MATH 130

Exam 2

April 14, 2006

NAME (please print legibly): ______________________________

Your University ID Number: ______________________________

- **You must show work to earn full credit.**
- **No cell phone calculators are allowed on this exam.**
- **Please put your final answers in the spaces provided.**

QUESTION	VALUE	SCORE
1	20	
2	20	
3	12	
4	11	
5	12	
TOTAL	75	

Part 1: Apportionment.

1. (20 pts) The country of Timbuktu consists of 6 states, A, B, C, D, E, and F, and the Congress of Timbuktu has 40 seats. The population of each state is given in the chart below.
(i) Use **Hamilton's method** to apportion the 40 seats of Congress to the 6 states of Timbuktu.

	population	. .	. .	. .
A	234,000			
B	841,000			
C	39,000			
D	106,000			
E	649,000			
F	136,000			
total	2,000,000			

(ii) Use **Adam's method** to apportion the 40 seats of Congress to the 6 states of Timbuktu.

	population	. .	. .	. .
A	234,000			
B	841,000			
C	39,000			
D	106,000			
E	649,000			
F	136,000			
total	2,000,000			

(iii) Which apportionment method does **not** violate the quota rule and does **not** suffer from any paradoxes. (circle your answer)

(a) Hamilton's method

(b) Jefferson's method

(c) Webster's method

(d) Lowndes's method

(e) all of the above

(f) There is no such method.

Part 2: Euler Circuits.

2. (20 pts) The map below depicts the city of Riverville. It contains 10 bridges to and from the three islands and the North and South riverbanks as in the picture below. The mayor of Riverville would like you to find a walking tour of the 10 bridges Riverville that begins and ends on the South Bank.

(a) Draw a graph that models this problem.

(b) Does there exist a walking tour for the city of Riverville that begins on the North Bank and ends on island D and crosses each bridge once and only once? Explain.

(b) An optimal eulerization of the graph that models this problem can be obtained by adding

2 edges 4 edges 6 edges 1 edge. (circle the answer)

(c) Draw an optimal trip that begins and ends on the South Bank on your graph above and label the edges along your route with circled numbers, i.e. 1,2,3 ... etc.

Euler vs. Hamilton Circuits

3. (12 pts) Determine whether or not each graph has a Hamilton circuit, Euler circuit, both or neither.

Graph 1:

Graph 2:

Graph 3:

Circle the correct answer.

Graph 1:	Euler only	Hamilton only	both Euler & Hamilton	neither
Graph 2:	Euler only	Hamilton only	both Euler & Hamilton	neither
Graph 3:	Euler only	Hamilton only	both Euler & Hamilton	neither

Part 3: The Traveling Salesman Problem.

4. (11 pts) A businessman must visit the following four office buildings A, B, C and D. The numbers on the edges represents the time (in minutes) that it takes to walk from one office building to the other. Find an optimal route for the businessman's trip assuming his route must begin and end at building A.

5. (12 pts) Jenny is a business woman that must visit clients in Boston (B), Dallas (D), Houston (H), Louisville (L), Nashville, and St. Louis (S). If Jennys home is in Pittsburgh (P) determine how many possible Hamilton circuits exist for Jennys business trip that begin and end in Pittsburgh.

Total number of Hamilton circuits beginning and ending in Pittsburgh : ____________

mileage	Nashville	Boston	Dallas	Houston	Louisville	Pittsburgh	St.Louis
Nashville	*	1088	660	769	168	553	299
Boston	1088	*	1748	1804	941	561	1141
Dallas	660	1748	*	243	819	1204	630
Houston	769	1804	243	*	928	1313	779
Louisville	168	941	819	928	*	388	263
Pittsburgh	553	561	1204	1313	388	*	588
St.Louis	299	1141	630	779	263	588	*

Find a Hamilton circuit beginning in Pittsburgh for Jennys trip using the **Cheapest-Link Algorithm**. Find the total length of this trip.

___P____ ______ ______ ______ ______ ______ ______ ___P____ length=______