

**MATH 3012G TEST I
TAKE-HOME PROBLEM**

SPRING 2010

Instructions. You are to work on this problem completely alone. You are permitted to contact the instructor with questions, but otherwise are not to communicate with any other individual about this problem. **Attach your solution to this piece of paper with a staple. At the top of this sheet of paper, write your name and group.** You may use computer algebra systems, calculators, textbooks, and notes to solve this problem. Other than to access course materials on T-Square or to contact the instructor, you are not to use the Internet to assist in solving this problem. You must also fully explain all of the steps of your work using *complete sentences*. Your solution must rely on models discussed in this course to receive full credit.

By signing on the line below, you certify that you have followed the rules above, including that you have not discussed this problem with anyone other than the instructor. You also certify that you have adhered to the Georgia Tech Honor Code, the principles of which are embodied by the Challenge Statement:

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community.

Student signature: _____

Due date. Your solution to this problem is due no later than when your group folder is submitted at the end of class on Monday, 22 February 2010, in class. Late work will not be accepted. In the event you cannot make it to class, send a digital copy to keller@math.gatech.edu before 1355 on 22 February 2010.

Problem. Georgia Tech Director of Athletics Dan Radakovich has been engaging in a debate with John Swofford, Commissioner of the Atlantic Coast Conference (ACC). Radakovich contends that the ACC football schedule can be designed so that all conference games are played over a span of eight weeks (with no team having a bye week in which it does not play). Swofford does not believe this to be the case. He cites the example of the Big Ten Conference, whose conference commissioner claims they must play its conference schedule over more than eight weeks. Radakovich claims that although teams in both conferences play eight conference games each, the structure of the Big Ten Conference necessitates more than eight weeks. Your mission (you don't have a choice as to whether you accept it) is to resolve the dispute between Radakovich and Swofford using graph theory. You are to do this by constructing schedules for the ACC and Big Ten that each use as few weeks of play as possible. **You must also justify why you cannot use fewer weeks.** Be sure to describe how you model the situation using graphs and what you are looking for in building a schedule.

Important information to assist you with this:

- The ACC contains twelve teams divided into two divisions: the Atlantic Division and the Coastal Division. The teams in each division are listed in Table 1.

TABLE 1. ACC Divisions

Atlantic	Coastal
Boston College	Duke
Clemson	Georgia Tech
Florida State	Miami
Maryland	North Carolina
North Carolina State	Virginia
Wake Forest	Virginia Tech

- Each ACC team plays eight conference games each season. They play each of the five other teams in their division and three teams from the other. The list of 2010 cross-divisional pairings is shown in Table 2.
- The Big Ten contains eleven teams (hence the reason it is sometimes called the “Big Televen”). The teams are Illinois, Indiana, Iowa, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Penn State, Purdue, and Wisconsin.
- Each Big Ten team plays eight conference games each season. The list of 2010 pairings is shown in Table 3.
- Each team must play either zero or one games in each week of a conference schedule.
- A conference schedule contains all games described or listed for the conference in this document. No other games are permitted.
- Do not worry about what calendar dates games would be played or any traditions regarding when games are played.
- Produce a list of weeks and which games are played that week. (For instance: Week 1: GT vs. Clemson, . . . ; Week 2: GT vs. Duke, . . . ; and so on.) A table would be a nice way to format this.
- Be sure to describe how you use a graph as a model.
- Be sure to explain why your schedule uses as few weeks as is possible for that conference.

TABLE 2. 2010 ACC Cross-Divisional Games

Coastal Division Team	Atlantic Division Opponents
Duke	Boston College, Maryland, Wake Forest
Georgia Tech	Clemson, North Carolina State, Wake Forest
Miami	Clemson, Florida State, Maryland
North Carolina	Clemson, Florida State, North Carolina State
Virginia	Boston College, Florida State, Maryland
Virginia Tech	Boston College, Wake Forest, North Carolina State

TABLE 3. 2010 Big Ten Opponents

Team	Opponents
Illinois	Indiana, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Penn State, Purdue
Indiana	Illinois, Iowa, Michigan, Northwestern, Ohio State, Penn State, Purdue, Wisconsin
Iowa	Indiana, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Penn State, Wisconsin
Michigan	Illinois, Iowa, Indiana, Michigan State, Ohio State, Penn State, Purdue, Wisconsin
Michigan State	Illinois, Iowa, Michigan, Minnesota, Northwestern, Penn State, Purdue, Wisconsin
Minnesota	Illinois, Iowa, Michigan State, Northwestern, Ohio State, Penn State, Purdue, Wisconsin
Northwestern	Illinois, Indiana, Iowa, Michigan State, Minnesota, Penn State, Purdue, Wisconsin
Ohio State	Illinois, Indiana, Iowa, Michigan, Minnesota, Penn State, Purdue, Wisconsin
Penn State	Illinois, Indiana, Iowa, Michigan, Michigan State, Minnesota, Northwestern, Ohio State
Purdue	Illinois, Indiana, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Wisconsin
Wisconsin	Indiana, Iowa, Michigan, Michigan State, Minnesota, Northwestern, Ohio State, Purdue