Effective: Fall 2014

The Computer Science Ph.D. qualifying exam is in the form of an oral exam and written report, assessing the student’s ability to survey a specific research topic, discuss the state-of-the-art in depth, provide a critical description of the literature, and propose creative ideas on improving the state-of-the-art. The exam is supplemented by the evaluation of the student’s course performance and the final decision is made in a meeting of faculty affiliated with the CS program.

**Timing:** Students who hold an M.S. degree are required to take the qualifying exam at the start of their 3rd semester, and pass the qualifying exam before the start of their 4th semester in the Ph.D. program. Students who do not hold an M.S. degree are required to take the qualifying exam at the start of their 5th semester, and pass the qualifying exam before the start of their 6th semester in the Ph.D. program.

The students may take the qualifying exam at most twice, depending on the outcome of their first try. If the outcome for the first try is “Fail”, then the student cannot take the qualifying exam again. If the outcome for the first try is “Retake”, then the student must take the exam again and pass before the end of the same semester. Please see “Outcome” for a complete description of the outcome of the exam.

**Committee:** The exam will be administered by a committee composed of 3 faculty members, at least 2 of them being primary CS faculty members. The student will provide 0 to 3 names as suggested committee members and the CS Graduate Committee will appoint the committee, taking into account the student’s suggestion and maintenance of the load balance of the faculty. If the student has a research advisor at the time of the exam, then the advisor must be a member of the committee, but cannot serve as the chair of the committee. The CS Graduate Committee will make every effort to include a faculty member outside the research area in the committee. The committee must be appointed at least 2 months prior to the exam.

**Format:** The student will select a research area from the following list:

- Algorithms
- Artificial Intelligence
- Biomedical informatics
- Computer Networks and Distributed Systems
- Databases and Data Mining
- Software Engineering

The exam committee will ask the student to write a report that adequately demonstrates the student’s ability to perform research in their chosen area of research. Specific examples of this might be a survey of a broad area and/or approaches to a specific problem in the area.
1. **Written Report:** The student will submit a written report on the specific research problem. The report has to adequately describe the problem and justify its relevance, identify the challenges associated with the problem, provide a broad classification of existing approaches, point out their key differences and trade-offs, identify limitations, and propose solutions for these limitations. The report must be **at most 10 pages** in length (11 pt font, single-spaced, single column, 1” margins) and use illustrative figures, tables, and other visual material to communicate key ideas. In addition, the report must include a comprehensive list of references. The written report must be submitted to the exam committee **three weeks before the date of the oral exam**.

2. **Oral Exam:** In the oral exam, the student will **answer questions** by the committee members on a specific research problem chosen by the committee in the selected research area, assessing the knowledge, technical depth, and broader vision of the student on the problem. The committee may also ask questions on the fundamentals of computer science as they relate to the specific research problem. The student may prepare **slides** in advance that will help answer questions or use the **chalk board** (or both), but the exam will **not be in the format of a presentation**. The exam will be **one hour** in duration. All students who are taking the exam for the first time have to take their oral exam in the week prior to the beginning or in the first two weeks of the Fall semester.

3. **Scoring:** Each of the three committee members will prepare a report rating the student’s exam performance according to the following criteria:

   - **Fundamentals:** Does the student have broad knowledge of fundamental concepts in computer science that will enable the student to understand and tackle the challenges in the specific research area?

   - **Knowledge of Chosen Area:** Does the student have sufficient technical depth and command of the key challenges and the state-of-the-art in the chosen area of research?

   - **Vision:** Does the student demonstrate a solid understanding of the relevance of the problem in the context of scientific progress and societal needs? Does the student show creativity in innovating their chosen area of research?

   - **Communication.** Can the student explain the concepts in an accessible and comprehensible manner and handle questions effectively?

   - **Overall Score** for the Written Report and the Oral Exam.

   Possible ratings are **2 (Pass), 1 (Retake), or 0 (Fail)**. The scoring sheet is attached.

4. **Course Work:** The student’s **performance in all courses** taken before the exam will also be considered by the CS faculty in making a decision. At the time of the exam, the student must have completed **at least two** 400-level Computer Science courses with a “B”. One of
these courses must be EECS-454 (Analysis of Algorithms) or EECS-477 (Advanced Algorithms). The second course must be relevant to their chosen area of research. The relevance of the additional course to the research area is subject to approval by the CS Graduate Studies Committee. The following courses are pre-approved for each of the research areas:

- Algorithms: EECS-405, EECS-454, EECS-477
- Artificial Intelligence: EECS-440, EECS-491
- Biomedical informatics: EECS-458, EECS-459
- Computer Networks and Distributed Systems: EECS-425, EECS-428, EECS-441
- Databases and Data Mining: EECS-405, EECS-433, EECS-435
- Software Engineering: EECS-493

The course list above is effective as of Fall 2014 and is subject to revision.

**Outcome:** The final decision will be made by a congregation of the CS faculty based on the committee’s reports and the student’s coursework. The outcome of the exam will be one of Pass (the student advances to candidacy), Retake (the student has to take the qualifying exam once more before the end of the following semester, the retake decision can be partial, i.e., the student can be requested to take the oral exam only, write the written report only, or take/retake a course), Fail (the student will be separated from the Ph.D. program). The decision will be documented using the attached “CS Qualifying Exam Decision Form”. The students who have to retake the exam must take it before the start of the following semester.
Case Western Reserve University
Department of Electrical Engineering and Computer Science

Computer and Information Science Ph.D. Qualifying Exam Score Sheet

Name of Student: ____________________________________________________________

Name of Committee Member: ________________________________________________

Date of Exam: _________________________________________________________________________

Score the performance of the student in the exam according to the below criteria at a scale of 0 (Fail), 1 (Retake), or 2 (Pass). Decimal scores are allowed. Briefly justify your score for each criterion.

Fundamentals (Breadth)
Rating: 
Justification:

Knowledge of Chosen Area of Research (Depth)
Rating: 
Justification:

Vision
Rating: 
Justification:

Communication
Rating: 
Justification:

Overall Score
Written Report: Oral Exam:
Computer and Information Science Ph.D. Qualifying Exam Decision Form

Name of Student: ____________________________________________________________

Date of Exam: _____________________________________________________________

Date of CS Faculty Meeting: ________________________________________________

Decision

Meeting Summary