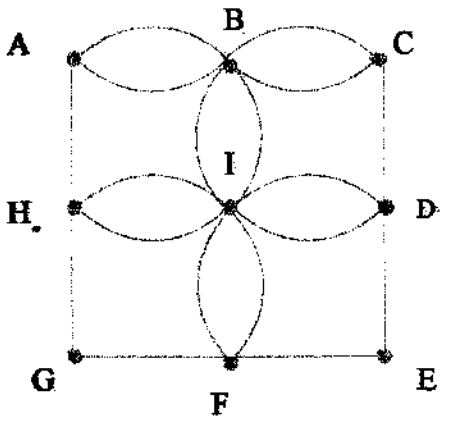
The following multiple choice questions are worth 5 points each.

1. Which edge(s) would have to be removed to create an Euler Circuit?



a. None, it has an Euler circuit.

b. One edge from A to B and one from B to C.

c. Both edges from B to I.

d. Both edges from B to C.

e. Both edges from A to B and both edges from B to C.

2. Suppose the edges of a 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.

e. None of the above.

3. Which of the following statements is/are true?

I. Every graph with an Euler circuit has an even number of edges.
II. Every connected graph has an Euler circuit.
III. Every graph that has an Euler circuit is connected.

a. II and III

b. III only

c. All are true.

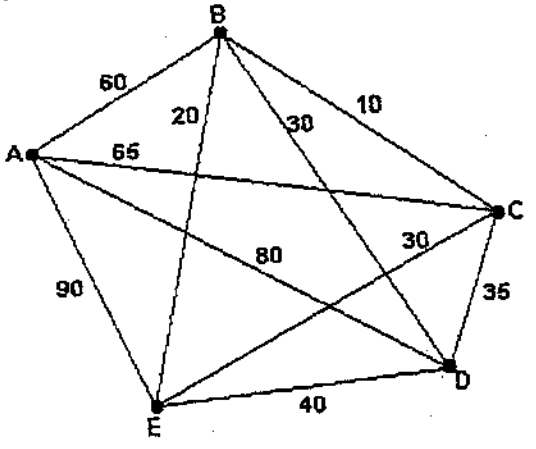
d. I and II

e. I only

4. How many different Hamiltonian circuits are there in a complete graph with nine vertices?

a. 362,880
b. 181,440
c. 40,320
d. 20,160
e. 5,040

5. For the graph below, what is the cost of the Hamiltonian circuit obtained by using the nearest-neighbor algorithm, starting at A?



a. 215
b. 220
c. 235
d. 295
e. 130

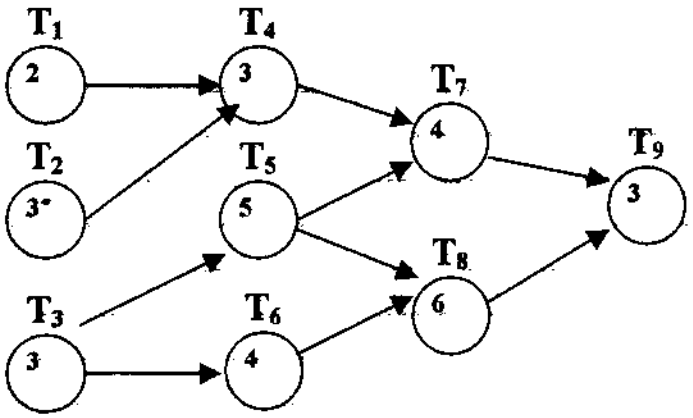
6. In Pennsylvania license plate codes consist of three letters followed by four digits. How many such license plate codes exist if repetition is allowed?

a. 118
b. 101,088,000
c. 175,760,000
d. 25,576
e. 78,364,164,100

7. Suppose an architect needs to design an intercom system for a large office building. The technique most likely to be useful in solving this problem is

a. finding a Euler circuit on a graph.
b. applying the nearest-neighbor algorithm for the traveling salesman problem.
c. applying Kruskal's algorithm for finding a minimum-cost spanning tree for a graph.
d. None of these techniques is likely to apply.

Use the following order-requirement digraph for questions 8 an 9.



8. What is the critical path?

a. $T_1T_4T_7T_9$

b. $T_2T_4T_7T_9$

c. $T_3T_5T_7T_9$

d. $T_3T_5T_8T_9$

e. $T_3T_6T_8T_9$

9. Use the critical-path scheduling algorithm to find a priority list for the tasks in this order-requirement digraph.

a. $T_3T_5T_2T_6T_1T_4T_8T_7T_9$

b. $T_3T_5T_6T_8T_2T_1T_4T_7T_9$

c. $T_3T_2T_1T_6T_5T_4T_8T_7T_9$

d. $T_1T_2T_3T_4T_5T_6T_7T_8T_9$

e. $T_8T_5T_6T_7T_2T_3T_4T_9T_1$

10. Use the list-processing algorithm to schedule these independent tasks on three machines: 12, 17, 20, 7, 10, 5, 15, 6, 4, 1, 6, 7, 10, 18, 17, 16, 05.

Which tasks are scheduled on the second processor?

a. 17, 10, 4, 7, 17

b. 20, 15, 10,16

c. 12, 7, 5, 6, 1, 6, 18, 5

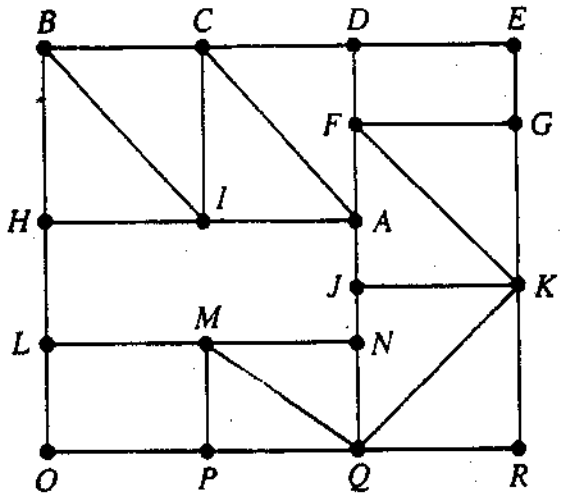
d. 20, 15, 10, 7, 5, 4

e. 18, 16, 2, 6, 5, 1

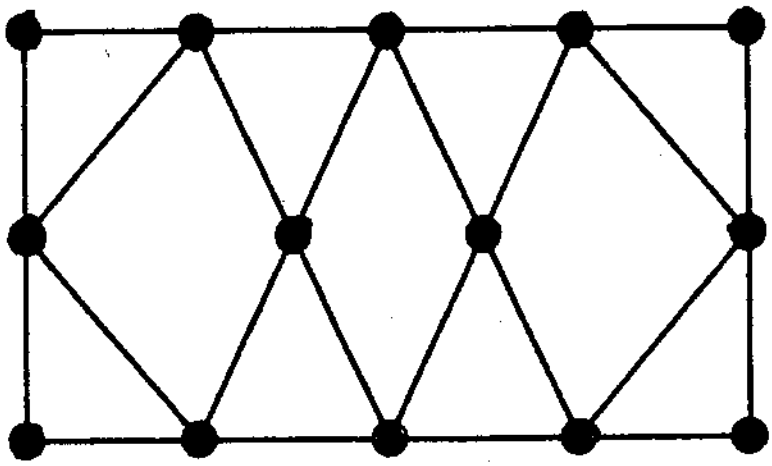
Name:_____ **Section:**_____

The following questions are free response. Please show all work in order to receive credit.

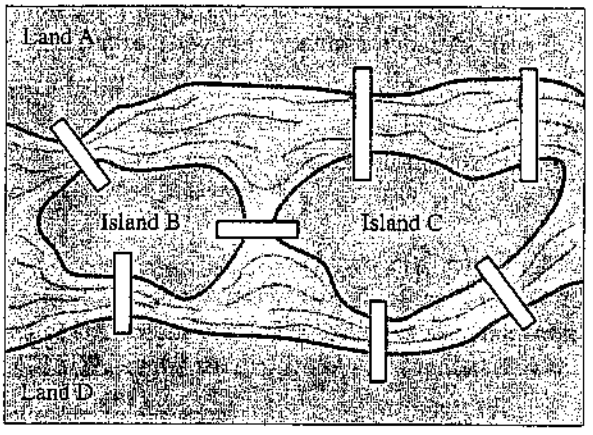
11. (6 pts.) Eulerize the graph below.



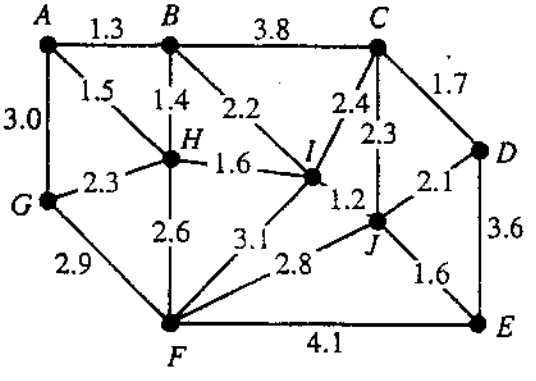
12. (7 pts.) Find an Euler circuit on the graph below.



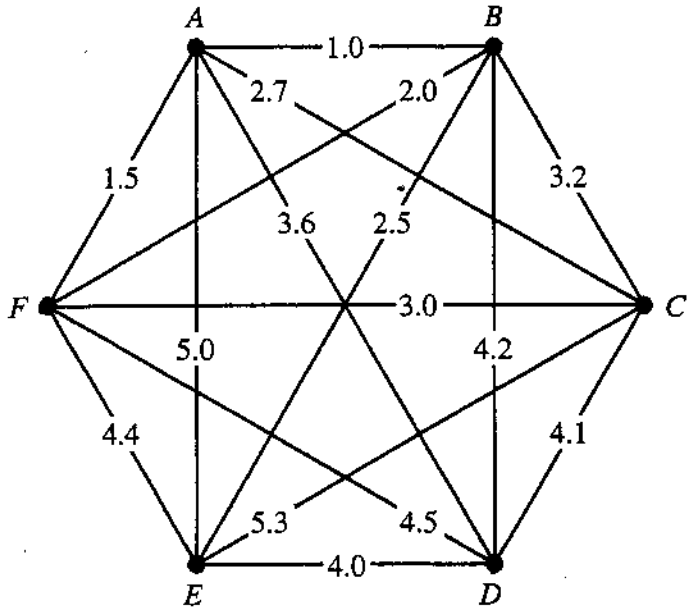
13. (6 pts.) The following diagram is of a hypothetical city with a river running through the middle of the city. Draw a graph that would be useful for citizens to use to determine whether it is possible to take a walk, cross each bridge exactly once, and return to their starting point. **Do not find a route.**



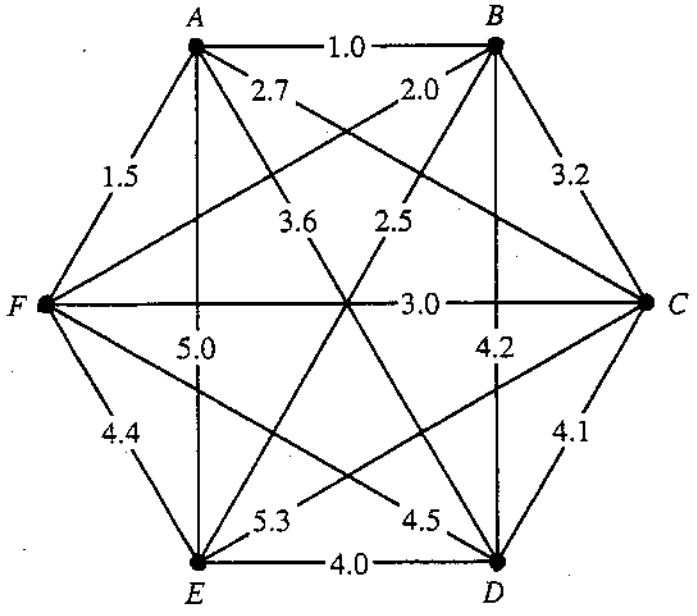
14. (7 pts.) Use Kruskal's algorithm to find a minimum-cost spanning tree for the graph below.



15a. (7 pts.) Use the nearest-neighbor algorithm starting at vertex C to find a Hamilton circuit. Write the circuit.



15b. (7 pts.) Use the sorted-edges algorithm to find a Hamiltonian circuit. Write the circuit.



16. (10 pts.) Given the order-requirement digraph below (with time given in minutes) and the priority list $T_1T_2T_3\ T_4T_5T_6T_7T_8T_9$, apply the list-processing algorithm to construct a schedule using three processors.