

EE 201A

October 30, 2006

EE Ph.D. Qualifying Examinations

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- Qualifying examination overview
- Grading procedures
- Statistics from past years

Qualifying examination structure

- Ten (or nine) 10-minute “oral” examinations in faculty offices.
Some faculty have students work on paper, others at the blackboard.
- Faculty “committees” are chosen from 20 faculty specified by students.
- Committees must have breadth—no more than four examiners in any one of eight question areas, roughly associated with the five department labs.
 - CSL: Computer Hardware & Architecture, Computer Systems Software
 - ISL: Signals, Systems
 - ICL: Electronic Circuits, Electronic Devices
 - SSP: Engineering Physics, Electronic Devices, Electromagnetics
 - STAR: Electromagnetics, Signals

Rationale for many short oral exams

- Written exams correlate strongly with grades and not very much with research accomplishments (based on retrospective surveys).
- EE quals at one time were hour-long exams. A survey showed that faculty learned enough about students' apparent knowledge and ability in the first 10 minutes; the remaining time only confirmed this initial evaluation.¹
- For the same total amount of exam time, more independent evaluations can be obtained by using shorter exams and a larger number of faculty.
- Bombing a short exam is much less traumatic than spending an entire hour in shock.

¹Malcolm Gladwell's recent book *Blink* gives many examples of decisions based on first impression.

Examiner committees

Faculty committees are chosen based on student rankings of faculty.

- Only top 20 (of about 60) faculty need be ranked.
- Rankings are in groups of 5 “equally desirable” faculty.
- At most 4 examiners from any question area will be assigned (although as many as 6 may be listed on the preference form)

Note: Faculty rankings are completely independent of faculty question areas.

- Students may put in their top group a faculty member from a remote question area or exclude a professor from their main area.
- The quals question area preferences section of the application form is for statistical purposes and is not binding.

Why rank faculty in groups?

- To obtain “fair” committees assignments as measured by the following criterion: all students get the same number of choices from each group.
- To reduce stress of fine tuning preferences; e.g., to avoid candidates worrying about “should Prof. Heaviside be ranked 8 or 9?”
- To make scheduling feasible: it is not possible to assign all applicants their first choice, since one or two faculty would be listed first 80 students.

Even we did ask someone to examine 75 students, there would be problems: this professor would either go on sabbatical every winter or would have too much influence on the selection of candidates.

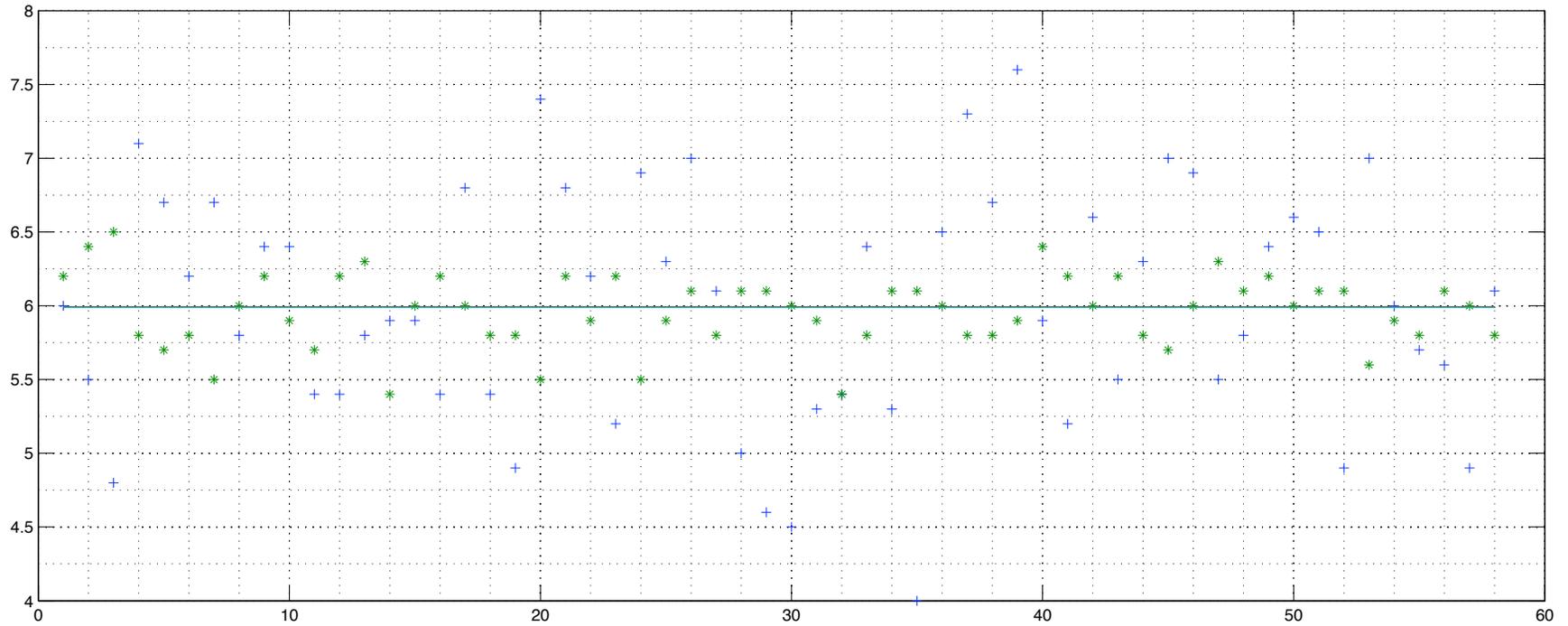
All students have been assigned exactly 4 of the first 5 choices and 3 of the next 5; that is, 7 from the first 10.

(Not everyone received his or her first choice, such as their thesis adviser.)

Grading procedures

- Faculty assign raw scores from 0 to 10. Scores are based not just on questions answered (end point) but on how the problems are approached (trajectory). Even if you don't know the area, you can score well by understanding the problem and suggesting reasonable ways to proceed.
- Faculty scores are normalized to neutralize the effect of easy or hard graders, taking into account the possibility that faculty examine different sets of students. For 2005-2006 quals, maximum and minimum means were 7.9 and 3.5; the respective adjusted means were 6.5 and 5.0.
- Adjusted scores are summed and sorted. The ranked list of students is presented to the faculty. A passing threshold is set, based on estimates of the number of openings in the Ph.D. research programs. Students above the threshold are passed.
- Students who do not pass on their second attempt may appeal. Appeals require letters of support from faculty research supervisors and are based on evidence of research. In the past few years, more than half of the appeals have been successful.

2005-2006 Qualls Scores



Quals statistics

| Year | T | P1 | PA | P | FT | ST | FP | SP | FP/FT | SP/ST |
|------|-----|----|----|----|-----|----|----|----|-------|-------|
| 2006 | 160 | 85 | 10 | 95 | 119 | 41 | 58 | 36 | 0.48 | 0.87 |
| 2005 | 148 | 82 | 6 | 88 | 102 | 46 | 48 | 40 | 0.47 | 0.86 |
| 2004 | 182 | 78 | 16 | 94 | 116 | 66 | 43 | 51 | 0.37 | 0.77 |
| 2003 | 195 | 79 | 13 | 92 | 141 | 54 | 58 | 34 | 0.41 | 0.63 |
| 2002 | 194 | 79 | 10 | 89 | 151 | 43 | 61 | 28 | 0.40 | 0.65 |
| 2001 | 160 | 82 | 3 | 85 | 134 | 26 | 68 | 17 | 0.51 | 0.65 |
| 2000 | 144 | 79 | 7 | 86 | 113 | 31 | 62 | 24 | 0.54 | 0.77 |

| | |
|--------|---|
| T | Number of students taking exams |
| P1 | Passing rank |
| PA | Number of students passed on appeal |
| P | Number who passed including appeals |
| FT, ST | Numbers of first timers and second timers |
| FP, SP | Numbers of first and second timers who passed (including appeals) |
| FP/FT | Ratio, first time passers to first time takers |
| SP/ST | Ratio, second time passers to second time takers |

Quals statistics (2)

Most MS students take four or five quarters to complete MS program.

Two opportunities to take the quals are therefore available.

Consider students who took the quals once and passed or took the quals a second time.

| | |
|----------------------|-----|
| Candidates 1997–2003 | 659 |
| Passing breakdown | |
| Try #1 | 438 |
| Try #2 | 122 |
| On appeal | 55 |
| Passing total | 615 |
| Passing percentage | 93% |

For the period 1997–2003, the pass rate for these students is high.