

# Teaching Committee report to the Faculty Board

## Examinations for Parts IA, IB and II of the Tripos, 2001

### Introduction

The Committee met five times to consider the examiners' reports on the 2001 Undergraduate Tripos examinations. We also looked at the examination statistics.

We noted with pleasure that the External Examiners, without exception, commented favorably both on the examination process and also on performance of the candidates. The six External Examiners' reports include comments such as: *The scripts of the good first class candidates were a pleasure to read* (Part IA); *The majority of students are demonstrating high levels of attainment* (Part IB); *I saw many excellent answers, which showed that students had successfully learned and understood a significant body of useful mathematics; lecturers and supervisors are to be congratulated on the teaching of the syllabus* (Part IB); *Overall the standard was impressive and there were some really excellent performances by a good number of candidates* (Part IB); *It is a pleasure to salute the overall high standard of the candidates' performance. This is a reflection of the skill dedication and hard work of the teaching staff ...* (Part II); *As reflected in the degree classes awarded, the vast majority of candidates produced work of excellent (and sometimes outstanding) quality and depth* (Part II)

There follows a summary of the points raised in the Examiners' reports which we believe need the attention of the Faculty Board. We have not highlighted the various points of a purely administrative nature that arise (such as a request for the provision of more reliable printers, a new location for the computers, storage of scripts). We assume that these will be dealt with as appropriate by the Faculty Secretary in conjunction with the Computer Officer and this year's Chairmen of Examiners.

### Data Protection Act

Professor Falconer (Part IA), Part II Examiners, remark 7. It was agreed by the Faculty Board (Minute 01.25, 3rd May 2001), with regard to marking and the DPA, that examiners should give subtotals and indicate mistakes on scripts as far as this was the previous practice. Candidates will be given a more detailed breakdown than before, namely the credit that they achieved for each question and each computational project. Candidates who are sufficiently motivated may then apply to the University Data Protection Officer for the additional information written by examiners on their scripts. We **recommend** that this agreement is included in the Chairman of the Faculty Board's letter to Chairs of Examiners.

### Errors

There were three minor errors in Part IA, one serious error in Part IB and five errors in Part II. It seems that none of these errors seriously disadvantaged candidates. The Examiners' reports for Part IB and Part II give an explanation of how the errors arose. As last year, we **recommend** that examiners give a brief explanation of how and when errors arise; perhaps this recommendation should be included in the Chairman of the Faculty Board's letter to Chairs of Examiners.

### Rubric

(i) The Part IA Examiners (11(v)) recommend that the Board of Examinations provide cover sheets omitting the instruction to write on both sides of the paper unless instructed otherwise. It

is particularly useful to write only on one side of the paper in mathematical examinations, to avoid the need to keep turning over the page to copy formulae. However, the Faculty Board has not had much luck in the past in persuading the Board of Examinations to provide special cover sheets for mathematical examinations. Does the Faculty Board wish to try again?

(ii) The Part IA examiners (11(vi)) comment on the large number of candidates who violate the rubric concerning the number of questions that may be attempted. Candidates who realise that all work handed in is marked and the lowest marks are discarded in cases of rubric violation are at some advantage. We are of the opinion that the policy of marking all work handed in is the only viable one. We **recommend** that the rubric is altered so that it reflects this policy. The current rubric states (in all parts of the Tripos where there are restrictions) that candidates ‘may attempt only X questions’ — which is clearly absurd. We **recommend** that the relevant Part IA rubric reads:

*You will be assessed on, at most, the four questions in Section I and five questions chosen from Section II, with a limit of three questions on each course in Section II.*

*If you submit answers to more than five questions from Section II, or answers to more than three questions on either course in Section II, your lowest scoring attempt(s) will be rejected.*

and that the rubric in Parts IB and II are altered similarly.

(iii) We also **recommend** that the rubric concerning the extra credit for ‘complete answers’ is made more accurate: for example, *Extra credit will be given for substantially complete answers.*

## Alternative merit marks

There are various comments about the desirability of replacing the current system of quality marks and merit marks. Professor Falconer (Part IA) did not find the alternative merit marks helpful and believes that quality marks are essential, and this view is supported by all the examiners. Professor Jones (Part IB) has ‘no objection’ to the current system and Professor Duck (Part IB) was ‘favourably impressed’ with it. Professor Bingham (Part II), who had last year advocated the quadratic merit formula, was this year persuaded that no change was required. Professor Cremona (Part II) thinks that the current system is ‘about right’.

The Part IB and Part II examiners were able to provide data showing the number of candidates who would change class if an alternative scheme were used. Together with data from last year, these show that there is very little to choose between the different schemes. It would still be possible to obtain the missing data for this year and possibly for last year.

There remains a strong argument for changing from from the current system of quality marks: the perception of students that the system is somehow unfair. This point of course does not show up either in the External Examiners’ reports or in the statistics.

This debate has now been running for more than two years. We propose to bring a final report to the next meeting of the Faculty Board.

## Model answers and mark schemes

Several of the External Examiners commented on the importance of providing TeX versions of questions with full model answers and mark schemes (including information about the source/status of each part of each question) at an early stage. In a small number of cases, this did not happen. We **recommend** that the above point is added to the Chairman of the Faculty Board’s letter to Chairs of Examiners. The use of the template implemented last year for solutions should also be added.

## Personal circumstances of candidates and resits

Several of the External Examiners mention the possibility of the examiners taking into consideration the personal circumstances of candidates (those with warning letters, for example) and also the possibility of candidates resitting examinations. These issues are matters of University policy and some at least have been discussed recently widely within the University. We feel that there are very good educational reasons for retaining the current situation (while recognising that the proposed alternatives also have merit).

## Guidelines for percentages in each class

Professor Duck (1.) comments on the recommended class percentages issued by the Faculty Board which imply little variation in quality from year to year. We note that the percentages do vary from year to year, more in fact than might be expected given the large numbers of students involved.

He also suspects (correctly!) that there is little standardisation within the University. We note that all the External Examiners who commented were happy with the quality of the students in each class — except Professor Bingham who believes that the number of firsts awarded in Part II was possibly a little niggardly. We also note that, although the Mathematics Faculty gives a greater proportion of firsts than is given in other faculties and in other university mathematics departments, there is consistent evidence from External Examiners over the years that this is in keeping with the performance of the candidates.

## Computational Projects

(i) The Faculty Board is well aware of the problems that arose with the Computational Projects courses last year. The quality of attempts at individual projects was significantly worse in Part IB this year than last. A number of factors may have played a part, and we were not able to draw any conclusions.

(ii) Professor Cremona (Part II) asks if the same benefit could be achieved with a smaller number of projects, thereby reducing the assessment load. We noted that the Faculty Board has set up a committee to consider such issues.

(iii) It appears that the error in the programme for awarding betas to Part II candidates that was identified in 2000 was not corrected in time for the 2001 examination. We **hope** that the the relevant computer office will be made aware of the situation in good time.

## Marks for Papers 5 and 6 of Part IA

Although the External Examiner for Part IA is of the opinion that the classification of candidates for Papers 5 and 6 were adequately considered, we again **recommend** that a different approach is taken. The suggested algorithm (see appendix to this paper) is similar to that used for incorporating Mathematics marks into the Part IA NST examination. It involves a piecewise scaling onto class boundaries. This would avoid the under-rewarding of high achievement recognised by the Part IA examiners. We **recommend** that the scheme proposed in the Appendix is adopted and automated this year, and that it be suitable tested beforehand.

## Timing of Part IB examinations

Professor Jones would like to know how the performance of students is correlated with the paper number (do they become increasingly exhausted, especially in Paper 4 which is sat on the same day as Paper 3). Professor Duck advocates that Paper 4 be sat on a separate day. We **recommend**

that the possible correlation is investigated and that, if the performance on Paper 4 is significantly worse, this paper should be moved to a separate day this year if possible.

We also felt that there was a good case, regardless of the outcome of the above, for reorganising the examination timetable so that no candidates sit two examinations on the same day. If all mathematics examinations are necessarily in the same building, this might entail moving Part IA forward by one day; if not, the timetable could be completely revised. We **recommend** that the Board of Examinations is consulted on the possibility

## Part IB Curriculum

Professor Jones notes the absence of abstract algebra (apart from linear algebra) and of combinatorics in Part IB. We noted that an Algebra Syllabus Committee is currently meeting to discuss the Part IB Curriculum. We **recommend** that Professor Jones's comment is brought to the attention of the Algebra Syllabus committee.

## Additional External Examiner for Part IB

Professor Jones comments that, since neither of the current External Examiners has any expertise in Statistics or Optimisation, the Faculty Board might consider the possibility of appointing a third External Examiner. There are currently three External Examiners for Part II and one for Part IA. Does the Faculty Board wish to **consider** this possibility?

## Structure of the Part IB examinations

Professor Jones suggests that the Faculty Board might like to consider modifying the structure of the examination to encourage the students to study a broader range of topics. He also suggests other modifications, including the existence of a core syllabus. The Curriculum Committee is at present considering these issues and will welcome Professor Jones's timely input.

## Format of Part II

Two of the three Part II External Examiners commented on the format of Part II.

Professor Cremona says that it is not clear what is gained by the division into two Alternatives, particularly as some (a few) students end up taking the 'wrong' Alternative. He also points out that the current format (non-modular) serves to protect the students, to some extent, from the inevitable variation in difficulty of questions on different courses.

Professor Bingham points out that while the present system works well, alternatives are not only feasible, they are usual elsewhere. The modular system has much to recommend it on academic grounds and for convenience. He also mentions that he believes the UK will go over to transcripts rather than classing within his academic lifetime (transcripts are only possible in a modular or comparable scheme).

## Classing policy in Part II

Professor Bingham commented on the method used by examiners to determine the relative size of the first class in Part II(A) and Part II(B). This year, the examiners took into account the relative numbers of students in II(A) and II(B) who got firsts in Part IB. This year, it seems that there are more students taking Part II(B) even than last year, which means that there may only be a few (maybe even no) students taking Part II(A) who got a first in Part IB. We **recommend** that

the Part II examiners consider alternative ways of determining the relative numbers of firsts in the two Alternatives (for example, by comparing a bit further down the lists).

We also noted that over the years, the proportion of students taking Part II(B) has increased from 35% in 1997 to 51% in 2001. The number of firsts in Part II(A) correspondingly decreased (from 16 in 1997 to 5 in 2001). Students perceive that it is statistically much harder to get a first in Part II(A) and this perception probably accelerates the drift towards Part II(B). We **recommend** that the Faculty Board take this into account in its deliberations on the future of Part II.

### **Timing of the final meeting of Part II examiners**

Professor Cremona (see also Examiners' report, remark 4) advocates moving the final meeting from its traditional day (Saturday) to Tuesday. We recalled that in previous years the timing has been found tight, even though it was not thought so this year, and **recommend** that Professor Cremona's suggestion is brought to the attention of the current chairman of Part II.

### **Part II: length of Paper 4 questions**

Examiners' report, remark 6, is based on a confusion. The Faculty Board (30th April, 1998, item 84(h)) agreed that all questions on all papers should be of the same difficulty and carry 30 marks. The preceding discussion makes it clear that 'difficulty' includes (or may even be measured by) length.

The rationale for this decision was that, although candidates are assessed on a maximum of 4 questions on Paper 4, a maximum of 6 questions in Papers 1 – 3 in Part II(A) and an unrestricted number in Papers 1–3 of Part II(B), in practice most candidates only complete the equivalent of about 4 or fewer questions on any paper. The purpose of the rubric is to force candidates to obtain their marks from a small number of questions rather than (as was previously the case) to force candidates to attempt questions of an extended nature.

We **recommend** that this Faculty Board minute is brought to the attention of this year's Part II examiners.

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John Lister,	Stephen Siklos (Chairman),	John Stewart.