



**Electronic and Electrical
Fundamentals Intermediate 2
External Assessment Report 2008**

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 marking team was delighted that the number of candidates sitting the Electronic and Electrical Fundamentals Intermediate 2 Examination in 2008 exceeded 100 for the first time. The actual number of candidates sitting the Examination was 120 compared with 99 in 2007. This represents a 21% increase in numbers sitting the Examination compared with 2007. Analysis suggests that most of the increased numbers are coming from secondary schools (e.g. 31 % of candidates came from secondary schools in 2008 compared with 20% in 2007).

The pass rate in the 2008 Examination was 50.8%* compared with a pass rate of 68.7% in 2007. This represents an 18% reduction in pass rate. Likewise the mean mark dropped from 57.7% in 2007 to 49.3% in 2008. The marking teams, while believing that there was no appreciable change in standard in the Examination Paper between 2007 and 2008, were naturally concerned that there was a further drop in pass rate and mean mark in successive years. For example, the pass rate in 2006 was 87.2 % and the mean mark was 67.3 %. However, as reported in last year's Principal Assessors Report the standard of candidates was generally regarded as very good in 2006. Last year the standard of candidates sitting the Examination was considered lower than in 2006 and it is the view of the marking team that there was a further reduction in the standard of candidates sitting the 2008 Examination. This view is supported by the estimates submitted by centres which, for example, show that 35.6% of candidates would achieve no award compared with a figure of 34.2% who actually achieved no award in the 2008 Examination. Likewise the estimates suggested that 22.8% of candidates would achieve an Upper or Lower A compared with an actual figure of 21.7% in the Examination.

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 2006 marking team that candidates appeared to be very well prepared for the 2006 Examination such that even questions that traditionally have been poorly answered were answered to a better standard. The view of the 2007 markers was that a significant number of candidates were not as well prepared for the 2007 Examination and this also seemed to be the case in 2008.

An overseas centre continues to provide the majority of candidates sitting the Examination. In 2008 the percentage number of candidates coming from this centre continues to be in the region of 60%.

As last year three secondary schools presented candidates for the Examination rather than just one school as had been the case in previous years. One new school offered the Examination for the first time in 2008 although one school who presented candidates in 2007 did not do so this year. It is hoped that an increased number of secondary schools will present candidates for the Electronic and Electrical Fundamentals Intermediate 2 Examination in future years especially given the sharp rise in candidates sitting the Intermediate I Electronics course. Furthermore, the work of updating the National Assessment Bank (NABs) instruments for the course, making them more consistent with the external examination, has now been completed and it is hoped that these revised NABs will make the Electronic and Electrical Fundamentals course more attractive to both schools and colleges.

Two FE colleges presented candidates for the Examination in 2008 which was the same as in 2007. 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. A candidate from this college achieved the highest mark in the Examination.

*All percentages are pre-appeals

Areas in which candidates performed well

- Q.1 As in previous years the coding questions were in the main answered well.
- Q.3 (b) This Question was generally answered well although a significant number of candidates gave the wrong units to (iii): for examples, Ohms instead of Watts.
- Q.6 This Question was on the whole answered well although a number of candidates drew their diagrams using ANSI symbols rather than BS symbols as asked for in the question.
- Q.8 This Question was in the main answered well although a few candidates demonstrated they did not understand what is meant by peak to peak voltage.
- Q.10 (a) Most candidates attempting this Question were able to convert the binary numbers to decimal and hexadecimal.
- Q.10 (c) This Question was done quite well by most candidates although some candidates used an AND function rather than an OR function in their answer.
- Q.11 This question was designed to test fundamental electrical principles. It is very pleasing to report that many candidates scored well in this question suggesting that centre staff are giving a great deal of attention to these fundamental electrical principles.
- Q.12 (a) This Question was answered reasonably well by candidates although quite a few candidates failed to subtract 0.6/0.7 volts when determining the maximum voltage across R_L . It is pleasing to report that a number of candidates realised that the minimum voltage across R_L was 0 V.

Areas which candidates found demanding

- Q.2 (a) Many candidates stated this as a NPN transistor rather than a PNP transistor.
- Q. 2 (b) While most candidates recognised the circuit symbol as a capacitor they failed to identify it as an electrolytic or polarised capacitor.
- Q. 3 (a) Many candidates had real difficulty in expressing Ohms Law in words.
- Q.5 (b) As on previous occasions when this type of question has been included in the Examination Paper most candidates failed to add on the volt-drop across the zener diode: namely 5.6 V.
- Q.7 Most candidates experienced considerable difficulty in calculating base current in terms of $I_B = I_c/h_{fe}$. In part (c) some candidates failed to add the base current to the current in the 6K8 resistor.
- Q.9 A number of candidates identified the circuit in the diagram as a half-wave rather than a full-wave rectifier and, as a consequence, drew the wrong waveform for part (b). In general, candidates struggled with explaining the concept of smoothing in Q. 9 (c).

- Q.10 (b) While a number of candidates were able to draw the logic diagram correctly some candidates failed to include the pin connections on their diagrams as asked for in the question. Question (iii) proved stretching for most candidates although a few candidates did get it correct.
- Q.12 (b) A number of candidates gave inverting amplifier rather than non-inverting amplifier as their answer which meant they did not score highly in this question. It is, however, pleasing to report that a number of candidates got the stretching question (iv) entirely correct.
- Q.12 (c) Most candidates were able to identify the components labelled X and Y in (i) but most also struggled with the purpose of R_V in (ii).

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 electronics and electrical engineering. This was particularly noticeable with regard to Q.11, the Electrical Principles question. Centres are to be praised for the continued efforts they have put into teaching these basic concepts and principles and are encouraged to maintain this excellent work.

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 that some candidates did not read some of the questions correctly and, thus, gave wrong answers to these questions. Centre staff should advise their candidates to read questions in full and make sure they understand what questions are asking for.

Centres are encouraged to continue to develop new approaches to the teaching of biasing of transistor amplifiers since candidates find this topic challenging. Such approaches should be linked back to basic electrical principles so that candidates understanding of biasing can be built on a clear set of principles. Centres may also wish to consider how best to teach candidates to apply Kirchhoff's Voltage Law correctly in the context of the zener diode circuit in Q.5 as most candidates failed to add the volt drop across the zener diode to the volt drop across the $330\ \Omega$ resistor. This has been a recurring problem for a number of years and one which it would be good to address. In light of the number of wrong answers given to Q.12 (b) centre staff may want to spend more teaching and learning time on operational amplifier circuit configurations. Centres should also consider the best ways to teach candidates the role of smoothing capacitors in rectifier circuits and variable resistors in light dimming circuits.

Traditionally candidates have found digital electronics questions easier to answer. While most candidates answer the coding questions and questions involving such tasks as determining logic outputs of gate arrangements and the drawing of logic diagrams well, many candidates struggle with questions involving faults in logic circuits and where questions are expressed in words rather than diagrams or logic formulae (e.g. Q.10 (c)). Centres may wish to review the way they deliver these latter two topic areas with a view to enhancing candidates understanding of what is required in these types of questions.

Statistical information: update on Courses

Number of resulted entries in 2007	99
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Number of resulted entries in 2008	120
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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	21.7%	21.7%	26	70
B	8.3%	30.0%	10	60
C	20.8%	50.8%	25	50
D	5.0%	55.8%	6	45
No award	44.2%	100.0%	53	-

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.