External Assessment Report 2009

Subject	Electronic and Electrical Fundamentals
Level	Intermediate 2

The statistics used in this report are pre-appeal.

This report provides information on the performance of candidates which it is hoped will be useful to teachers/lecturers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published question papers and marking instructions for the Examination.

Comments on candidate performance

General comments

The number of candidates sitting the Electronic and Electrical Fundamentals Intermediate 2 Examination in 2009 was 115 compared with 120 in 2008 and 99 in 2007. Thus, there was a 4.2% reduction in candidate entries between 2009 and 2008. However, the marking team were pleased that the Examination attracted over a hundred candidates for the second year in succession.

The pass rate in the 2009 Examination was 53.0%* compared with 51.7% in 2008 and 68.7% in 2007. Thus, the pass rate rose by 1.3% in 2009 compared with 2008. The mean mark also rose in 2009 to 51.8% compared with 49.3% in 2008. However, the mean mark in 2009 was still significantly below the mean mark obtained in 2007: namely 57.7%. The marking teams were pleased to see a small reversal in the trend of reducing pass rates and mean marks since 2006 (where the pass rate was 87.2 % and the mean mark was 67.3 %). The marking team are of the view that the standard of the Examination Paper has not altered appreciably over the last 4-years. Their view is that the standard of candidate sitting the Examination in 2006 was generally very good. However, in the subsequent two years the standard of candidate sitting the examination was not as good resulting in the lower pass rates and mean marks. It is reasonable to conclude that the standard of candidate sitting the Examination in 2009 was slightly better than in 2008 but still well below the standard of candidate sitting the Examination in 2007 and 2006.

It is also important to remember that any statistical analysis is based on a relatively small number of candidates so it is not surprising if significant changes in pass marks and mean scores occur year on year.

It was the view of the marking team that in 2006 candidates were very well prepared for the Examination such that even questions that traditionally have been poorly answered were answered to a better standard. The view of the marking team is that in 2007, 2008 and 2009 a significant number of candidates were not as well prepared for the Examination although it must also be noted that some candidates in all three years were very well prepared to sit the Examination.

One overseas centre continues to provide a significant number of entries for the Examination. However, as a percentage of total entries the numbers fell from around 60% in 2008 to 45% in 2009. It is understood that the centre originally planned to enter significantly more candidates for the Examination but around 20 candidates did not in the end sit the paper.

As last year three secondary schools presented candidates for the Examination rather than just one school as had been the case in previous years. No new schools made entries for the Electronic and Electrical Fundamentals Intermediate 2 Examination in 2009. Last year it was hoped that an increased number of secondary schools would present candidates for the Examination in future years especially given the sharp rise in candidates sitting the Intermediate I Electronics course. However, this did not occur in 2009. It is still hoped that the Electronic and Electrical Fundamentals Intermediate 2 course will become more attractive to schools and colleges when the updated National Assessment Bank (NABs) instruments for the course, which are more consistent with the external examination, are published by the SQA.

As in 2008 two FE colleges presented candidates for the Examination in 2009. It is pleasing to report that one college continues to maintain a good pass rate which can be attributed in no small measure to the additional preparation for the Examination which candidates received.

*All percentages are pre-appeals

Areas in which candidates performed well

Q.1 As in previous years the coding questions were generally answered well.

Q.2 Most candidates identified the circuit symbols in this question including the DIAC.

Q.3 Candidates in general demonstrated a good understanding of the important concept of potential differences between points in a circuit.

Q.4 This digital electronics question in which candidates had to determine the Boolean expression and truth table for a digital circuit was answered well.

Q.5 & Q.7 The two operational amplifier questions were generally answered satisfactorily although some candidates confused inverting and non-inverting amplifier configurations and vice-versa.

Q8 This question was in the main answered well. It was good to see that some candidates were able to show how 2-input AND gates could be connected to perform the function of a 3-input AND gate.

Q9 Most candidates showed a good grasp of basic electrical concepts which this question was designed to test.

Q.11(a) & (b) Most candidates attempting Q.11 answered these two parts of the question satisfactorily although only a few candidates got Q.11(b) (ii) correct (i.e. 0^0).

Q.12 As normal the digital electronics question in Part B was attempted by most of the candidates. In the main it was answered well although in Q.12(b) while candidates got the correct Boolean expressions for the two gates they did not get the correct truth tables. In Q.12(d) a lot of candidates saw Gate 6 as an OR gate rather than a NOR gate.

Areas which candidates found demanding

Q.6 This question was answered poorly. Candidates failed to illustrate the interaction of the field associated with the current carrying conductor with the field between the North and South poles.

Q.10(a)(ii) A number of candidates mixed up or gave completely the wrong names for the three terminals of the FET.

Q.10(a)(v) Few candidates were able to state the purpose of C_1 and C_2 (i.e. to block dc or allow ac to pass through or to act as a coupling capacitor).

Q.10(c)(ii) This question was not answered well. Candidates did not recognise the clipping effect that takes place in this kind of circuit.

Q.11(a) A number of candidates failed to notice the ac sinusoidal voltage was in mV.

Q.11(c) Candidates found this question particularly challenging (especially parts (iii) and (iv)). Most candidates did not appear to understand the significance of an open switch in a branch of a circuit. Some candidates were also unable to work out correctly the total resistance of series-parallel combinations of resistance.

Q.11 (d) While a few candidates calculated correctly the maximum current that flows through the resistor some candidates failed to make use of the 0.125 W power rating of the resistor in their calculations.

Advice to centres for preparation of future candidates

The marking team noted that some candidates continue to demonstrate a sound grasp of many of the basic concepts and principles in both electronic and electrical engineering. With regard to electronic principles this was noticeable with regard to Q.4, Q.5, Q.7 Q.8 and Q.12. and in the case of electrical principles this could be seen in the answers candidates gave to Q.3 and Q.9 and Q. 11 (a) and (b). Centres are to be congratulated for the continued efforts they have put into teaching these basic concepts and principles and are encouraged to maintain this excellent work.

On the downside candidates are still finding it difficult to answer questions involving magnetic fields and aspects of analogue electronics (e.g. amplifier configurations, coupling capacitors and half and full-wave rectifiers). The marking team were also somewhat surprised by the difficulties candidates encountered in answering Q.11(c). Many candidates did not appear to appreciate the impact of having an open switch in a branch of an electrical network. Some candidates had difficulties in calculating the total resistance of series-parallel combinations of resistors. Teachers/lecturers are encouraged to give due attention to these 'problem areas' in their teaching.

It is also evident from candidate performance in the Examination that some candidates are being provided with very good support in preparing for the external examination. However, it was noticeable in this year's Examination, as in last year's Examination, that some candidates did not read some of the questions correctly and, thus, gave wrong answers to these questions. Teachers/lecturers should advise their candidates to read questions in full and make sure they understand what questions are asking for.

As mentioned in last year's Report teachers/lecturers should continue to review their approaches to the teaching of the following subjects which have proved difficult for candidates in the past: biasing of transistor amplifiers; apply Kirchhoff's Voltage Law correctly to a zener diode circuit (i.e. not forgetting to include the volt-drop across any resistor in the circuit), the function of variable resistors in light dimming circuits, questions involving faults in logic circuits and where logic questions are expressed in words rather than diagrams or logic formulae.

Statistical information: update on Courses

Number of resulted entries in 2008	120

Number of resulted entries in 2009	115

Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark - 100				
A	28.7%	28.7%	33	70
B	10.4%	39.1%	12	60
C	13.9%	53.0%	16	50
D	9.6%	62.6%	11	45
No award	37.4%	100.0%	43	-

General commentary on grade boundaries

- While SQA aims to set examinations and create marking instructions which will allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary), it is very challenging to get the standard on target every year, in every subject at every level.
- Each year SQA therefore holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.
- The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- Where standards are comparable to previous years, similar grade boundaries are maintained.
- An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in say Higher Chemistry this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related as they do not contain identical questions.
- SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.