capacity, calculate fuse current rating	56	38	6
			Feb 2008	5	Current rating of fuses, why fuses blow, characteristics of protection devices, rewireable fuses, operation of thermal type MCB	100	0	0
			May 2008	6	Current rating of fuses, why fuses blow, characteristics of protection devices, rewireable fuses, back-up protection, reloading rewireable fuses	75	16	9

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**H10.66**	**Fault diagnosis**			**Connect new hot water cylinder to existing isolating switch – testing in order, describe tests, personal safety**	**57**	**24**	**19**
			Sep 2007	9	Reconnection of single phase sewing machine, detail instrument checks before connection, ensuring own safety checks after reconnection.	55	35	10
			Jun 2008	5	Appliances plugged in socket out – fuse blows. Describe how to determine if socket outlet overloaded, describe tests to determine if faulty appliance	50.5	31	18.5
			Sept 2008	3	Reconnection of printing press – safety before connecting testing before connection, main safety checks after connection	52.5	32	15.5
			Sep 2008	3	Connect new hot water cylinder to existing isolating switch – testing before connection.	66.5	14.5	19

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**F1.19**	**<u>1ph-Motors</u> - Theory**			**Circuit diagram of universal motor with reverse switch. Why universal motors more suitable for some applications. Circuit diagram of cap-start motor, reversing motor.**	**33**	**12**	**55**
			Jun 2007	2	Circuit diagram of cap-start motor, reversing, purpose of capacitor, calculate power, faults on single phase motors	55	35.5	9.5
			May 2008	2	Name parts of diagram of 230V induction motor. Redraw diagram to reverse motor. Effects on motor if various parts were faulty.	48	39	13
			Sep 2008	6	Circuit diagram of cap-start motor, reversing motor. Reversing universal motor. Diagram of split-phase motor, reversing of motor. Motor fault.	72	15	13
			Sep 2008	6	Circuit diagram of universal motor with reverse switch. Why universal motors more suitable for some applications. Circuit diagram of cap-start motor, reversing motor.	33	24	43

2.3 - ESTB 2033

A2.3.1 - Moderation

There were two moderators for ESTB 2033.

ESTB 2033 was moderated in a meeting of 28 October.

A2.3.2 - Marking

There were two markers for ESTB 2033.

Teleconferences were held with the markers on 1 and 8 December.

Version 2 of the answer schedule was sent to markers on 1 December.

Comments

This was a fair examination although it involved a lot of writing. Questions 2, 6 and 9 had practical content as well as theory. These questions identified knowledge gaps in most candidates.

Questions 1(h), 1(i) and (5c) required candidates to interpret regulations and parts of AS/NZS 3760 to provide an answer. These are good questions and provide a better means of assessment of a candidate's technical knowledge and understanding of requirements rather than questions which only ask candidates to regurgitate definitions from regulations/standards.

Marker 1 had a pass rate of 86% from 105 papers marked. Marker 2 had a pass rate of 66% from 106 papers marked.

A2.3.3 - Amendments to ESTB 2033

The significant amendments to ESTB 2033 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(b)	Preamble rewritten to make intention clearer	Amended accordingly	-
1(c)	Rewritten to make intention clearer	Additional option added	-
1(g)	Replaced with new question. Original duplicated elsewhere in paper	Amended accordingly	-
1(j)	-	Two additional options added	-
2(b)	-	-	Rewritten to be more accurate
2(c)	Preamble rewritten to make intention clearer	-	3rd bullet point deleted as being not relevant to question
3(c)	-	Additional option added	-
5(a)	-	Editorial amendment	-
5(c)	-	Option removed as being not relevant to question	-
4(a)	Rewritten to remove superfluous information	-	-
7(b)(ii)	-	-	Additional option added
7(d)	Rewritten to make intention clearer	Amended to require only answers in the positive as required by the question	-
8(a)	Split into two parts. 1st part relates to the order of the testing, 2nd part relates to how the test are carried out	Amended accordingly	Test results amended to be more accurate
8(b)	-	1st bullet point amended to be more accurate	-
9(b)	Changed to require technical reasons to be given	Amended accordingly	2nd bullet point amended to be more accurate

Appendix 3

Electrician Regulations Examinations

6, 7, 21, 22 November 2008

ER 34, a moderated paper, was used for the examination of 22 November 2008
ER 35, a composite paper, was used for the examinations 6, 7 and 21 November 2008

A3.1 - Overall Candidate Performance

	Number of candidates	**Number of candidates who passed**	**Percentage passed**
ER 34	748	488	65
ER 35	6	6	100
November 2008	**754**	**494**	**65**

ER 34

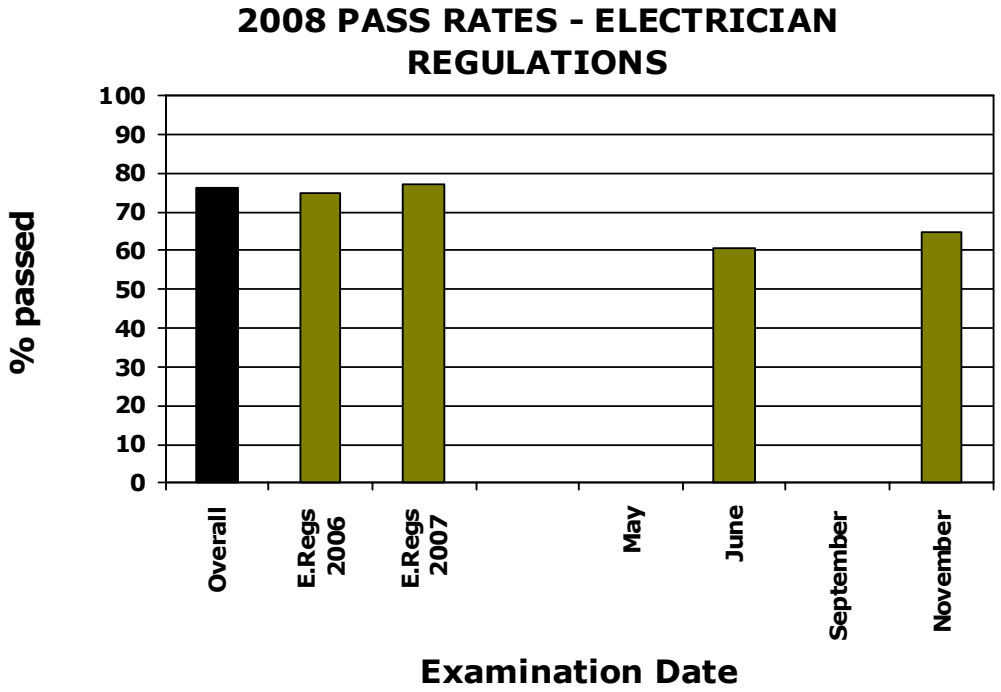
All candidates

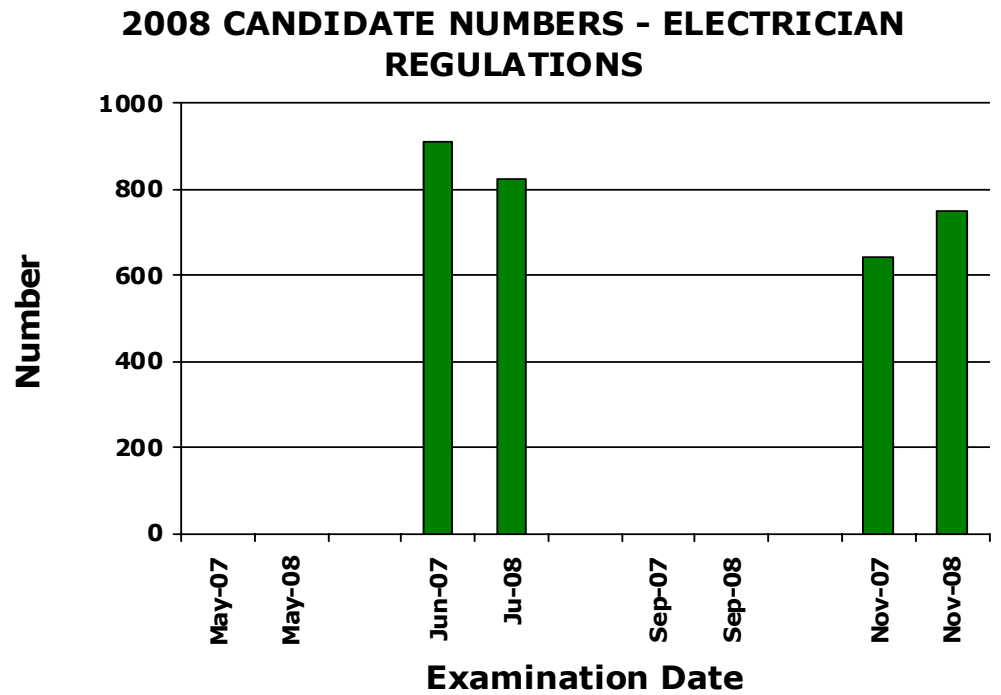
Average pass mark 63 %
Median mark 64

Those who passed

Average pass mark 72 %
Median mark 72

2 candidates gained more than 95 marks.


2008 PASS RATES - ELECTRICIAN REGULATIONS
% passed
100
90
80
70
60
50
40
30
20
10
0
Overall
E.Regs 2006
E.Regs 2007
May
June
September
November
Examination Date


2008 CANDIDATE NUMBERS - ELECTRICIAN REGULATIONS
Number
1000
800
600
400
200
0
May-07
May-08
Jun-07
Ju-08
Sep-07
Sep-08
Nov-07
Nov-08
Examination Date

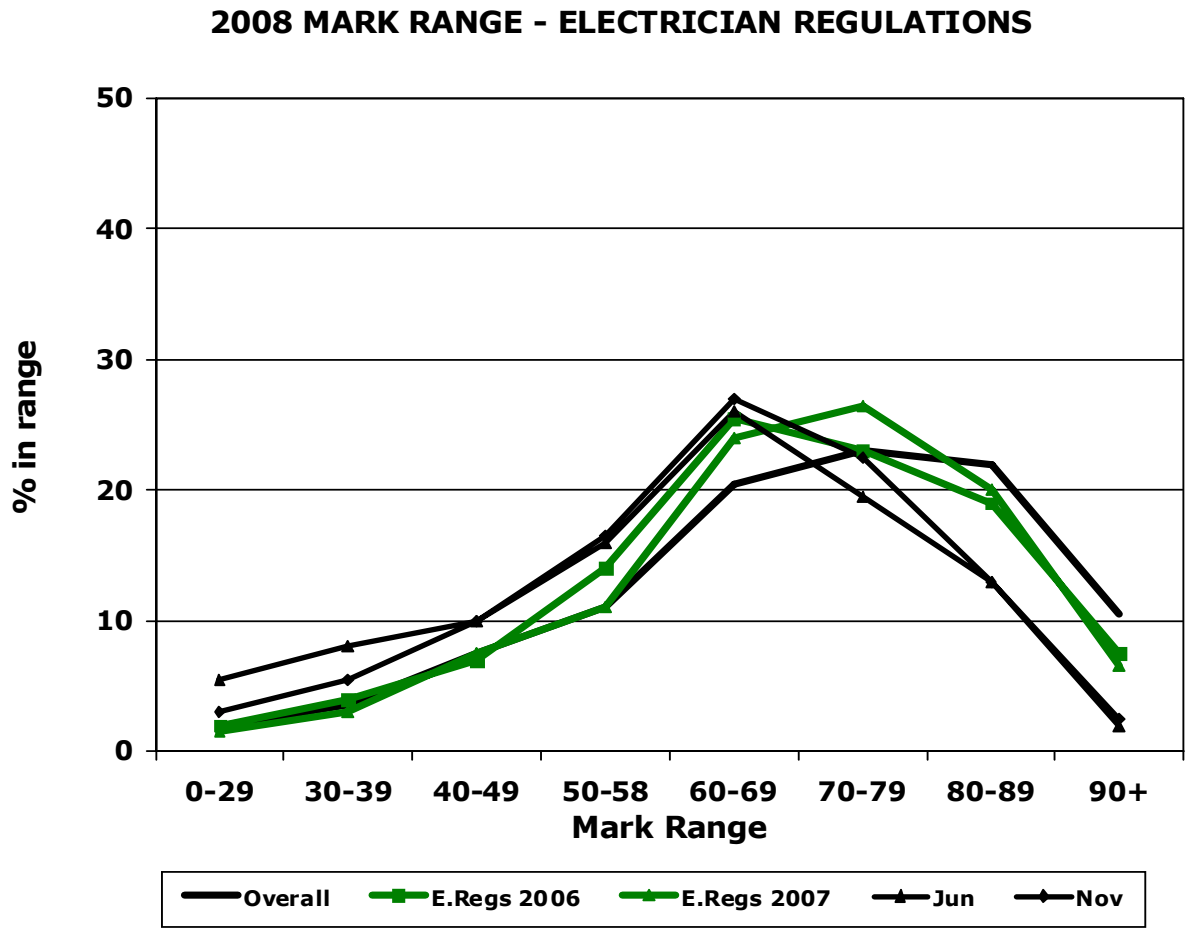
Mark Ranges

Number of candidates

Range	ER 34	ER 35			November 2008	
90 – 100	16	2			**18**	**candidates**
80 – 89	97	2			**99**	**candidates**
70 – 79	169	2			**171**	**candidates**
60 – 69	206	0			**206**	**candidates**
50 – 58	124	0			**124**	**candidates**
40 – 49	75	0			**75**	**candidates**
30 – 39	40	0			**40**	**candidates**
0 – 29	21	0			**21**	**candidates**
	748	**6**			**754**	

% of candidates

Range	ER 34	ER 35			November 2008	
90 – 100	2	34			**2.5**	**% of candidates**
80 – 89	13	33			**13**	**% of candidates**
70 – 79	22.5	33			**22.5**	**% of candidates**
60 – 69	27.5	0			**27**	**% of candidates**
50 – 58	16.5	0			**16.5**	**% of candidates**
40 – 49	10	0			**10**	**% of candidates**
30 – 39	5.5	0			**5.5**	**% of candidates**
0 – 29		0			**3**	**% of candidates**


2008 MARK RANGE - ELECTRICIAN REGULATIONS
% in range
50
40
30
20
10
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
Overall
E.Regs 2006
E.Regs 2007
Jun
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 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**	**32**	**12**
Q 2	**H1b.28**	**Protection and Control RCD characteristics**			**Draw connections on switchboard for mains, main earth, RCDs and final subcircuits**	**52**	**12**	**36**
			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
			Jun 2006	2	Installation of RCDs – domestic installations	21.5	27	51.5
			Jun 2006	2	Installation of RCDs – other installations, domestic installations	60.5	29.5	10
			Nov 2007	4	Requirements for outlet in laundry, RCDs in commercial, industrial installations, installing RCDS in kitchen	56	25	19

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**H1c.31**	**<u>Protection and Control</u> Selection of control and protection equipment**			**Main switches - fittings not controlled by; requirements for two points of supply; remote control. Functional switching. Switching of neutral**	**64**	**25**	**11**
			Nov 2004	22	Explain- current rating, fusing factor, breaking capacity; current rating of HRC fuse, disconnection times	12	32	56
			Nov 2007	2	Room heaters – 3 general requirements for functional and isolation switches, position of isolating switches. Features of isolating and functional switches	28	38.5	33.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**H3a.29**	**<u>Cables and Cords</u> Selection of mains and submains**			**Cable size of 3 phase supply to building, volt drop and load**	**42**	**19**	**39**
			Nov 2005	18	Cable size of 3 phase development, volt drop and load	52.5	14	33.5
			Jun 2006	3	Cable size of 3 phase farm complex, volt drop and load	26	12	62
Q 5	**D3.21**	**<u>System theory</u> - Earthing of installations fittings and appliances**			**Determine size of main earth; Types of earthing conductors not required to be insulated. Whether RCCB can be only circuit protection. PECs at distribution board**	**59**	**31**	**10**
			Jun 2006	6	Operational results of earthing, minimum size of earth, protection against mechanical damage, restrictions on PEC	66.5	20.5	13
			Jun 2007	8	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

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**K2.38**	**Statutory testing and inspection requirements**			**IR testing requirements. Carrying out IR test**	**36.5**	**43.5**	**20**
			Jun 2006	9	Reasons for testing in low voltage installations	79	9.5	11.5
			Jun 2007	6	Four mandatory inspections and tests, CoC for installation with IR of 100 Mohms, inspection of electrical equipment	46	29	25
			Jun 2007	6	Sequence of tests for an installation, reasons for carrying out earth continuity and IR tests, CoC for installation with IR less than 1 Mohm	92.5	5.5	2
			Jun 2008	8	Testing of low voltage installations. Two methods of verifying function of RCD, why verification carried out on each final subcircuit, one reason why earth fault loop test carried out. Why installation can be certified with IR test less than 1 MΩ	59	21	20

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**H1c.31**	**<u>Protection and Control</u> Selection of control and protection equipment**			**Hazards if impedance of neutral is higher than earth. Switching of ranges. Mechanical stress on socket outlets**	**12.5**	**36**	**51.5**
Q 8	**H3a.29**	**<u>Cables and Cords</u> Selection of mains and submains**			**Maximum demand of 230 V domestic installation**	**27**	**47**	**26**
			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
			Jun 2007	9	Maximum demand of 230 V domestic installation	78	14	8
			Jun 2007	9	Maximum demand of 230 V domestic installation	71	9	20
			Nov 2007	6	Calculate maximum demand of low rise development, determine size of cable based on maximum demand	52	18.5	29.5
			Jun 2008	9	Calculate maximum demand in kW of three phase factory complex	5	37.5	57.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**K2.38**	**Statutory testing and inspection requirements**			**Why polarity testing necessary, testing for phase/neutral transpositions**	**37**	**12**	**51**
			Jun 2006	9	Reasons for testing in low voltage installations	79	9.5	11.5
			Nov 2006	4	3 reasons why polarity testing necessary, equipment for polarity test on mains, how to carry out polarity test and expected result	19	21	60

A3.3 – Moderation

There were three moderators for ER 34.

This paper was moderated via a meeting held on 29 October.

A3.4 – Marking

There were seven markers for ER 34.

Teleconferences were held with the markers on 2 and 9 December.

Version 2 of the answer schedule was sent to markers on 1 December.

Version 3 of the answer schedule was sent to markers on 9 December.

Comments

The examination content was fair to all candidates. The paper was varied and covered a wide range of topics within the electrical industry. There was some excellent results and of course some very disappointing. Those candidates who struggled with the examination generally did poorly in questions 2 and 9.

Although there was a huge discussion over many of the questions and the merits of the various changes suggested (and expedited) the moderation of the paper stood up fairly well. The teleconferences were lively and informative. The good feature of the quality of the markers and probably the moderators is the varied backgrounds that they have bringing a variety of views to the forum. It is important that we do become too pedantic.

A3.5 – Amendments to ER 34

The significant amendments to ER 34 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	Rewritten to make intention clearer	Additional option added	Additional option added
1(b)	Rewritten to make intention clearer		
1(c)	Editorial amendment	Reference inserted	
1(d)	Rewritten to include additional information	Amended accordingly	Additional option added
1(f)		Amended to be consistent with Standard	
1(i)(i)			Additional option added
1(i)(ii)		Answer corrected	
1(h)		Additional option added	
1(j)			Answer amended to be more accurate
2	Replaced with a different question relating to RCDs	Amended accordingly	Note added that details the 3 situations considered dangerous – no marks if any of them are shown.
3(b)	Rewritten to make intention clearer		
3(c)	Rewritten to make intention clearer		
3(d)		Reference corrected	
3(e)	Editorial amendment		Additional options added
4(a)	"Load requirements changed to "load current requirements" Reference to the load being balanced included. Reference to the "highest loaded phase" removed from Vd information	Answer corrected	
4(b)	Reference to the load being balanced included. Reference to the "highest loaded phase" removed from Vd information	Answer corrected	Alternative solution included
4(c)	"Load requirements changed to "load current requirements"	Answer corrected	

The significant amendments to ER 34 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
5(c)	Rewritten to make intention clearer	Amended accordingly	
6(a)(i)	Editorial amendment		
6(a)(ii)	Editorial amendment		
6(a)(iii)	Rewritten to make intention clearer	Note added indicating another possible answer	
6(b)	Rewritten to make intention clearer	3rd and 5th bullet points corrected	
7(a)		Additional option added	
7(b)		Answer corrected	
7(c)	Rewritten to make intention clearer		Additional options added
7(d)			Rewritten to make more accurate
8	Editorial amendment to preamble	Additional option added	Changed to include 2 discrete solutions
9(b)			Note added to the effect that they must state the correct equipment to achieve the correct test results
9(b)(i)		Answer corrected	

Appendix 4

Electrician Theory Examinations

14 and 15 November 2008

ET 28, a moderated paper, was used for the examination of 15 November 2008.
ET 29, a composite paper, was used for the examination of 14 November 2008.

A4.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
ET 28	778	378	48.5
ET 29	2	2	100
November 2008	**780**	**380**	**48.5**

ET 28

All candidates

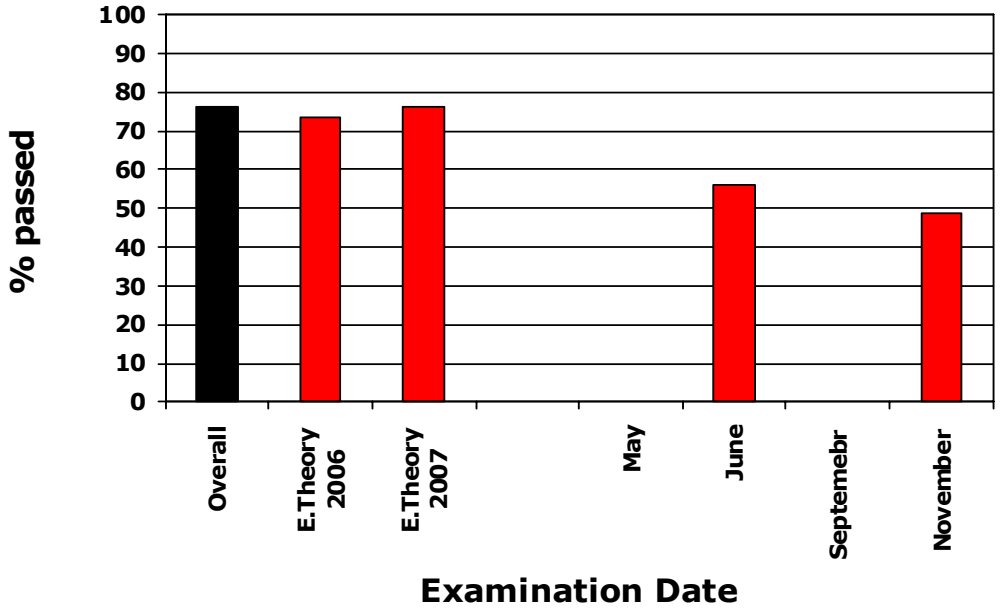
Average pass mark 56 %
Median mark 57.5

Those who passed

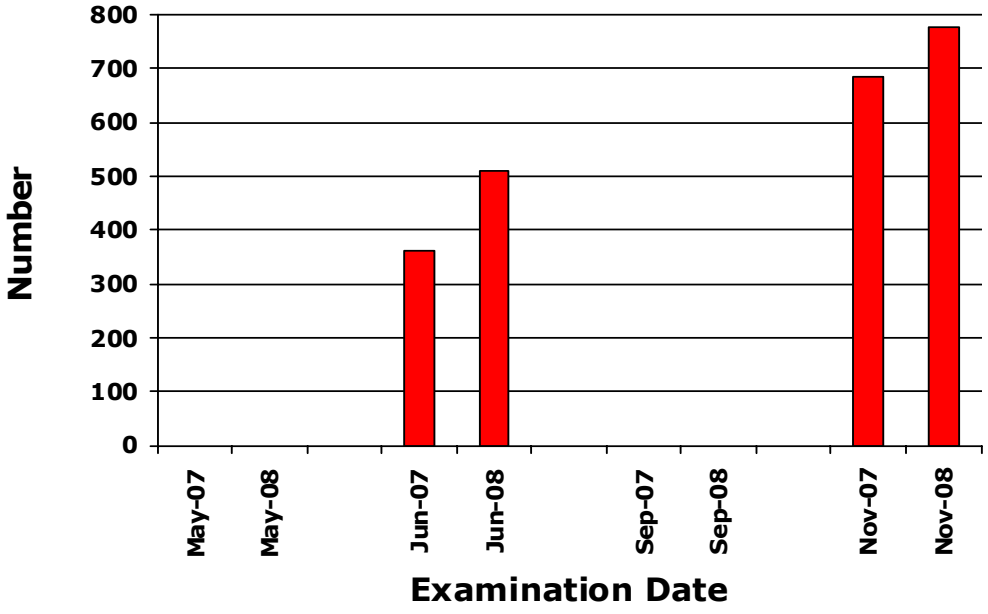
Average pass mark 71.5 %
Median mark 70

4 candidates gained 95 or more marks.

2008 PASS RATES - ELECTRICIAN THEORY



2008 CANDIDATE NUMBERS - ELECTRICIAN THEORY



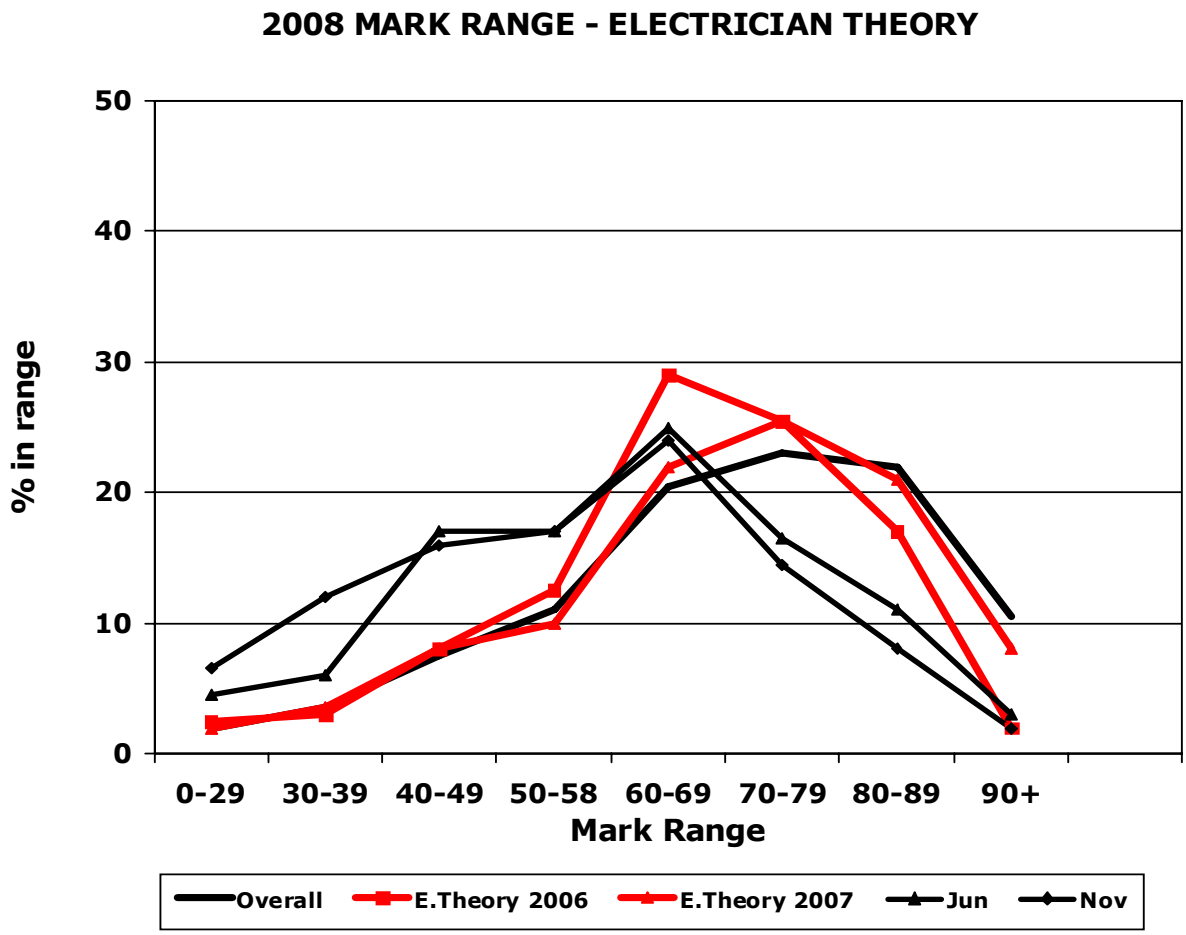
Mark Ranges

Number of candidates

Range	ET 28	ET 29		**November 2008**	
90 – 100	16	1		**17**	**candidates**
80 – 89	65	0		**65**	**candidates**
70 – 79	112	0		**112**	**candidates**
60 – 69	185	1		**186**	**candidates**
50 – 58	132	0		**132**	**candidates**
40 – 49	126	0		**126**	**candidates**
30 – 39	91	0		**91**	**candidates**
0 – 29	51	0		**51**	**candidates**
	778	**2**		**780**	

% of candidates

Range	ET 28	ET 29		**November 2008**	
90 – 100	2	50		**2**	**% of candidates**
80 – 89	8	0		**8**	**% of candidates**
70 – 79	14.5	0		**14.5**	**% of candidates**
60 – 69	24	50		**24**	**% of candidates**
50 – 58	17	0		**17**	**% of candidates**
40 – 49	16	0		**16**	**% of candidates**
30 – 39	12	0		**12**	**% of candidates**
0 – 29	6.5	0		**6.5**	**% of candidates**


2008 MARK RANGE - ELECTRICIAN THEORY
% in range
50
40
30
20
10
0
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90+
Mark Range
Overall
E.Theory 2006
E.Theory 2007
Jun
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**				**15**	**39**	**46**
Q 2	**D3.21**	**System theory - Earthing of installations fittings and appliances**			**Describe the circuit tested by an earth fault loop impedance tester. Uses for information from the test. Why path through main neutral more important.**	**25.5**	**26.5**	**48**
			Nov 2006	2	MEN system, draw fault loop and single-phase fault. Calculate current in faulty phase and whether MCB will operate. Reasons why high resistance earth fault increase risk of shock	48	24	28

	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 circuit diagram of three-phase RCD. Describe operation of RCD on earth fault. Define RCBO.**	**47**	**32**	**21**
			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
			Jun 2007	3	Draw diagram of RCD, describe operation of RCD under fault, explain PRCD and RCBO	79	14	7
			Jun 2007	3	Describe operation of RCD under fault, RCD rating for personal protection, why no shock with RCD and extra protection required, why PRCDs voltage dependent	62.5	29.5	8

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**C2.11**	**a.c. – Measurements V, A, P, pf**			**Three-phase installation – calculate line current in each phase, total power of installation. Determine neutral current by vectors. Balancing loads**	**39**	**10**	**51**
Q 5	**E2.16**	**3ph-Motor/Alternators Selection, starting, protection**			**Draw power circuit for star/delta starter. Draw control circuit for circuit for star/delta starter**	**22.5**	**17.5**	**60**
			Jun 2007	9	Draw control circuit for three phase starter, difference between variable speed controller and soft starter. Why thermal overload and HRC fuses used for motor circuit protection	55	28	17
			Nov 2007	6	Draw control circuit for three phase starter, redraw start/stop and insert remote start/stop with 3-core cable, replacement for thermal overload	55.5	29.5	15
			Jun 2008	9	Draw power circuit for DOL forward and reverse starter. Draw control circuit for circuit for DOL forward and reverse starter	25	13	62

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**H10.66**	**<u>Fault diagnosis</u>**			**Hazards of mains transposition, testing for transpositions.**	**58**	**22**	**20**
			Jun 2006	4	Hazards of mains transposition, testing for transposition	14	10	76
			Jun 2007	6	Hazards of mains transposition, testing for transposition	61	13.5	25.5
			Nov 2007	7	Hazards of mains transposition, testing for transposition, cause of shock off washing machine	61	21	18

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	**D3.21**	**<u>System theory</u> - Earthing of installations fittings and appliances**			**Fault on three phase oven. Calculate current in faulty line. Calculate current in faulty line; whether fuse will operate and hazards that exist. Calculate fusing current in fault is of negligible impedance.**	**43**	**16**	**41**
			Jun 2007	8	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,	27	39	34
			Nov 2007	5	Faulty three-phase kiln – calculate current in faulty line, effect on circuit protection. Fault current if 8Ω fault develops, explain electrical; hazards.	54	23.5	22.5
			Jun 2008	7	Fault on three phase bakery oven. Calculate current in faulty line. Calculate current in faulty line, whether fuse will operate and touch voltage if PEC resistance high.	36.5	17	46.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**H10.66**	**<u>Fault diagnosis</u>**			**Faulty hot water cylinder, safely isolate, why cylinder operates on 1 fuse, testing an description of faults**	**33**	**43.5**	**23.5**
			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
			Nov 2006	8	Replacement of kiln isolator –effect of various transpositions, testing for transposition	12	43	45
			Jun 2007	6	MCB socket outlet circuit – three possible causes of fault, for each fault, action to find cause and remedial action	32	55	13

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**G2.24**	**<u>Transformers</u> Operating principles**			**Three- phase transformer – calculate secondary phase and line voltages, full load current and secondary line current. Calculate percentage regulation.**	**49.5**	**21**	**29.5**
			Jun 2007	7	Three phase transformer - calculate primary and secondary line currents, total kVA. Why no fuses on CT secondary	37.5	8	54.5
			Nov 2007	8	Three- phase transformer – draw circuit diagram, calculate secondary phase and line voltages, primary and secondary line currents, method to reduce iron losses	57	20	23
			Jun 2008	8	Three phase transformer supply to commercial site. Calculate kVA of heaviest laded phase, minimum size of transformer. Calculate line current in 11kV system	10.5	15	74.5

A4.3 - Moderation

There were three moderators for ET 28.

This paper was moderated via a moderation meeting on 31 October

A4.4 - Marking

There were five markers for ET 28.

Teleconferences were held with the markers on 24 November and 1 December.

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

Comment

Overall the examination paper set a good standard, which an electrician needs to be able to achieve to be a competent worker in the industry.

Of all the papers marked over the years this was has been the most poorly attempted. It is obvious that candidates do worse in written questions than they do in the mathematics questions. It is also evident within the written questions of the candidates for whom English is a second language. In these cases markers often have difficulty in interpreting what is intended to be said.

Often the question answered was not the question asked. For example, single phase answers to three phase questions, forward/reverse motors for star/delta motors (or in several cases a transformer).

At a basic level some candidates had problems understanding simple terms such as "calculate", "describe", "define" or "draw and label".

Often candidates used phrases such as "imbalanced" or "shock hazard" or "test-prove-test" but without context or meaning. Their answers were vague and did not specify what was "imbalanced" or what was being "test-prove-tested".

A4.5 - Amendments to ET 28

The significant amendments to ET 28 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(b)	Rewritten to make intention clearer	-	-
1(c)	Replaced with a more topical question relating power calculations	Amended accordingly	Amended to better reflect question asked
1(d)	Replaced with more topical RCD question	Amended accordingly	-
1(e)	-	Amended to make more accurate	-
1(f)	Replaced with question relating to slip speed. Original question covered in question 5.	Amended accordingly	-
1(g)	-	Amended to make more accurate	-
1(h)	Replaced with more topical single-phase motor question	Amended accordingly	-
	-	-	2 additional options added
1(j)	Replaced with more topical power calculation question	-	-
2(a)	-	-	Answer simplified as original considered too complex
2(b)	Replaced with question relating to part (a)	Amended accordingly	-
3(a)	Changed from single-phase RCD to three-phase RCD	Amended accordingly	-
3(b)	Rewritten to make intention clearer	-	-
4	Replaced with question relating to calculation of loads in an installation. Original question too similar to question 3.	Amended accordingly	-
4(b)	-	-	Additional option added
5(a)	Rewritten to make intention clearer	Terminology corrected	Terminology corrected
5(b)	Rewritten to make intention clearer	-	-

The significant amendments to ET 28 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
6(a)	Rewritten to make intention clearer	Amended accordingly	-
6(b)	-	Amended to make more accurate	-
6(b)(iii)	-	-	Amended to make more accurate
7	Preamble rewritten to make intention clearer	--	-
7(a)(i)	Marks increased from 4 to 5	Amended accordingly	-
7(a)(ii)	Marks decreased from 2 to 1	Amended accordingly	-
7(b)	Rewritten to make intention clearer	Amended accordingly	Alternative solution added
8	Rewritten and diagram added to make intention clearer.	Amended accordingly	-
8(b)(iv)	-	-	Additional option added
9(a)	Rewritten to make intention clearer.	-	-
9(c)	Rewritten to make intention clearer	-	-
9(d)	Rewritten to make intention clearer	-	-
9(e)	Replaced with a question relating to part (a).	Amended accordingly	-

Appendix 5

Electrical inspector Examinations

15 November 2008

IT 16, a moderated paper, was used for the examination of 15 November 2008.

A5.1 - Overall Candidate Performance

	Number of candidates	Number of candidates who passed	Percentage passed
IT 16	89	66	74
November 2008	**89**	**66**	**74**

IT 16

All candidates

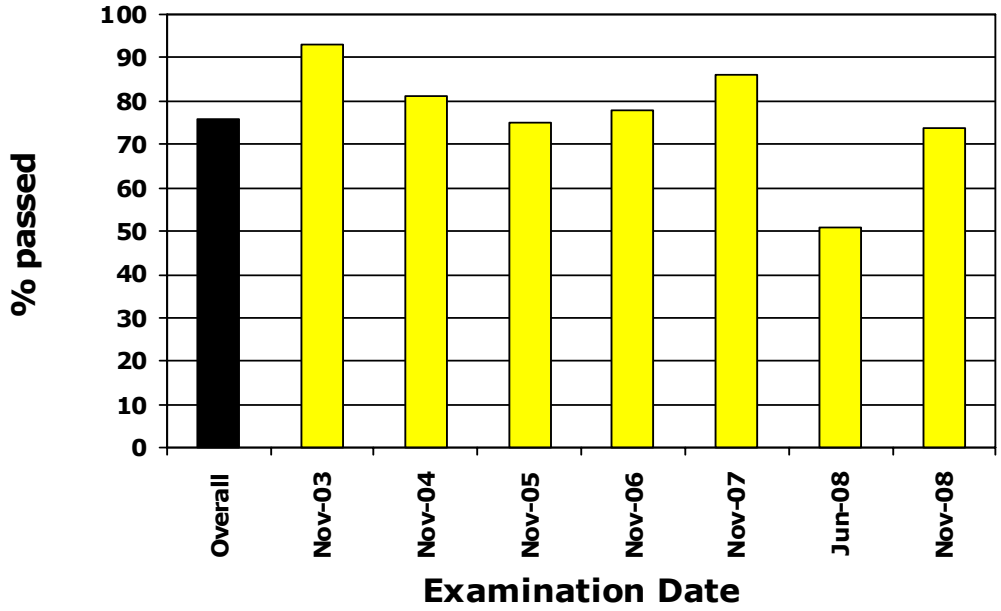
Average pass mark 67 %
Median mark 68

Those who passed

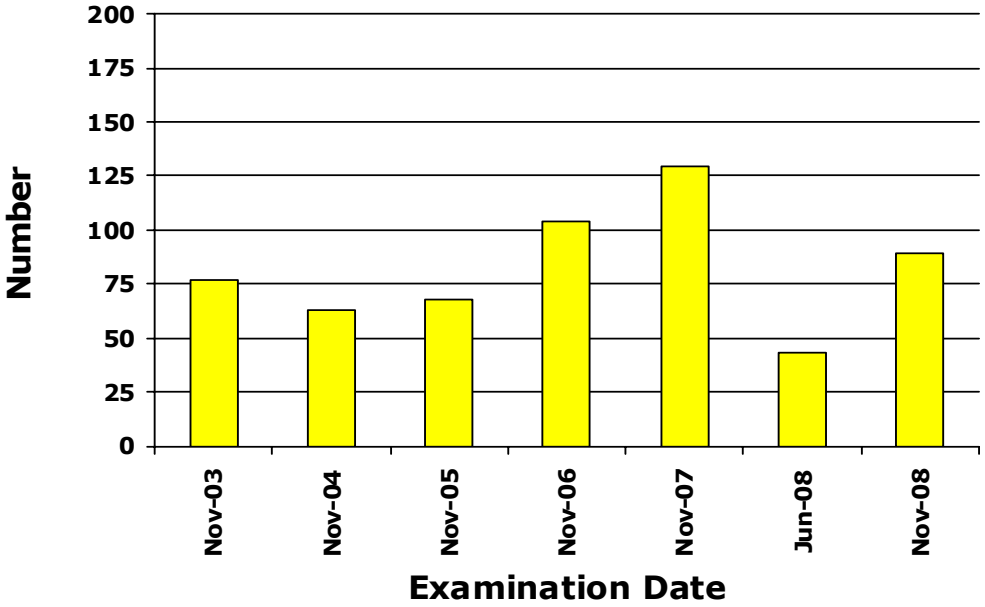
Average pass mark 73 %
Median mark 72

5 candidates gained 90 0r more marks.

PASS RATES - ELECTRICAL INSPECTOR



CANDIDATE NUMBERS - ELECTRICAL INSPECTOR



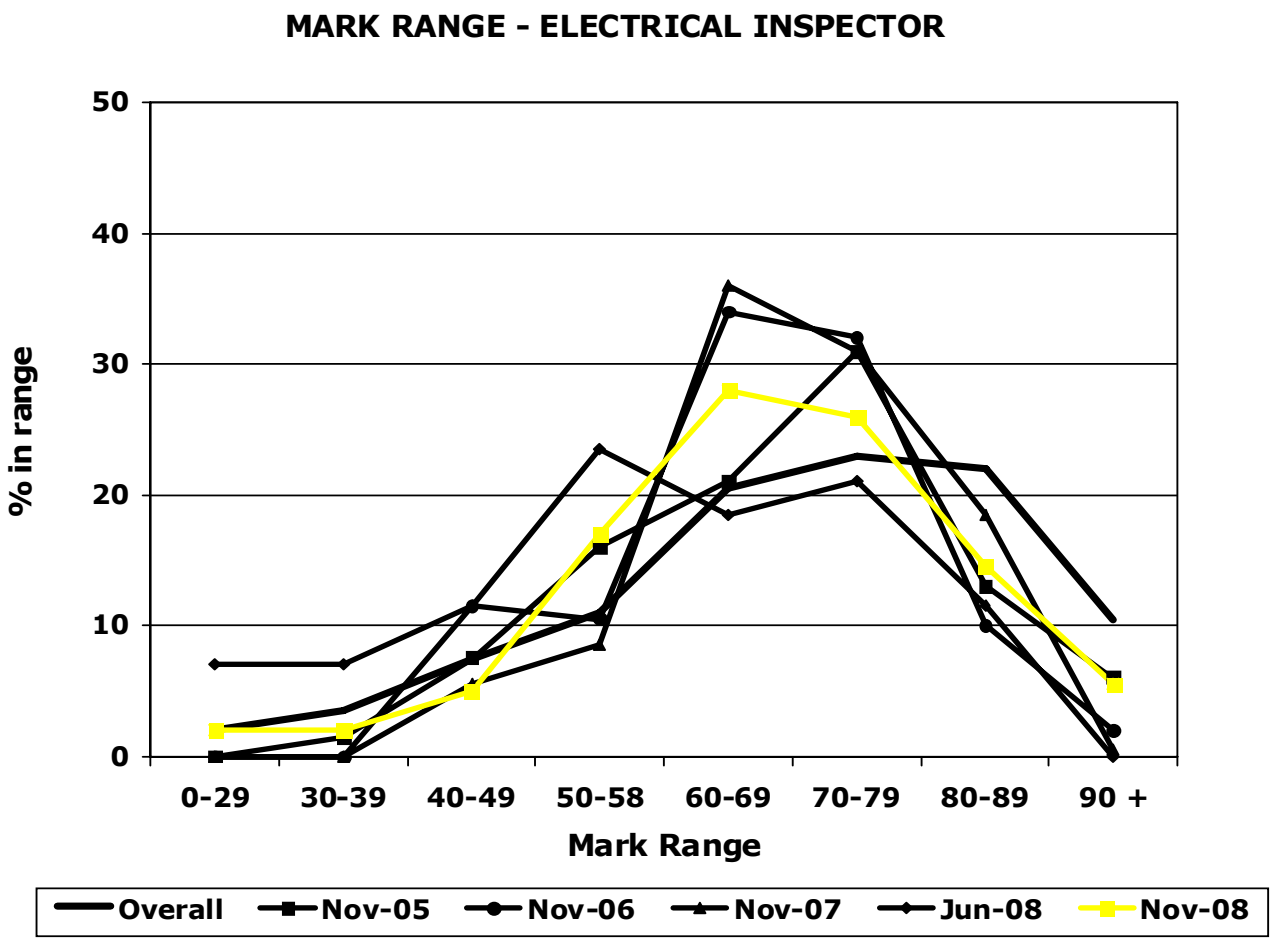
Mark Ranges

Number of candidates

Range	IT 16			November 2008	
90 – 100	5			**5**	**candidates**
80 – 89	13			**13**	**candidates**
70 – 79	23			**23**	**candidates**
60 – 69	25			**25**	**candidates**
50 – 58	15			**15**	**candidates**
40 – 49	4			**4**	**candidates**
30 – 39	2			**2**	**candidates**
0 – 29	2			**2**	**candidates**
	89			**89**	

% of candidates

Range	IT 16			November 2008	
90 – 100	5.5			**5.5**	**% of candidates**
80 – 89	14.5			**14.5**	**% of candidates**
70 – 79	26			**26**	**% of candidates**
60 – 69	28			**28**	**% of candidates**
50 – 58	17			**17**	**% of candidates**
40 – 49	5			**5**	**% of candidates**
30 – 39	2			**2**	**% of candidates**
0 – 29	2			**2**	**% of candidates**


MARK RANGE - ELECTRICAL INSPECTOR
50
40
30
20
10
0
% in range
0-29
30-39
40-49
50-58
60-69
70-79
80-89
90 +
Mark Range
Overall
Nov-05
Nov-06
Nov-07
Jun-08
Nov-08

A5.2 - Overall Marking Analysis

Performance by topic

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

	Topic No.	**Topic**	Year	Q.No.	**Subject**	**75-100% (%)**	**50 – 70% (%)**	**0 – 45% (%)**
Q 1	**-**	**10, 2 mark questions**				**80**	**17**	**3**
Q 2	**D4.22**	**System theory - MEN systems**			**Describe the circuit tested by an earth fault loop impedance tester. Why installation requires larger earthing lead. Why path through main neutral more important. Main switch requirements with two points of supply**	**50.5**	**28**	**21.5**
			Nov 2006	2	Diagram and circuit of loop impedance tester, use of information from loop impedance tester, min. size main earth, calculate fault level and PSSC	48.5	33	18.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 3	**H3b.30**	**<u>Cables and Cords</u> Selection of final subcircuits**			**Maximum volt drop permitted; options for calculating voltage drop. Calculate cable size so volt drop does not exceed 2.5%.**	**49.5**	**28**	**22.5**
			Nov 2003	2	3 phase furnace – calculate cable size, loading and volt drops.	40	22	38
			Nov 2004	6	3 phase furnace – calculate cable size, loading and volt drops.	54	6	40
			Nov 2005	7	3 phase factory – calculate cable size, loading and volt drops.	57	15	28
			Nov 2006	3	3 phase furnace – calculate cable size, loading and volt drops.	48.5	19.5	32
			Nov 2007	4	4-core N/S cable from three-phase distribution panel to pottery kiln – buried direct or surface mounted options. Calculate cable size for both based on load and volt drop	46	22	32
			Jun 2008	5	Three phase supply to moulding room – calculate cable size, loading and volt drops.	69	12	19

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	**H1b.28**	**<u>Protection and Control</u>** **RCD characteristics**			**Four situations where RCD protection not required. Identifying Type A RCDs. Describe operation of RCD when earth fault occurs**	**47**	**42**	**11**
			Nov 2006	5	RCDs installed in a motel, Type A RCDs.	57	32	11
			Nov 2007	3	Describe operation of RCD on earth fault, markings and operating characteristics of Type A RCD, advice on RCD protection in kitchen	66.5	25	8.5
Q 5	**K3.39**	**<u>Certification, verification, WOEF</u>**			**Three different installations. Testing and inspection Standards. Connection requirements. Certification and inspection requirements.**	**56**	**25**	**19**
			Nov 2004	7	Situations requiring COCs and inspection	86	14	0
			Nov 2005	5	Upgraded domestic main switchboard – three items that require inspection, other types of work requiring inspection, homeowner work.	59	28	13
			Jun 2008	2	Inspection of homeowner work – test and inspection documents, minimum size of cables, protection	28.5	50	21.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 6	**G2.24**	**<u>Transformers</u> Operating principles**			**Three phase transformer supply to commercial site. Calculate kVA of heaviest loaded phase, minimum size of transformer. Calculate line current in 11kV system**	**16**	**11**	**73**
Q 7	**K4.46**	**<u>Testing and inspection methods</u>**			**Landlord requests inspection – which Standard used; inspection of fixed-wired appliances and MEN system. Four instrument tests. Document to be provided**	**77.5**	**14.5**	**8**

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	**H3a.29**	**<u>Cables and Cords</u> Selection of mains and submains**			**Determine transformer size for shop complex based on calculating kVA**	**32.5**	**12.5**	**55**
			Nov 2003	4	Max. demand of 3 phase bakery	1	6	93
			Nov 2004	9	Max. demand of 3 phase factory	13	19	68
			Nov 2005	4	Max. demand of 3 phase small engineering shop	43	26	31
			Nov 2006	9	Max. demand of 3 phase small engineering shop	2	12.5	85.5
			Nov 2007	9	Maximum demand of low rise residential development comprising living units and communal areas	3	17	80
			Jun 2008	8	Calculate maximum demand of low rise development, determine size of cable based on maximum demand	21.5	7.5	71

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	**H1a.27**	**<u>Protection and Control</u> Protection characteristics**			**Two terms relating to current rating. Characteristics of short circuit devices. Maximum touch voltage. Final subcircuits and disconnection times**	**46**	**27**	**27**
			Nov 2003	7	Switchgear current ratings and meaning, characteristics of HRC fuses, omission of overload protection	72	13	15
			Nov 2005	2	Omission of overload protection, fittings suitable for protection, disconnection times for MCBs, Calculate PSSC.	69	21	10
			Nov 2005	8	Characteristics of HRC characteristic curves, operation of RCD, PSSC of transformer	46	26	28

A5.3 - Moderation

There were three moderators for IT 16.

This paper was moderated via a meeting held on 29 October.

A5.4 - Marking

There were two markers for IT 16.

Teleconferences were held with the markers on 24 November and 2 December.

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

Comment

This examination was generally well done by most candidates.

The examination content was fair to all candidates, and those who struggled generally did poorly in questions 6 and 8.

The paper had a good balance of complexity to test the candidates' understanding of testing, maximum demand, transformer loading, volt drop, compliance responsibility, Earth loop impedance, and earthing.

There were a number of questions which tested the candidates' general and technical knowledge of the electrical trade. It is not unreasonable to expect candidates to be able to answer these questions in an examination situation. Those who sit this exam should have a sound knowledge of all technical aspects of the electrical industry at the trade level.

The answer schedule required minimal changes during the marking period.

A5.5 - Amendments to IT 16

The significant amendments to IT 16 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	Deleted	-	-
1(b)	Deleted	-	-
1(c)	Now (a)	Amended accordingly	-
1(d)	Now (b)	Amended accordingly. 1st and 3rd bullet points amended to be more accurate	-
1(e)	Deleted	-	-
1(f)	Now (c)	Amended accordingly	-
1(g)	Now (d)	Amended accordingly	-
1(h)	Deleted	-	-
1(i)	Now (e)	Amended accordingly	-
1(j)	Now (f)	Amended accordingly	-
1(k)	Deleted	-	-
1(l)	Deleted	-	-
1(m)	Now (g)	Amended accordingly	-
1(n)	Now (h)	Amended accordingly	-
1(o)	Deleted	-	-
1(p)	Now (i)	Amended accordingly	-
1(q)	Deleted	-	-
1(r)	Deleted	-	-
1(s)	Deleted	-	-
1(t)	Now (j)	Amended accordingly	-
2(a)	Rewritten to make intention clearer	Amended accordingly	-
2(b)	-	Amended to make more accurate	-
2(c)	Rewritten to make intention clearer	-	-
2(d)	Rewritten to make intention clearer	Amended accordingly	Additional option added
3(a)	Rewritten to make intention clearer	Reference corrected	-
3(c)	Length of cable reduced from 20 metres to 15 metres	Calculations corrected	-

The significant amendments to IT 16 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
4	Preamble deleted as being unnecessary	-	-
4(a)		Reference corrected	-
4(b)(i)	Rewritten to make intention clearers	-	-
4(c)	Rewritten to make intention clearer	Amended to make more accurate	-
5	Preamble rewritten to make intention clearer	-	-
5(a)	Preamble rewritten to make intention clearer	-	-
5(b)	Preamble rewritten to make intention clearer	-	-
5(d)	-	3rd bullet point amended to better reflect question asked	-
5(e)	-	Amended to better reflect question asked	-
6(b)	-	Alternative solution included	-
7(a)	Preamble rewritten to make intention clearer	-	-
7(b)	Preamble rewritten to make intention clearer	-	-
7(b)(ii)	-	Amended to be more accurate	-
8	Preamble rewritten to make intention clearer	Amended accordingly	-
9(a)	-	2 additional options added	-

Appendix 6

Tradesperson Electrical Work Certificate Examinations

22 November 2008

TEWC 150, 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 150A which comprised questions 1 to 4, 5, 7, 9, 10 and 11 of TEWC 150.

A6.1 - Moderation

There were two moderators for TEWC 150.

TEWC 150 was moderated in a meeting of 28 October.

A6.2. - Marking

Comments

No candidate sat this examination.

A6.3 - Amendments to TEWC 150

The significant amendments to TEWC 150 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(a)	-	Editorial amendment	-
1(b)	Editorial amendment	-	-
2(a)	Rewritten to make intention clearer. Marks increased from 4 to 6	Amended accordingly	-
2(d)	Deleted	-	-
3(b)	-	Amended to align with question	-
4(c)	Reference to "cables" changed to "conduit wire".	-	-
4(c)(ii)	-	Editorial amendment	-
7	Preamble – editorial amendments	-	-
7(b)	-	Reference corrected	-

Appendix 7

Electronic Security

15 November 2008

ES 17, a moderated paper, was used for this examination.

A7.1 - Moderation

There were three moderators for ES 15.

ES 17 was moderated in a meeting on 30 October.

A7.2. - Marking

There was one marker for ES 17.

Comments

One candidates sat an passed this examination with a mark of 94.

A7.3 - Amendments to ES 15

The significant amendments to ES 15 arising from the moderation and marking were as follows:			
No.	**Question (Moderation)**	**Answer (Moderation)**	**Answer (Marking)**
1(b)		Additional option added	
1(c)		Amended to be more accurate	
2(a)	Rewritten to make intention clearer	Additional option added	
2(b)		2nd bullet point rewritten to be more accurate	
2(c)		Additional information added to 1st bullet point Last bullet point deleted as not being relevant to the question Additional option added	
2(d)	Editorial amendment		
3(b)	Oder of questions changed to reflect practical situation	Amended accordingly	
4(a)	Editorial amendment		
4(b)	Rewritten to make intention clearer	Last bullet point amended to be more accurate	
4(c)		2 additional options added	
4(d)		Rewritten to be more accurate.	
5(b)		Rewritten to be more accurate	
6(a)	Editorial amendment		
6(b)		Amended to accurately align with Standard	
6(b)		Amended to accurately align with Standard	
7(a)(ii)		References corrected	
7(b)	Editorial amendment	References corrected	
8(a)(ii)		Additional option added	
8(b)(iii)		Additional option added	
9(a)(iii)		Reference corrected	
10(a)		Additional option added	