External Assessment Report 2014

Subject(s)	Electronic and Electrical Fundamentals
Level(s)	Intermediate 2

The statistics used in this report are prior to the outcome of any Post Results Services requests

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

There were 23 candidate entries for the 2014 Electronic and Electrical Fundamentals Intermediate 2 examination, compared with 39 in 2013 and 23 in 2012. The reduction in numbers is probably a reflection of the fact that the Electronic and Electrical Fundamentals Intermediate 2 qualification is in the process of being phased out.

Three centres presented candidates for the 2014 examination, with no returning or new centres. This compares with four centres in 2013 and three in 2012. The three centres presenting candidates were secondary schools.

In 2014, 87% of candidates achieved an A to C pass grade. This compares with 84.6 in 2013 and 91.3% in 2012. Of the candidates who failed in 2014, all three achieved a No Award. Given the low number of candidates sitting the examination in 2014 and 2013 it is not possible to read any real significance into the small increase in pass rates and mean marks between 2014 and 2013.

The various grades in the 2014 Examination were as follows, with the corresponding 2013 grades shown in brackets:

- Upper A – 17.4% (7.7%);
- Lower A – 43.5% (33.3%);
- B – 13.0% (20.6%);
- C – 13.0% (20.5%);
- D – 0.0% (2.6%);
- No Award – 13.0% (15.4%).

It is difficult to draw any meaningful significance from the percentage figures given the low numbers of candidate entries, although it is perhaps worth observing that candidate performance in 2014 was even better than in 2013, which could be regarded as a ‘good year’ in terms of candidate examination performance.

The setting and marking teams both indicated that in their view the 2014 examination paper was of a comparable standard to previous years’ examination papers. These views are supported by the percentage marks.

Markers did not report any questions that did not perform as expected. However, it has to be reported that only two candidates attempted Question 12 in Section B of the paper: the analogue electronics question. The tendency of candidates not to answer the analogue electronics question in Section B has been prevalent since the inception of the Electronic and Electrical Fundamentals Intermediate 2 examination paper, and reflects the fact that many candidates find analogue electronics harder than digital electronics.

Areas in which candidates performed well

- Question 1(a) to (c): As in previous years candidates found the coding questions straightforward.
- Question 3(a): Most candidates answered this question well, although a few forgot to convert the 750mm to metres.
- Question 3(b): It is pleasing to report that most candidates determined that the force on the conductor increases three times when the length of the conductor is increased from 750mm to 2250mm.
- Question 8: Most candidates were able to identify the two logic gates correctly.
- Question 9: Most candidates obtained the correct logic output for the Generator (G) and drew the correct logic diagram. However, perhaps surprisingly, many candidates got the wrong answer to Question 9(c) giving answers such as 'transistor'.
- Question 10(c): This question was generally answered well, although a few candidates forgot to convert the 1.5 hours in part (v) to seconds.
- Question 11: As has been the case in previous examinations, most candidates scored well in the Part B digital electronics question including the fault question 11(c)(iv).
- Question 12: The two candidates who attempted this question scored high marks.

Areas which candidates found demanding

- Question 2: Many candidates had difficulty determining voltage V_{BD}.
- Question 4(b): Some candidates used the rms value of the voltage rather than the peak value in this part of the question.
- Question 6(a): Many candidates thought that the component was a zener diode rather than a thyristor.
- Question 7(b): Several candidates did not include reference to a 0.6/0.7 V voltage drop on the output voltage across the load resistor on their graphs.
- Question 7(c): Most candidates did not take 0.6/0.7 V away from the 20 V when calculating the peak current in the 10Ω load resistor.
- Question 10(a) Most candidates were unable to determine currents I_4, I_5, and I_6 correctly. This may be due to the fact that I_5 was 0 A, as the resistor in the branch I_5 was assigned to, which was effectively shorted out.
- Question 10(b): Some candidates still appear to struggle with the concept of different voltage levels at different nodes in a circuit.

Advice to centres for preparation of future candidates

The quality of answers given by candidates and the overall grades achieved in the 2014 examination indicate that the greater majority of candidates prepared well to sit the paper. Teachers are to be commended for the hard work and support they gave to their candidates while they prepared for the examination paper.

It is evident that the teaching of digital electronic topics in 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 finding 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 this course. Such knowledge and understanding is essential if candidates intend to take subjects in electrical and electronic engineering at a higher level. Teachers may wish to focus more attention on the concept of voltage levels at different nodes in circuits and the calculation of volt-drops between nodes as it was clear from Question 10(b) that some candidates did not understand this important concept.

Analogue electronics continues to be the subject area which causes candidates the most challenge. Topics such as the volt-drops in simple circuits consisting of a diode with a current limiting resistor; voltage and current calculations in half and full-wave rectifier circuits; 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 some difficulties. 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

Number of resulted entries in 2013	39

Number of resulted entries in 2014	23

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	60.9%	60.9%	14	70
B	13.0%	73.9%	3	60
C	8.7%	82.6%	2	50
D	0.0%	82.6%	0	45
No award	17.4%	-	4	-

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.