External Assessment Report 2010

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 2010 was 71 compared with 115 in 2009, 120 in 2008, and 99 in 2007. Thus, there was a 38% reduction in candidate entries between 2009 and 2010. The drop in candidate entries is due in the main to no further education colleges entering candidates for the examination in 2010. A number of colleges have moved over to the new National Certificate in Electronic Engineering at SCQF level 5 Course which does not contain the Units making up the Electronic and Electrical Fundamentals Intermediate 2 Course and, therefore, explains why colleges no longer have candidates for the Electronic and Electrical Fundamentals Course. The Principal Assessor has agreed to undertake a mapping exercise to see if it is possible to find broadly equivalent Units between the new National Certificate in Electronic Engineering award and the Units making up the Electronic and Electrical Fundamentals Intermediate 2 Course with a view to allowing candidates studying the new National Certificate award to sit the external examination for the Electronic and Electrical Fundamentals Intermediate 2 Course.

The pass rate in the 2010 examination was 52.1%* compared with 55.7% in 2009, 51.7% in 2008, and 68.7% in 2007. Thus, the pass rate fell by 3.6% in 2010 compared with 2009. The mean mark also fell in 2010 to 45.5% compared with 51.8% in 2009. The mean mark in 2010 remains significantly below the mean mark obtained in 2007: namely 57.7%. The marking teams were disappointed to see a reduction in both the pass rate and mean mark following the small rise in both of these marks in 2009. The pass rate and mean mark are significantly below 2006 levels where the pass rate was 87.2% and the mean mark was 67.3%. However, the marking team is of the view that the standard of the examination paper has not altered appreciably over the last five years. Their view is that the standard of preparation of candidates sitting the examination in 2006 was generally very good, such that even questions that traditionally have been poorly answered were answered to a better standard. The preparedness of candidates sitting the examination in subsequent years has generally declined and this was further evidenced in 2010 with the drop in the mean mark, although it must also be noted that some candidates in all four years, including 2010, were very well prepared to sit the examination. However, 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.

The overseas centre that has entered candidates for the Electronic and Electrical Fundamentals Intermediate 2 examination for a number of years provided the majority of candidates in 2010 (46 entries corresponding to 64%).

The remaining candidate entries (25) came from three secondary schools. Anecdotal evidence from colleagues teaching in secondary schools suggests that studying the Electronic and Electrical Fundamentals Intermediate 2 Course provides candidates with good preparation for the Electrical/Electronics Unit in the current Higher Physics Course.

As noted above there were no entries from FE colleges in 2010.

*All percentages are pre-appeals.

Areas in which candidates performed well

Q1 As in previous years, the coding questions were generally answered well.

Q3 Most candidates identified the magnetic pole as North and many candidates got the field pattern correct for the brass ring, albeit sketches could have been clearer.

Q4 While most candidates got their logic diagrams for the two Boolean expressions correct, a number of candidates did not read the question carefully enough and used ANSI symbols in their diagrams rather than BS symbols.

Q6 This question was answered well with most candidates demonstrating a good ability to manipulate the equation $F = Bli$ to calculate current.

Q7 This question was, in the main, answered well. However, some candidates still confuse non-inverting and inverting configurations.

Q8 Most candidates showed a good grasp of basic electrical concepts which this question was designed to test.

Q9 Most candidates were able to demonstrate an ability to develop the logic expression from the written information in the question.

Q10 (a) Answered correctly by nearly all candidates attempting Q10.

Q11 (a) Most candidates were able to determine the two voltages asked for in the question.

Q11 (viii) & (ix) It is pleasing to report that a significant number of candidates were able to determine the correct values of R_V for these two questions.

Areas which candidates found demanding

Q2 Quite a few candidates were unable to recognise the symbol for a variable resistor and some candidates did not know the applications of one or more components in this question.

Q5 Candidates found this question quite challenging with very few candidates getting part (d) correct.

Q10 (b) While some candidates made a good attempt at this question some failed to include the pin numbers on their diagram.

Q10 (c) (iii) Most candidates attempting Q10 found this question challenging although it is pleasing to report that a few candidates made a good attempt at it.

Q11 (b) (i) & (ii) Perhaps surprisingly, many candidates attempting Q11 had difficulties with these two questions especially determining the currents in wires 1 and 3.

Q11 (c) (iv) & (v) Candidates had difficulties in calculating the voltage across the 10 Ω resistance and the current through the 10 Ω resistance.

Q12 (b) (ii) Several candidates used 3.4 V pk-pk to calculate the rms voltage rather than 1.7 V.

Q12 (c) In general, all parts of this question were fairly poorly answered.

Q12 (d) (ii) Some candidates are still giving the wrong answers for the transistor terminals.

Q12 (d) (iv) Some candidates still fail to understand that capacitor C_1 is a coupling capacitor.

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 Q4, Q7, Q9, Q10 and Q12, and in the case of electrical principles this could be seen in the answers candidates gave to Q3, Q6, Q8 and Q11. 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 aspects of analogue electronics (eg amplifier configurations, coupling capacitors and half- and full-wave rectifiers). The marking team was somewhat surprised by the difficulties candidates encountered in answering Q11 (b) involving Kirchhoff's Current Laws. Teachers/lecturers may wish to review their teaching approaches to this subject with a view to improving candidates' understanding of the applications of this important basic law.

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 (eg using ANSI symbols in diagrams when BS symbols were asked for) 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 previous years' reports, 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; applying Kirchhoff's Voltage Law correctly to a zener diode circuit (ie not forgetting to include the volt-drop across any resistor in the circuit), and fault finding in logic circuits.

Statistical information: update on Courses

Number of resulted entries in 2009	115
Number of resulted entries in 2010	71

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	21.1%	21.1%	15	70
B	16.9%	38.0%	12	60
C	14.1%	52.1%	10	50
D	4.2%	56.3%	3	45
No award	43.7%	100.0%	31	–

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, therefore, SQA 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 Head of Service 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.