Exam 1 Topics

Chapter 1 - Urban Services
- Identify vertices and edges of a given graph.
- Construct the graph of a given street network.
- Determine by observation whether or not a graph is simple.
- Determine by observation if a graph is connected and which vertices are adjacent.
- Determine by observation the valence (degree) of each vertex of a graph.
- Know the relationship between the number of edges and the sum of the valences of the vertices in a graph.
- Determine by observation whether a list of vertices from a graph forms a path, a circuit, an Euler path, an Euler circuit, or none of the above.
- Determine when deadheading has occurred and how it relates to real-world situations.
- Define an Euler path and an Euler circuit.
- List the conditions for the existence of an Euler circuit.
- List the conditions for the existence of an Euler path when no Euler circuit exists.
- Determine whether a graph contains an Euler circuit or an Euler path.
- If a graph contains an Euler circuit, list one such circuit by identifying the order of vertices in the circuit.
- If a graph does not contain an Euler circuit, "add" (reuse) a minimum number of edges to eulerize the graph.
- Use the edge-walker process (as described in class) to eulerize a rectangular network.
- Find the least cost eulerization of a weighted graph.
- Identify management science problems whose solutions involve Euler circuits.

Chapter 2 - Business Efficiency
- Write in your own words the definition of a Hamiltonian path and a Hamiltonian circuit.
- Explain the difference between an Euler circuit and a Hamiltonian circuit.
- Identify a given application as being an Euler circuit problem or a Hamiltonian circuit problem.
- Know what it means for a graph to be complete and how the number of vertices and edges are related in a complete graph.
- Calculate n! for a given value of n.
- Apply formulas to calculate the total number of Hamiltonian circuits, the number of Hamiltonian circuits with a given starting vertex, and the number of non-mirror images of each in a complete graph with n vertices.
- Use the method of trees to list all possible Hamiltonian circuits and use this to solve the Traveling Salesman Problem by brute force.
- Explain the term heuristic algorithm and list both an advantage and a disadvantage of using this type of algorithm.
- Use the Nearest-Neighbor algorithm to find an approximate solution to the Traveling Salesman Problem.
- Find an approximate solution to the Traveling Salesman Problem by applying the Sorted-Edges algorithm.
- Know the traits of a spanning tree and be able to create a spanning tree from a given graph.
- Use Kruskal’s algorithm to determine a minimum-cost spanning tree from a weighted graph.
- From a word problem, write out specific tasks and show their relationship in an order-requirement digraph.
- Identify the critical path on an order-requirement digraph.
- Find the earliest possible completion time for a collection of tasks by analyzing its digraph and critical path.

Chapter 3 - Planning and Scheduling
- Schedule tasks using the list processing algorithm on a processor chart.
- Apply the list-processing algorithm to schedule independent tasks using a given priority list or using the decreasing time priority list.
- Compute the minimum completion time for a list of independent tasks on a given number of processors.
- When given an order-requirement digraph, apply the list-processing algorithm to schedule a list of tasks subject to the digraph.
- Use the critical path scheduling method to create a priority list.
- Compute the optimal scheduling time on a given number of processors when tasks are not independent.
- Given an application, determine whether its solution is found by the list-processing algorithm or by one of the bin-packing algorithms.
- Solve a bin-packing problem by using the following algorithms:
  - next-fit
  - first-fit
  - worst-fit
  - best-fit