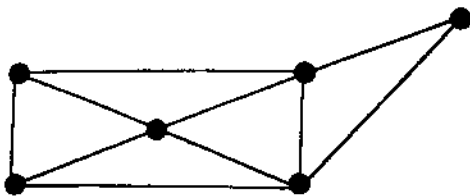
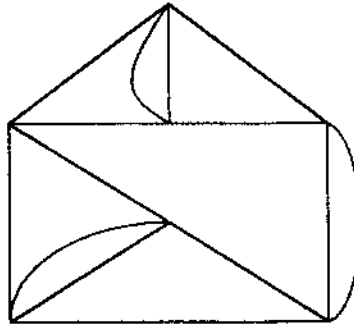


1. Determine the valence of each vertex.



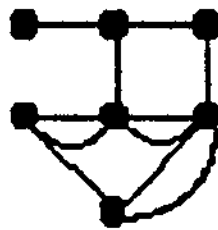
This graph has two vertices with odd valences.
This graph does not have an Euler circuit.

2. To eulerize a graph, edges must be duplicated so that all vertices have even valences.
The correct eulerization is



3. I. True.
II. False. An Euler circuit must cover each edge exactly once.
III. False. The minimum completion time for an order requirement digraph is the length of the longest path.

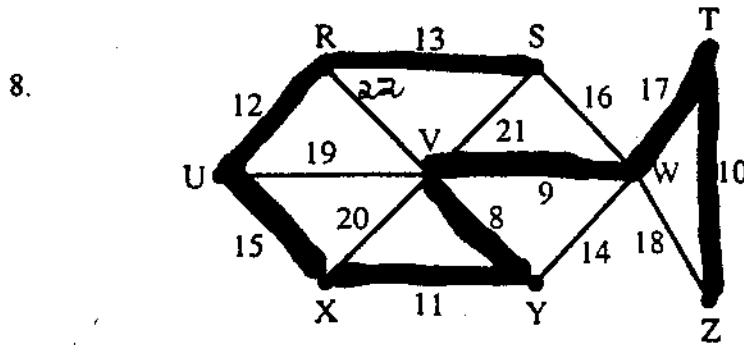
- 4.



5. $\frac{(n-1)!}{2} = \frac{(13-1)!}{2} = \frac{12!}{2} = 239,500,800$

6. $26 \times 26 \times 26 \times 26 \times 10 \times 9 \times 8 = 329,022,720$

- 7. I. True
- II. False. Eulerization is the process of duplicating existing edges on (adding new edges to) a graph so as to make a graph that possesses an Euler circuit.
- III. True.



The total cost is 95.

- 9. The longest path (the critical path) is $T_2 T_5 T_7 T_9$. The minimum completion time is the length of this path-41.
- 10. Using the critical-path scheduling algorithm, the priority list is $T_3 T_2 T_1 T_5 T_6 T_4 T_7 T_8 T_9$
- 11.

	12	25		70		104	123
P_1	12	13		45		34	////
P_2	23	²³		24	⁴⁷	23	⁷⁰
P_3	32			23	14	21	//////
			32		55	69	90
							123

The completion time is 123 minutes.

- 12. Packing I used the First Fit algorithm.
- Packing II used the Worst Fit algorithm.
- Packing III used the Next Fit algorithm.

Name: _____

Section: _____

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

13. The following questions are true/false and are worth one point each. (1 pt. each)

A. The valence of vertex A of a graph is the total number of edges of the graph.

True

False

B. In a connected graph, a path of edges exists between any two vertices of the graph.

True

False

C. Every graph with an Euler circuit has an even number of vertices.

True

False

D. The sorted-edges algorithm for solving the traveling salesman problem always gives optimal results.

True

False

E. The nearest-neighbor algorithm for solving the traveling salesman problem always produces the same result as the sorted-edges algorithm.

True

False

F. A spanning tree of a graph must contain every edge of the graph.

True

False

G. A digraph is a graph with exactly two vertices.

True

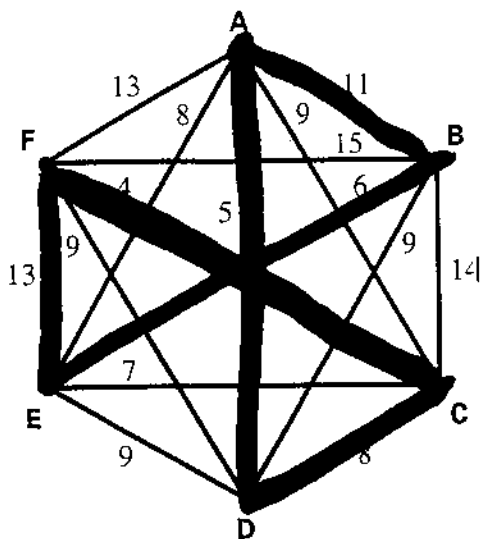
False

H. When scheduling tasks using the list-processing algorithm, increasing the number of machines always reduces the completion time.

True

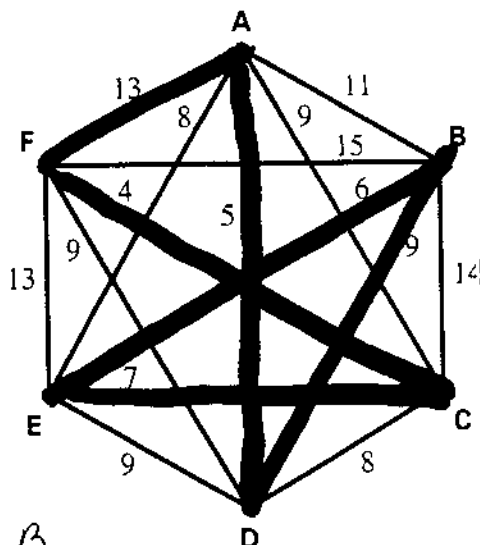
False

- 14a. Use the nearest-neighbor algorithm starting at vertex A to find a Hamiltonian circuit. Write the circuit. (6 pts.)



A D C F E B A

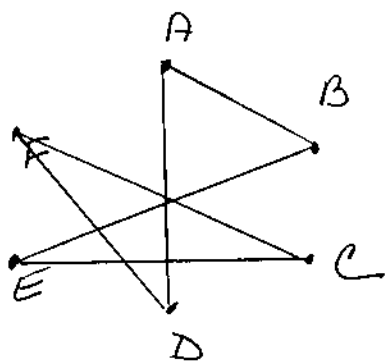
- 14b. Use the sorted-edges algorithm to find a Hamiltonian Circuit. Write the circuit. (6 pts)



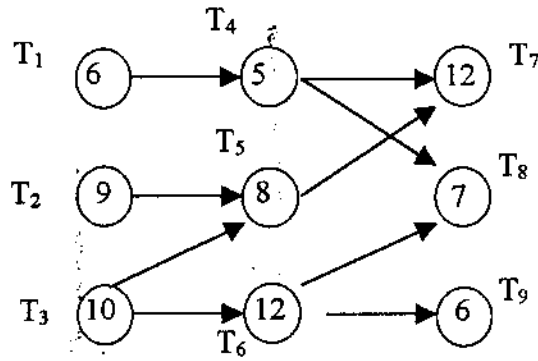
CF 4
 AD 5
 BE 6
 CE 7
 BD 9
 AF 13
 A D B E C F A

or

CF 4
 AD 5
 BE 6
 CE 7
 DF 9
 AB 11
 A D F C E B A



15. Given the order-requirement digraph below (with time in minutes) and the priority list $T_6T_7T_3T_2T_5T_8T_1T_9T_4$, apply the list-processing algorithm to construct a schedule using three processors. (10 pts.)

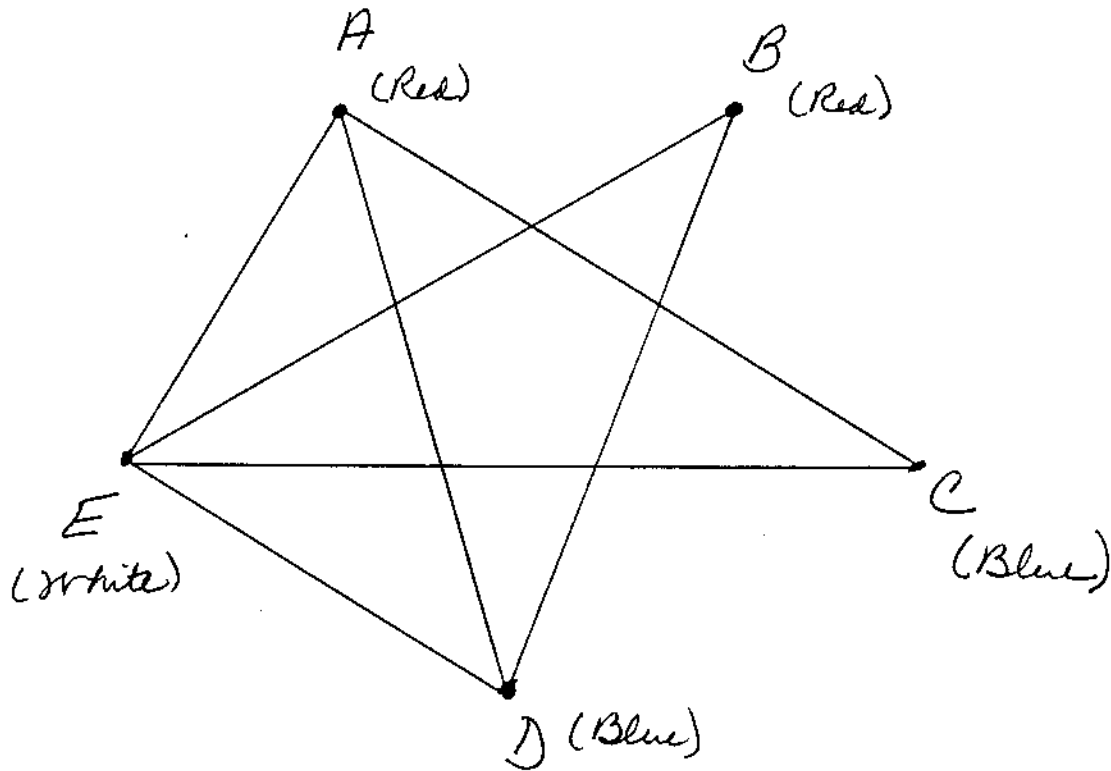


		10		22		29					
M ₁	T ₃		T ₆		T ₈		//				
M ₂	T ₂		9 //	T ₅		18	T ₇		30		
M ₃	T ₁		T ₄		// // // // //		// // // // //		T ₉		// // // // //
	6	11	18	22	28						

16.

	A	B	C	D	E
A			X	X	X
B				X	X
C	X				X
D	X	X			X
E	X	X	X	X	

A, B, C, D, and E represent the names of five people who work together in a large organization. Their supervisor is planning several projects which will require different people to work together. An "X" means that two people do not work well together. Solve the manager's scheduling problem by drawing an appropriate graph and providing a vertex coloring for it. Each color will represent a different project. (10 pts.)



The chromatic number is 3.