MAD 5305 — Graph Theory

Section 1, Fall 1994.

Instructor: Bellenot.

The good doctor's Office: 002-B Love, Office Hours: MWF 12:30–1:15 or by appointment. Email addressed bellenot@cs.fsu.edu, bellenot@math.fsu.edu, or even bellenot@fsu.edu will get to the good doctor ('bellenot' is enough of an email address on math or cs machines).

Eligibility: Graduate standing

Texts: Gary Chartrand and Linda Lesniak *Graphs and Digraphs* 2^{nd} Edition. Steven Skiena *Implementing Discrete Mathematics.* (recommended)

Coverage: Parts of most of the chapters (as time permits).
Grades: The easy going 85% A, 70% B, 55% C, 40% D.

Final: The final is worth 20% of your grade. It is in class and closed book. The final is at 5:30-7:30 Wednesday Dec 14, 1994.

Projects: Each student will do a project on a pre-approved graph theory topic. The project's grade will be determined on both the many page document (at least 5 and usually 10-20) and the in class oral presentation. Presentations are the last week and a half of classes. The project is due Wednesday, November 30. The project is 15% of your grade.

Homework: The remaining 65% of your grade will be determined by homework problems. Some problems (most, but not all) will be graded on a 10 point scale. Only the top 90% of your graded homework is used to compute your homework average. Generally three homework problems (often proofs) will be assigned each Monday and due the following Monday.

Homework Rules

- Must be your **OWN** work.
- Must be neat and written in clear English.
- Must be on time – late homework is **NOT** accepted.
- Must be on 8.5 by 11 paper.
- Must be written in ink.
- Must use only one side of each page.
- Multiple pages must be stapled together.

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Show **ALL** work for credit; be neat; and use only **ONE** side of each page of paper. Problems are **NOT** equally weighted.

1. Find examples.
   A. A graph with a bridge but no cut-vertex.
   B. A coloring of K_5 which shows $r(3,3) > 5$.
   C. A tournament which is not transitive nor strong.
   D. For each n, a graph which has radius 2, diameter 3 and vertices in the center.

2. Prove the following are equivalent for a graph G.
   A. G is connected and has one cycle.
   B. G is connected and $p = q$.
   C. G has one cycle and $p = q$.
   D. G has an edge e so that $G - e$ is a tree.
   E. G is a connected planar graph with 2 regions.

3. If $n_i \geq 3$ for $1 \leq i \leq m$, define the graph $T_{n_1,n_2,\ldots,n_m}$ to be $C_{n_1} \times C_{n_2} \times \cdots \times C_{n_m}$. That is T_n is the cycle graph of length n. $T_{n,m}$ is the torial mesh $C_n \times C_m$, for example $T_{4,3}$ is drawn below.
   A. For $T_{n_1,n_2,\ldots,n_m}$ find p, q, the degree of each vertex, and show the graph is Eulerian.
   B. For T_{n_1,n_2} find $\kappa, \alpha, \beta, \chi$ and show the graph is Hamiltonian. (Hint do the case n_1 and/or n_2 even cases first and use them in the odd-odd case.)
   C. Show $T_{3,3}$ is non-planar.