External Assessment Report 2013

Subject(s)	Electronic and Electrical Fundamentals
Level(s)	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

Candidate entries for the 2013 Electronic and Electrical Fundamentals Intermediate 2 examination were 39 compared with 23 in 2012 and 73 in 2011. This represents an increase of 70% in candidate entries compared with 2012 although a decrease of 47% compared with 2011 entries.

Four centres presented candidates for the 2013 examination which included two returning centres, but no new centres. This compares with 3 centres in 2012 and 6 centres in 2011. The 4 centres presenting candidates were secondary schools.

The Examination and Marking teams both indicated that in their view the 2013 examination paper was of a comparable standard to previous years' examination papers. Markers did not report any questions that did not perform as expected.

Areas in which candidates performed well

Question 1a) to c): As in previous years candidates found the coding questions straightforward.

Q4: Most candidates demonstrated they were able to transpose the formula $F = Bli$ to calculate I.

Q6: This question was generally answered well although few candidates knew the correct formula to calculate the average current ($I_{AV} = 0.637I_{PK}$).

Q8: This question was in the main answered well. It was good to see that many candidates understood that they had to subtract the 6V volt drop across the 3Ω resistor from the supply voltage before calculating the current in the 10Ω resistor. This shows a good understanding of voltage levels at different nodes in a circuit.

Q9: A generally well answered question, although some candidates found part c), the fault condition, challenging.

Q10: As usual, almost all candidates attempted Q10, the digital electronics question, in Section B, and most candidates scored high marks with this question. Several candidates applied good logical thinking to identify the faulty gate in Q10e)iii).

Q11a): generally answered well.

Q11.d): the correct formula was normally given for i). Some good explanations involving diagrams of a hand were given to illustrate Fleming's rule for ii).

Areas which candidates found demanding

Q2: Some candidates thought the circuit symbol in a) was a thyristor rather than a zener diode.

Q5d): Some candidates calculated the correct volt drop across the 330Ω resistor but failed to add the 2V volt drop across the diode to get the correct answer.

Q7: Some candidates identified the circuit configuration as an inverting amplifier rather than a non-inverting amplifier. Several candidate used the wrong equation to calculate the gain of the amplifier circuit (ie $(R_1 + R_V)/R_1$ rather than $(R_1 + R_V)/R_V$).

Q11b): Several candidates were unable to apply Kirchhoff's Laws to determine the supply voltage in ii). Some candidates only converted the 3-hours in iv) to minutes rather than seconds.

Q12: This question was only attempted by a few candidates so it is difficult to judge just how well it performed. The tendency of candidates not to answer the analogue electronics question in Section B has been prevalent since the inception of the exam paper, and reflects the fact that many candidates find analogue electronics harder than digital electronics.

Advice to centres for preparation of future candidates

The quality of answers given by candidates, and the overall grades achieved in the 2013 examination, indicate that the majority of candidates prepared well to sit the 2013 paper. Teachers are also to be commended for the hard work and support they gave to their candidates while they prepared for the examination.

It is evident that the teaching of digital electronic topics within the course continues to be of a high quality. The only topic where teachers may wish to do additional work with their candidates is in the area of fault-finding in combinational logic circuits. Fault-finding on digital circuits (and other types of circuit for that matter) often requires candidates to adopt a logical and problem solving approach to find faults. The development of such skills can only benefit candidates, especially if they wish to study technology or science at a higher level.

It is also clear that many candidates develop a sound knowledge and understanding of how to apply Ohm's and Kirchhoff's Laws in electrical and electronic circuits as a result of doing the Electronic and Electrical Fundamentals Intermediate 2 course. Such knowledge and understanding is essential if candidates intend to take subjects in electrical and electronic engineering at a higher level. Teachers are encouraged to continue doing the good work they are already doing in terms of the learning and teaching of electrical principles.

Analogue electronics continues to be the subject area which causes candidates the most difficulties. Topics such as the volt-drops in simple circuits comprising of a diode with a current limiting resistor; calculations involving inverting and non-inverting amplifier configurations; the functions of smoothing, coupling and bypass capacitors; the names of transistor terminations and biasing in single-stage transistor amplifier circuits continue to cause candidates problems. Teachers are encouraged to explore new paper based and electronic teaching and learning approaches which enhance candidates' knowledge and understanding of these important topics.

Statistical information: update on Courses

Intermediate 2

Number of resulted entries in 2012	23

Number of resulted entries in 2013	39

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	41.0%	41.0%	16	70
B	20.5%	61.5%	8	60
C	20.5%	82.1%	8	50
D	2.6%	84.6%	1	45
No award	15.4%	100.0%	6	-

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.