

Second Homework Assignment for Math 408 and 708

Due: Friday, October 8th, 2010, in class.

Note:

The midterm will take place in class on **Friday, October 22nd** (10:30-12:30).

Problems for Math 408 and 708:

1. We showed in class that the vertex-edge incidence matrices of all directed graphs and bipartite undirected graphs are totally unimodular. However, in general, the vertex-edge incidence matrices of undirected graphs are not totally unimodular. Give an example where this happens.

2. Chapter 2 problem 2.
3. Chapter 2 problem 3.
4. Chapter 3 problem 1.
5. Chapter 3 problem 2.

Additional problems for Math 708:

6. Chapter 2 problem 4.
7. A binary (zero-one) matrix has the *consecutive ones property* if its columns can be rearranged so that the ones in each of its rows are consecutive. Show that any matrix with the consecutive ones property is totally unimodular.

Remark: This is the transpose of question 3.3 in the text, however note that you can do it without using the generalized necessary condition.

8. Chapter 3 problem 4.

Reading:

Chapters 3, 6, 7 and 8.

Graduate student projects:

Math 708 students will give presentations surveying recent research topics in integer programming. These presentations will take place either in class, on November 26th, December 1st or December 3rd, or perhaps in the Operations Research Seminar. The book [1] finishes with a series of surveys of current topics (Chapters 14 through 19), these are well suited to this purpose. Other topics may be possible, please see the instructor if you have something else in mind.

Students can choose to do the projects by themselves or in pairs. Individual presentations will be for 25 minutes, while two person presentations will last for 50 minutes with each student speaking for about half the time on a common topic. It may be helpful to discuss with your advisor which topics are relevant to your research. Please sign-up for a date and topic. First-come, first-served.

REFERENCES

- [1] Michael Jünger, Thomas Liebling, Denis Naddef, George Nemhauser, William Pulleyblank, Gerhard Reinelt, Giovanni Rinaldi, and Laurence Wolsey, editors. *50 years of integer programming 1958–2008*. Springer-Verlag, Berlin, 2010. From the early years to the state-of-the-art, Papers from the 12th Combinatorial Optimization Workshop (AUSSOIS 2008) held in Aussois, January 7–11, 2008.