Answer FOUR questions as follows: Answer any TWO of the four questions from Section A (HCI Process and Theory). From Section B (Special Topics in HCI) answer ONE question from EACH of your TWO declared areas of specializations.

Each of the four questions you answer will be given equal weight.

You will be assigned an identifying number and are required to hand in printed or written copies of your answers with each page identified only by that number. This enables us to grade your answers anonymously. You should NOT identify yourself explicitly by name on your answer sheets or implicitly by referring in the first person to your work (my project on ABC).

Please answer each question starting on a new page, with your answer following the text of the question. To avoid having to type the questions yourself, electronic copies of the questions will be available after 9am from a URL that you should already have been given. You may copy the questions from there.

Place any relevant references that you cite in an answer at the end of that answer, NOT in a separate section at the end of the whole exam.

If you have any questions or feel it necessary to make any assumptions in your answers, do not seek clarification from faculty or staff. Simply record your assumptions as part of your answer.
Section A: HCI Process and Theory – answer any TWO of questions 1 through 4.

1. A somewhat popular research activity in emerging HCI research areas is to adapt "traditional" evaluation techniques to the new area. For example, heuristic evaluation, first defined by research conducted by Jakob Nielsen, has been adapted for use in Web design, mobile computing and ambient displays. Pick an evaluation technique taught in CS 6750 that has some research backing and provide relevant references to the literature on that technique. Then pick an emerging research area in HCI (e.g., ambient displays). Explain how you might adapt your chosen evaluation technique to be of most use in providing formative or summative evaluation input for design of applications in this emerging research area. Describe how you would present in a CHI paper this modified evaluation technique and the evidence that it is an effective technique in the emerging area you chose.

2. In Greenberg and Marwood's paper, "Real-Time Groupware as a Distributed System: Concurrency Control and its Effect on the Interface," the authors use the example of concurrency control to illustrate how low-level technical features can have a visible impact on the user experience. In their case, they look at how locking and serialization mechanisms designed to allow concurrent data access fail when the "distributed system" includes not only computers, but people as well.

Pick another low-level technical feature that is widely used in modern computing systems (examples might come from machine learning, networking, security, operating systems, but the choice is yours).

a) Describe in detail how this feature impacts the user experience of systems. Be sure to be specific (just saying that "operating systems are bloated and slow and this affects users' performance" would be an insufficient answer).

b) Describe the *process* of how you might go about redesigning this low-level feature from a human perspective. Note that you do not have to actually invent a replacement for the feature you've chosen; rather, explain how you might bring a user-centered design and evaluation perspective to something that, by its nature, is intended be "below the surface."

3. In 1899, Annie MacLean wrote a paper "Two Weeks in Department Stores" an ethnography of the working conditions for women on the shop floor. Much has changed in the development of qualitative methods since she wrote this piece.

Identify three things that have changed, and discuss each in detail. Compare closely between her work using examples of research papers that illustrate the changes that you feel are different today.

One commonality that the 1899 and 2009 is the degree of social change that this paper argues for. Using examples describe how social change plays a role in HCI.
4. Following the ever increasing reach of Information and Communications Technologies (phones, computers, any computationally enabled device), so HCI is pushed into new domains as people constantly seek to appropriate technologies for new purposes.

Identify one of these emergent research trends in HCI. Justify your selection by demonstrating how HCI has expanded to accommodate this new trend.

With new domains, so do new challenges emerge for HCI. These may be methodological, theoretical, and/or systems, etc. For the trend you chose, elaborate on at least three challenges that it presents for HCI. What changes when HCI happens in this new domain? Be detailed and specific, cite from results, to present your case.
Section B: Special Topics in HCI

User Interface Software – answer ONE of questions 5 or 6.

5. Multitouch, it appears, is all the rage now, whether it's the MERL DiamondTouch, Jeff Han's bi-manual multitouch interaction, the iPhone or MS Surface. However, despite the attention it has garnered, most current multitouch applications are limited to a very few gestures, such as the "pinch-zoom" gesture so adeptly demonstrated by Jeff Han, and used on the iPhone and MS Surface.

a) Describe the benefits of multitouch as an interaction technique, referring to concepts from the literature on interaction.

b) Discuss the weaknesses of multitouch. What aspects of multitouch as an input modality are intrinsically weak? Again, a good answer should refer to well-known concepts from the literature of interaction.

c) Assume you wanted to design a "Multitouch UI Toolkit" and a set of multitouch gestures that overcome the difficulties you cited in B. Give specific examples of gestures you would include in such a toolkit, and how these would change the interaction techniques currently being used. More importantly, use these gestures and interaction techniques as examples to discuss what fundamental interaction capabilities, events, and/or building blocks you would need to introduce beyond what is needed for modern GUI-based event toolkits such as Java's Swing.

6. In the early days of speech recognition interfaces, Chris Schmandt timed interactions selecting objects on a screen with a mouse versus a mouse and speech. Even though both interactions took the same amount of time, the users perceived that the speech-based interaction was shorter.

a) Give another example of a multimodal interface where the interaction may take the same or even more time than with a mouse.

b) Hypothesize why multimodal interfaces would be perceived to require less time than unimodal interfaces. Support your hypothesis with your readings.

c) Discuss the trade-offs between an interface that takes more perceived time to use versus other interface design considerations. Why would an interface that takes more time to use be potentially more desirable? Drawing on examples from the research, discuss two cases in which designers have had to sacrifice perceived performance time for other considerations.
7. Consider the following statement: Information visualization has traditionally been used more for analysis activities, but its impact will be greater over time for communication and collaboration. Argue both sides of that position (agree and disagree) and support your arguments with evidence and citations.

8. Recent interest in social computing and social networks (from Facebook to terrorist cells) has spurred renewed interest in graph and network visualization. Describe two research/design ideas gaining momentum in this area over the past five years, including representative citations, and explain why you feel each idea has emerged.
Ubiquitous Computing – answer ONE of questions 9 and 10.

9. Context and Capture are two basic themes that Abowd, Mynatt and Rodden described as pillars of applications-driven ubicomp research. In the domain of health, both context and capture have been applied in a variety of projects. Provide three specific examples of ubicomp research in health (at least one of which is not at GT). For each example, make clear how either context or capture (or both) are important to the success of the application. Select one of those examples and assume you were to join that effort today. How would you critically assess the impact of that effort in terms of the specific health application and what opportunities would you see for leveraging new advances in technology to advance that agenda?

10. Infrastructure-mediated sensing (IMS) was introduced in Shwetak Patel's PhD research at Georgia Tech. The first external publication describing this work was presented at Pervasive 2008 (see http://shwetak.com/papers/air_ims_pervasive2008.pdf). What is the main argument in favor of the IMS approach to sensing in a built environment? Please provide contrasting examples of addressing some sensing problem using the IMS approach versus some other approach in your answer. What disadvantages does the IMS approach have? You can use your previous example to explain this disadvantage or provide another example that more clearly demonstrates your point. Finally, assess whether the IMS approach can have any impact on the challenge of human activity detection in a home environment.
Multimedia – answer ONE of questions 11 and 12

11. Define the terms multimedia and multimodal, and discuss the differences in terms of how developers and end users may differ in their expectations of an interface. Include in your discussion examples of systems or interfaces that satisfy one definition (e.g., multimedia) and not the other (e.g., multimodal). Be sure to ground this discussion in the literature.

12. Some multimedia systems and interfaces rely largely on pre-generated media, whereas other multimedia systems and interfaces rely partially or completely on generating/synthesizing/rendering the required media at run time (sometimes during initialization, and sometimes on the fly). Discuss the relative merits of these approaches, in relation to a specific type of system of your choosing. Be sure to ground this discussion in the literature, and include examples of actual systems (research or production) in your discussion.