The Oral Qualifying Examination in Area II (Old Program)*

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The Oral Qualifying Examination (OQE) is the second part of the General Examination required for a Ph.D. in the Department of Electrical Engineering and Computer Science (see Department Memo 3800old).

The supplementary information and advice below may be helpful to students and faculty in Area II. It has been revised to take into account the elimination in 1986 of the Computer Science Written Examination.

The OQE is the first formal examination required for a Ph.D. in the Department of Electrical Engineering and Computer Science. It tests the student's knowledge, problem-solving skills and intellectual preparedness for doctoral research.

What is the purpose of the OQE?

The Oral Qualifying Exam provides the student and faculty an opportunity to assess the likelihood that the student will be able to complete a doctoral program sucessfully.

Who takes the OQE in Area II?

Enrolled graduate students prior to September 1999 who plan to pursue doctoral studies in Area II must take the Oral Qualifying Examination.

When does a student take the OQE?

The Area II Committee expects most students planning to obtain a Ph.D. to take the OQE during their fourth term of graduate study. The OQE is normally taken around the time that a student is completing the MS program (or equivalent research experience if the student comes to MIT with a Master's degree). It is not necessary to have completed the

*Old program applies to students in the EECS Graduate program before September 1999.

MS in order to take the OQE. However, students whose research is not sufficiently under way to be assessed by their research supervisor will be at a disadvantage in the examination.

In addition, the student must have qualified in two of the core fields within computer science—programming languages, artificial intelligence, computer architecture, and theory of computation and algorithms—before taking the OQE.

After consultation with his/her graduate counselor, a student may choose to postpone the OQE until the fifth term of graduate study. Such a decision might be based on the need to make up for a weak undergraduate background in computer science or on slow progress in Master's thesis research. Students wishing to postpone the OQE past the fifth term must provide by Registration Day an acceptable written explanation to the Area II Committee, approved by their graduate counselor, of the postponement and a proposed schedule for taking the exam.

How does one apply for the OQE?

Application forms are available in the EECS Graduate Office (38-444), Area II Secretary's office (NE43-366), or in ftp://theory.lcs.mit.edu/pub/areaii. Contact joanne@theory.lcs.mit.edu for more information. Applications are due in the Area II Secretary's office on Registration Day of the term in which the exam is to be taken. The application is in two parts: an EECS form and an Area II supplementary page.

When applying for an examination, you should meet with your faculty counselor, research supervisor, or the Area Chairman to:

1. Discuss which Computer Science faculty members you would like to have on your Exam Committee. You will list at least three of these, in order of preference, on the Area II supplement.

2. Indicate (under item 9 on the application form) the names of three EECS faculty members not in Area II who seem desirable for your examining committee. This information will be used in assigning a Departmental Representative to your committee.

What takes place before the exam?

Basing its decision on the interests and the names of faculty indicated by you in item 9 of the OQE application form, the EECS Committee on Graduate Students selects one EECS faculty member outside Area II to serve on your OQE committee. The Area II committee, which includes all Area II graduate counselors, selects two or three Area II faculty to complete your examining committee. At least one member of the Area II committee serves on each examining committee, usually as chair. The student and the examining committee are then notified and receive further instructions about arranging the examination from

the Area II Secretary. The student should meet with each member of the committee and discuss procedures for the exam and its scheduling with the chair of the committee.

The student should also provide written copies of his/her SM thesis or other available research to the members of the committee.

What should the student expect during the OQE?

The student and examining committee generally meet for two hours in a conference room. First, the student is asked to make an oral presentation of his/her research, and to explain and defend the topic and conclusions. The presentation is usually about half an hour in length, not counting interruptions for questions. The duration of the presentation, as well as the material (slides, etc.) to be used for the presentation should be arranged some weeks in advance of the examination by consultation betwen the student and the chair of the examining committee.

The remaining time is devoted to questioning the student. Students should expect to be asked questions about their research, including technical questions, questions about the significance of the work, and questions about the relationship of the work to other work in the same research area.

Students should also expect to do some problem-solving at the blackboard and to explain their approaches orally as they attack problems. The problems to be solved will typically be based on material the student has learned in the three core areas in which he or she has qualified. Questions may be quite different from typical written examination questions in the same fields, however. The feedback available in an oral exam allows examiners to ask poorly-defined questions for which necessary data is not given.

Ability to refine a fuzzy question and to realize what data are required is a part of problem-solving ability. Take advantage of the feedback to ask for, or to suggest, assumptions or data required to make sense of the problem and to solve it.

What does the examining committee look for?

In general, the examining committee looks for evidence that the student has sufficient understanding of computer science and sufficient promise in research to make success in a doctoral program likely.

More specifically, the committee looks for:

1. Breadth and depth of knowledge and problem-solving ability at a level commensurate with the Ph.D. The areas in which the student has qualified define the expected breadth of knowledge.

2. Mastery at a high professional level of some topic in computer science. Generally this topic is related to the student's Master's thesis research. A student should be able to demonstrate not only technical expertise about some topics, but also an ability to explain and evaluate the topic in an overall research context. For example, a student who has solved some technical problem but cannot explain why the problem was interesting, or the use to which the solution might be put, or where his/her research area fits into the computer scientific enterprise, has not demonstrated the kind of ability needed for doctoral research.

What takes place after the examination?

After the exam, the examining committee files a report including a recommendation to the Area II Committee. The Area II Committee decides on the basis of the examining committee's report and all other information (such as academic performance and reports from the student's counselor and research supervisor) whether to recommend that the student be found qualified to enter the doctoral program. The Area II Committee reports its recommendation to the Department Committee on Graduate Students. The Committee on Graduate Students then notifies the student whether he/she is:

1. **Qualified** to enter the doctoral program;
2. **Not Qualified At This Time** to enter the doctoral program; or
3. **Not Qualified** to enter the doctoral program.

You and your counselor are sent a copy of the Examining Committee's report. The significance of outcomes 2 and 3 are explained in the next section.

Repeating the OQE

The finding **Not Qualified At This Time** is used when there are deficiencies either in breadth and depth of knowledge or in demonstration of research potential or both, but those deficiencies are judged to be remediable and the candidate is encouraged to request a second oral examination after a term or two. If only research is deficient, the examining committee may wait a term or so to receive an updated estimate of research potential from a research supervisor and may then forward a recommendation to the Area II Committee, or may do so after holding a second oral examination dealing only with research issues.

The finding **Not Qualified** is intended to warn the student that in the judgement of the faculty his/her chances of successful completion of the doctorate are small and that alternative educational or career goals should be seriously considered. However, students found not qualified may remain enrolled and repeat the OQE after one or two more terms, but usually not later than their sixth term of graduate study. A student who has not

been found qualified after a second OQE will generally not be allowed to enter the doctoral program.

How should one prepare for the OQE?

The OQE is an evaluation of the student's ability and progress as judged by a committee of experienced professionals.

The best preparation is long-term: by the time of the examination the student should have had enough exposure to the mainstream of computer science activity to carry on an informed discussion of the main goals and technical concepts in the areas of computer science, defined by the core graduate subjects, and his or her professional mastery of some specific topic should be evident.

Students who have had no prior experience with oral examinations or oral presentations of technical material may be at a disadvantage on the examination. From early in his/her graduate career, a student should be seeking opportunities to discuss technical material with faculty and other students. Presenting lectures in research seminars or teaching recitation sections is particularly valuable experience.

In the weeks immmediately preceding the OQE, it is probably unwise to attempt to learn new material solely for the examination. A review of courses previously taken and other material studied dealing with the areas of examination is generally most effective.

When, as is usually the case, the examining committee chair has asked the student to prepare a presentation of recent research, the student should practice and time his/her presentation beforehand, preferably before an audience of interested students or faculty. A typical weakness of students' research presentations is a concentration on particular technical details without explanation of where the problems arise or what the research goals may be. The best presentations are generally "top-down," beginning with an overview of the research area, progressing to subareas, and finally reaching the student's own research.