Math 118 Summer Session 2, 2005
Sample Hour Exam 1

Tom Cooney

June 29, 2005

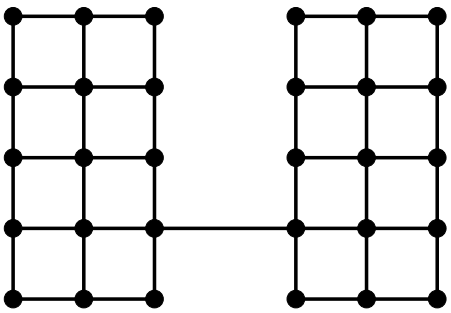
Do not assume that the actual exam will be identical to this sample exam. Topics which do not appear on this sample exam may still appear on Friday's exam paper. The exam will be similar to the quizzes but with a few more "theory" questions. The quizzes focussed on "can you do this calculation?" The hour exam will also ask this but it will also ask "do you understand what is going on?"

The following directions will be on your exam paper:

Answer all questions. Full marks = 100 points. Not all questions are worth the same number of points. You have 55 minutes to complete this exam. It is very important to show all your work in order to obtain full credit for your solution. Read questions carefully.

Name:_____

1. Eulerize the following graph. For full credit, duplicate the minimum number of edges.



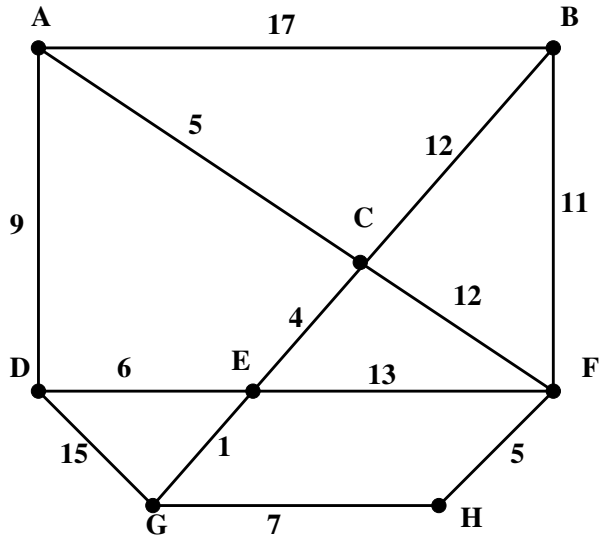
2. Why is the critical path in an order-requirement digraph important?

3. Give a careful and complete definition of a *Hamiltonian circuit.*

4. In some states, license plates use a mixture of letters and numerals. How many different license plates are possible if they consist of two letters followed by four numerals?

5. An online banking service requires its customers to select a password that is four characters long. The password is case-sensitive so upper-case letters are considered to be different from lower-case letters. The first character of the password must be an upper-case letter and the second character must be a digit. The remaining two characters may each be a digit, an upper-case letter or a lower-case letter. What is the number of possible passwords? You do not have to multiply out your answer.

6. Apply Kruskal's algorithm to the graph below. Draw a sketch of your answer in the space provided, carefully labelling all vertices.



7. Suppose that the edges of graph represent streets that must be checked by a worker from the department of public works. In order to eulerize the graph, we must add 3 edges.

   The real world interpretation of this is:

   (a) We must travel 3 blocks twice in our circuit.

   (b) The street department will build 3 new streets.

   (c) Three blocks will not be checked by the department of public works.

   (d) It will take three workers to check all the streets in the city.

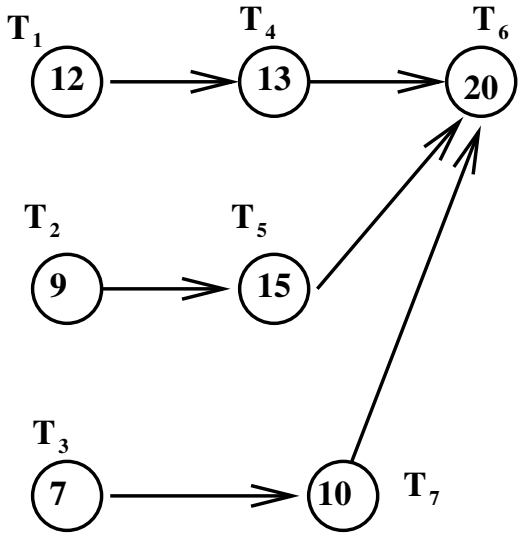
8. Suppose that after a storm an inspection needs to be made of the sewers along the streets in a small village to make sure local flooding is not due to clogging. The technique most likely to be useful in solving this problem is

   (a) finding an Euler circuit on a graph.

   (b) applying the nearest-neighbour algorithm for the traveling salesman problem.

   (c) applying Kruskal's algorithm for finding a minimum cost spanning tree for a graph.

9. Given the order-requirement digraph below (with time given in minutes), apply the critical-path scheduling algorithm to construct a schedule using **THREE** processors. Try to determine whether or not this schedule is optimal?



10. Apply the sorted edges algorithm starting at A to the graph below. Describe your answer by listing the order in which vertices are used.