

Principal Assessor Report 2004

Assessment Panel:

Engineering

Qualification area

**Subject(s) and Level(s)
Included in this report**

Mechatronics Higher

Statistical information: update

Number of entries in 2002	26 from 4 centres
Number of entries in 2003	33 from 5 centres (5 centres linked to 3 FE colleges)

Number of entries in 2004	16 from 5 centres (5 centres linked to 3 FE colleges)
---------------------------	---

General comments re entry numbers

In the first four years there had been a steady growth in both numbers of candidates and presenting centres. This year there was a reduction in the number of candidates owing to one of the stalwart centres encountering funding issues in relation to their local school arrangements. The head of department there is presently optimistic that a cohort of students are seeking to do Mechatronics and that the funding issues will be resolved – this should restore numbers for the next (2005) presentation. A new additional centre did submit candidates some of whom were successful in gaining passes. An interesting development this year has been the presence of three female candidates amongst the candidates, which represents almost 20% of candidates. This is encouraging, as few female students have traditionally sought engineering courses (except in software).

The overall engineering sector still remains depressed owing to national and international issues though there is much evidence of increased activity and declared staffing shortages in the Mechatronics segment though the Scottish situation appears to lag behind the situation in England.

In addition to those who sat the examination there were an additional nine candidates some from each FE centre who were absent on the examination day – a figure that is proportionally similar to last year. These candidates will not have the opportunity to gain their qualification at this time, but may do at a later date and will have studied some of the component units that make up the continuously assessed element. These candidates therefore will have benefited from the course and some will have achieved the units. Discussion with centres show that these absent candidates come about because of a variety of issues. Some are candidates who have left courses either because of going into employment or dropping out. Others are candidates who have decided to concentrate on other parts of their course particularly if the Higher is seen as an adjunct to an NC course rather than an integral element.

Statistical Information: Performance of candidates

Distribution of awards

Marks awarded ranged from 18 marks to 89 marks. Of the sixteen candidates the awards were as follows:

Award Section	No of Candidates	% of Candidates
A	2	12.5
B	0	0.0
C	1	6.3
Not Passed	13	81.3

Note candidates near boundaries and the highest non pass (46) were all cross-checked and checked by PA to ensure the vigorous application of standards and logistical correctness.

Comments on any significant changes in percentages or distribution of awards

With small numbers it is difficult to make appropriate comments on changes. However the number of candidates gaining an A pass on the exam paper has continued at just over 30% over the last three years (including 2004) and also the number of candidates gaining a pass has continued at just over 60%. The actual pass rate is somewhat less when the internal assessment is included.

The overall range of marks 18 to 89 is comparable to 2003, which was 14-92 with a larger candidate cohort.

This shows that once again there is a wide range of ability and knowledge demonstrated by candidates and that the examination provides suitable stretching which provides differentiation between candidates.

Grade boundaries for each subject area included in the report

Distribution of awards				
	%	Cum %	Number of candidates	Lowest mark
A	12.5	12.5	2	70
B	0.0	12.5	0	60
C	6.3	18.8	1	50
D	0.0	18.8	0	45
No award	81.3	100	13	

General commentary on passmarks and grade boundaries

- While SQA aims to set examinations and create mark schemes which will allow a competent candidate to score a minimum 50% of the available marks (notional passmark) and a very well-prepared, very competent candidate to score at least 70%, it is almost impossible to get the standard absolutely on target every year, in every subject and level
- Each year we therefore hold a passmark meeting for each subject at each level where we bring together all the information available (statistical and judgmental). 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 senior management team at SQA
- We adjust the passmark downwards if there is evidence that we have set a slightly more demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- We adjust the passmark upwards if there is evidence that we have set a slightly less demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- Where the standard appears to be very similar to previous years, we maintain similar grade boundaries
- 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 are different. This is also the case for exams set in centres. And just because SQA has altered a boundary in a particular year in say Higher Chemistry 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
- Our main aim is to be fair to candidates across all subjects and all levels and maintain standards across the years, even as syllabuses evolve and change

Comments on grade boundaries for each subject area

The 2004 paper appears to have been a fair and reasonable paper with a standard in line with previous papers and the required descriptor requirements. No student appears to have been disadvantaged by any aspect of the paper or marking. Differences in teaching, topic coverage, topic emphasis and individual candidates skill, knowledge and application are much more likely to have influenced gained marks than any effect or nuance in the paper.

It was recommended that the grade boundaries were maintained at 50, 60 and 70 and the candidates awarded the appropriate grades for the examinable part of their course. This decision was not taken without considerable detailed consideration of the whole paper, individual questions and parts of questions.

Detailed discussions are recorded under the “areas in difficulty in marking”. But a summary of the topics of the discussion areas included:-

- detailed comments on every question part
- potential issues arising from question Q7 (as to how much of the process required description)
- acceptable range of responses to question Q9(b) (all potentially true answers should be accepted)
- number of candidates and quality of responses to Q11 (basically the issue “was Q11 an acceptable question”)
- were Q11, Q12 & Q13 balanced.

Comments on candidate performance

General comments

The performance by the candidates varied from quite poor through to excellent with a variety of results in between also. With few exceptions candidates gained more marks in Section A than Section B which was in line with the stretching and integration issues of the paper. Also candidates generally performed in a similar fashion in Section A and in Section B (both good and poor performers). Of the Section B questions, usually each selected question received approximately similar marks but there were examples of a very low mark for one Section B question yet a very high for another.

Overall there was a demonstration of learning, knowledge and application in Mechatronics. Mechatronics as an applied subject cannot be taught or assessed by standard, pre-known examples but requires elements of new situations and applications which candidates may never have seen before. The better candidates showed a very well developed skill in responding to such scenarios where as the poorer often floundered or failed to attempt such aspects.

Areas of external assessment in which candidates performed well

The table below shows where candidates performed well (defined as the average mark gained being more than 66% of the maximum possible).

Q No.		% who gained any marks	% average mark of all who attempted	Topic(s)
Q1		100	75	Micro-controller
Q3	(a)	94	70	Robot Programming
	(b)	94	72	Drive systems
Q5	(a)(i)	94	94	Encoder code type
Q6	(a)	81	67	Robot geometry
	(b)	100	70	Work envelope
Q8	(a)	94	91	Sensor waveform
Q9	(a)	88	88	Control systems
Q10	(b)	94	88	Linear actuator
Q12	(d)(i)	85	85	Positional sensor
Q13	(b)(i)	100	98	Suitable Sensor
	(b)(ii)	92	92	Suitable Sensor
	(d)	92	75	Robot geometries
	(e)	83	73	Workcell safety

Areas of external assessment in which candidates had difficulty

The table below shows where candidates performed poorly (defined as the average mark gained being 33% or less of the maximum possible).

Q No.		% who gained any marks	% average mark of all who attempted	Topic(s)
Q8	(c)	19	19	Calculate speed
Q9	(c) (ii)	38	28	Error signal
Q11	(b)(ii)	29	17	P, I, D, meaning
	(d)(i)	29	14	Shaft encoder
	(d)(ii)	0	0	Calculation
Q12	(c) (ii)	62	32	Explain PLC Ladder Diagram in part 12c (i)

In addition candidates sometimes had difficulty in gauging (or supplying) the depth of answer required, i.e., some answers were too brief or omitted detail. The depth of answer should have been discerned from the specific wording (state, briefly describe, sketch, calculate, etc.) and/or from the marks allocated (3 mark describe questions needing a more detailed response than a 1 mark state question). Some sketches were also lacking detail or clarity.

Recommendations

Feedback to centres

Centre performances

All centres should be commended in providing candidates of a suitable level for sitting the examinable aspect of the course. The top five candidates included candidates from all three FE colleges which showed that a good standard of candidate knowledge and performance was attainable at all centres. By implication the teaching and learning therefore must have been at a suitable level.

The bottom five were from two FE colleges with the sixth lowest being from the other FE college. One college managed to supply a better standard of candidate (by natural ability, selection or teaching and learning process) than the other centres but there was an improvement in one centre who had previously supplied a poorer standard of candidate. A new centre provided a good spectrum of candidates and the achievement of their better candidates showed a commendable standard of response to the examination.

Centres should continue to ensure all aspects of the subject (as defined in the arrangements) are taught and nothing is omitted without a conscious choice. Centres should also ensure candidates are well prepared for the examination in terms of exam techniques, planning and accuracy of reading questions. Attention to specific wording and marks available for parts of questions should be emphasised.

Some questions in the exam covered areas directly assessed by the NABs which it is presumed candidates have already successfully completed. Candidates should be reminded that retention of the knowledge and understanding in the completion of the NABs will assist them in a number of exam questions.