Specification
Graduate Examination
Spring 2006

January 9, 2006

General Specification

The Graduate Examination in Computer Science will consist of test in each of the following areas: Theory Artificial Intelligence, and Systems. Three hours will be allowed for completion of each area test and the entire examination will take place over the course of three days, one area exam per day.

The Ph.D. Qualifying Examination in Computer Science will consist of all three area examinations. The Plan B Master's Final Examination will consist of one of the three area examinations as chosen by the student and agreed to by the student's graduate committee.

Date: The Spring 2006 examination is tentatively scheduled for the week 10 – 14 April 2006.

Grading Policy:
Each area examination will be administered by a group of faculty associated with that area of examination. Each group of faculty will grade its portion of the examination and decide a grade for that portion of the examination.

In the case of a Plan B Master's Final Examination, this grade will be reported to the student's graduate committee who will determine the passing criteria and conditions.

In the case of a Ph.D. Qualifying Examination, this grade will be reported to a meeting of the graduate faculty[1]. The graduate faculty will decide a grade of *Pass*, *Pass Conditionally*, or *Fail* on the whole examination for each doctoral student. A grade of Pass or Pass Conditionally requires a two-thirds majority vote by the Computer Science graduate faculty.

The grade Pass Conditionally is included in recognition that borderline cases will appear from time to time. The conditions foreseen are (1) that the student must pass (with a specified grade or better) one or more particular courses the next time these courses are offered, or (2) the student must pass an oral examination in one or more areas of the examination. Each oral examination will be administered by the faculty in the area involved within two weeks of the student's receiving notification of the Pass Conditionally grade and its conditions.

A student may continue in the Ph.D. program with a grade of Pass or Pass Conditionally. If student with a Pass Conditionally grade fails to meet the conditions at the earliest possible time, that student's grade will be changed to Fail. A student with the grade of Fail may retake the qualifying examination at most a second time. Failure to Pass or Pass Conditionally the examination at the second sitting will terminate the student from the Ph.D. program.

[1] The graduate faculty consists of those members of the Department of Computer Science who are on the graduate faculty, or who are advising or co-advising graduate students in the department and expect to be admitted to the departmental graduate faculty.

Area Examination Specifications and Reading Lists

1 Systems

There are four sections to the Systems exam. Each examinee must identify three of the four parts by 7 March, 2006 over which he/she will be examined. The examination will be based on the references listed below. Each part will consist of three questions making a total of nine questions on this examination for each student. At the time of the exam, students may select five of the nine questions to be graded. The exam is *open book*, meaning that those taking the examination may consult the referenced cited below during the examination.

1.1 Software Engineering

Gustafson, D. *Schaum's Outline of Software Engineering*, McGraw-Hill, 2002.
Readings: Software Life Cycle [Chap.1], Software Project Management [Chap. 3], Software Project Planning [Chap. 4], Risk Analysis and Management [Chap. 6], Software Quality Assurance [Chap. 7], Requirements [Chap. 8], Software Design [Chap. 9], Software Testing [Chap. 10].

Bennett, S., J. Skelton, and K. Lunn. *Schaum's Outline of UML*, McGraw-Hill, 2001.
Readings: UML [Chap. 2], Use Cases [Chap. 3], UML Class Diagrams [Chap. 4-5], UML Sequence Diagrams [Chap. 9]

1.2 Principles of Programming Languages

David A Schmidt, The Structure of Typed Programming Languages, MIT Press, 1994.
Readings: Chapters 1, 2, 6.1-6.3.

John C. Mitchell, Foundations for Programming Languages, MIT Press, 1996.
Readings: Chapters 1, 2

1.3 Operating System Design

Silberschatz, Galvin, and Gagne, Operating System Concepts (sixth edition), John Wiley & Sons, Inc., 2002. ISBN 0-471-41743-2
Readings: Chapters 4, 5, 6, 7, 9, 10, 12

1.4 Principles of Database Systems

Silberschatz, Korth, and Sudarshan, Database System Concepts (third edition), McGraw-Hill, 1998.
Readings: Introduction [Chap.1], ER Model [Chap.2], Relational Model [Chap.3], SQL [Chap.4], Integrity Constraints [Chap.6], Relational Database Design [Chap.7], Transactions [Chap. 15].

2 Theory

There are five sections to the theory exam. The examination will be based on the references listed below. Each examinee must identify three of the five parts by 7 March, 2006 over which he/she will be examined. Each part will consist of three questions making a total of nine questions on this examination for each student. At the time of the exam, students may select five of the nine questions to be graded. The exam is **open book**, meaning that those taking the examination may consult the referenced cited below during the examination.

2.1 Foundations of Computing

J.L. Hein *Theory of Computation: An Introduction*, Jones and Bartlett, 1996.

Readings: Sections 1.1, 1.4, 2.1, 2.2, 2.4, 3.6, 5.1, 5.2, 5.4, 6.1, 6.2, 6.4, 7.1, 8.3

J.L. Hein *Discrete Structures, Logic and Computability* (first or second editions), Jones and Bartlett, 1996.
Readings: Sections 1.1, 3.1, 3.2, 3.3, 4.4, 8.2, 11., 11.4, 12.1, 12.2, 12.4, 13.1

2.2 Theory of Computation

M. Davis, R. Sigal, and E. Weyuker, *Computability, Complexity, and Languages (2^{nd} Ed.)* , Academic Press, 1994.
Readings: Chapters 2–7

2.3 Analysis of Algorithms

T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, *Introduction to Algorithms* (second edition). McGraw Hill, 2001.
Readings: Chapters 15-17, 22-24, 34-35.

2.4 Computational Complexity

C. H. Papadimitriou, *Computational Complexity*, Addison Wesley, 1994.
Readings: Chapters 1-3, 7-9, 10.1, 11, 17, 19.

2.5 Languages and Automata

D. Kozen, *Automata and Computability,* Springer, 1999.
Readings: Numbered Lectures 1-16, 19-27.

3 Artificial Intelligence

The examination will be based on the references listed below. There will be a total of five questions on this area examination. Two questions from the Russell and Norvig reference, one from Michalewicz and Fogel reference and two from the Machine Learning reference. Each examinee must identify three questions to be graded. The examination is **closed book**, reference material may not be consulted during the examination.

3.1 Artificial Intelligence

S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach* (first or second edition), Prentice Hall.
Readings: Chapters 1-21.

3.2 Evolutionary Algorithms

Z. Michalewicz and D.B. Fogel, *How to Solve It: Modern Heuristics*, Springer-Verlag, 1998.
Readings: Chapters 1–3, 7, 12, and 13.

3.3 Machine Learning

T. Mitchell, *Machine Learning*, McGraw-Hill, 1997.
Readings: Chapters 1–4, 9, 13.