CEE 6930   **Final Exam**   **Fall 2000**
GIS in Water Resources

There are four questions on this exam. They are of equal credit. Do all four questions. For each question, prepare a 2-page typed theme paper. *Staple all four papers together in the order of the questions*, and turn in the result to the CEE secretary in EC211 by 5PM on Friday, December 15. This is a take-home exam. You are honor bound not to discuss this exam with your colleagues in the class. Your answers should be the result of your work and thought alone. Be assured that if essentially the same idea appears in answers from more than one person, it is fairly easy to recognize that when the grading is being done. If that happens, it is not clear from whom the idea originated and who is just using somebody else's knowledge. So, keep your ideas to yourself!

The term papers that you choose to describe in answering Questions 1, 2, and 3 should be mutually exclusive, that is, if you focus on a particular term paper in answering one of the questions, don't focus on the same paper when answering either of the other two questions. Question 4 covers the whole scope of the course, lectures as well as term papers. The Texas class term project listing can be found at:
http://www.ce.utexas.edu/prof/maidment/giswr2000/docs/termproj.htm
The Utah class term project listing can be found at:
http://egl16.engr.usu.edu/giswr/dtarb/
You can use projects from either location in preparing your answers.

What I am looking for in grading your answers is:

- **Knowledge of the facts.** Make sure you lay out the facts of what has actually been done before you start offering opinions about what could have or should have been done. This particularly applies to the discussion of term papers. Make sure you discuss what was actually done in the term paper not just about the general subject itself.
- **Thoughtful evaluation.** How do you evaluate the advantages and limitations of the principles, methods and data that have been used? How does the knowledge you've learned in this class relate to the world around us? I am looking for a sense of reflection here, of seeing you set individual situations and facts in a larger context in an intelligent way.

Questions

1. Summarize and Critique a GIS in Water Resources Application

Choose a single term paper (not your own!) that you think is interesting and effective. Summarize the content of the paper, describing the nature of the problem examined by the author, how the investigation was carried out, and what results were achieved. Explain why this paper appeals to you. Why is the problem it addresses important? What insights or new knowledge does this paper contribute? What makes the investigation described by this paper an effective implementation of GIS technology? What makes the

presentation of the paper effective in terms of communication? How could the paper have been improved? What are the advantages and limitations of the methods used in the paper?

2. Compare and Contrast Two Applications Dealing with the same Theme

Choose two term papers that deal with the same or similar themes or topics. These papers should be different than the paper you chose to answer Question 1, and neither of them should be your own term paper. Briefly summarize the contents of the papers (the problem examined, the method of analysis, the results achieved).   Compare and contrast the approaches to the problem that the two papers took. Which technical approach do you think was more effective? Why? Which paper does a more effective job of communicating its results? Why? Suppose you were undertaking a study of this same subject. Having studied these two papers, what have you learned about how to go about your investigation effectively? What would you do differently from what the authors of these papers did?

3. Assess the State of GIS Technology in a Particular Application Area

Choose a particular topic area that is the subject of more than two term papers and which has also been addressed in the course lectures.   This subject area should be different from the ones that you have discussed in Questions 1 and 2 but in this case it can be the area in which you did your term paper. Identify which term papers and which course lectures deal with the subject you have chosen. Make an assessment of the state of GIS technology for solving problems in this area. How effective are currently available methods? Are the required data available to support them?   What limitations are apparent? What problems that we would like to solve are as yet unsolved? What advances do you think can be made within the next year? What problems remain so far out of reach that they are unlikely to be solved for a number of years?   Where is progress limited by a lack of knowledge and understanding rather than technology?

4. Review the use of digital elevation data in hydrology and water resources as an application of GIS technology.

Comment on different digital representations of topography in GIS (Grid, TIN, contours) and the advantages and disadvantages of each. Describe how watersheds and stream networks can be derived from digital elevation models. Describe how river cross-sections and longitudinal profiles can be derived from land surface topography representations. Discuss the practical implementation of hydrologic models to represent hillslope and channel runoff processes. Comment on the strengths and weaknesses of these approaches. Comment on data deficiencies, limitations and implementation problems and suggest which problems may be readily solvable and which problems are unlikely to be solved for a number of years. Comment on where progress is limited by technology and where progress is limited by lack of knowledge or physical process understanding.