Evan Wilcox CS2500 Test 3 Crib Sheet 5/9/19

**Graph Theory**

Adjacency List – an adjacency list representation for a graph associates each vertex in the graph with the collection of its neighboring vertices or edges.

Adjacency Matrix – an adjacency matrix is a square matrix used to represent a finite graph. The elements of the matrix indicate whether pairs of vertices are adjacent or not in the graph.

Spanning Tree – an undirected graph G is a subgraph that is a tree which includes all of the vertices of G.

Minimum Spanning Tree - a subset of the edges of a connected, edge-weighted undirected graph that connects all the vertices together, without any cycles and with the minimum possible total edge weight.

**Graph Algorithms**

Prim’s – Greedy algorithm that creates an MST. The algorithm operates by building this tree one vertex at a time, from an arbitrary starting vertex, at each step adding the cheapest possible connection from the tree to another vertex. Time complexity of .

Kruskal’s – Greedy algorithm that creates an MST by adding the cheapest edge until all vertices are in the graph. Time complexity of .

Dijkstra – Greedy shortest path algorithm that finds the shortest path from a source node to all other nodes, works similar to prim’s. Time complexity of .

Bellman-Ford - an algorithm that computes shortest paths from a single source vertex to all of the other vertices in a graph. It is slower than Dijkstra's algorithm but more versatile. Time complexity of .

Floyd-Warshall – shortest path algorithm that compares all possible paths through the graph between each pair of vertices. Time complexity of

**Max Flow**

The maximum amount of a resource you can push through a graph from one vertex to another based on the weight of the edges.

Flow Network – a directed graph where each edge’s weight corresponds to the capacity of that edge.

Residual Network – a directed graph based on a flow network where each edge’s weight corresponds to the remaining capacity of the edge.

Edmonds-Karp – an algorithm that finds the max flow between two vertexes in a graph. Chooses the augmenting path to be the shortest path between the two vertices in the residual graph using bfs. Time complexity of

**Connectivity**

Edge Connectivity – the minimum number of edges that must be deleted from a graph in order to produce a disconnected graph.

Vertex Connectivity - the minimum number of vertices that must be deleted from a graph in order to produce a disconnected graph.

Use contradiction to prove the correctness of a greedy algorithm. Show that a more optimal solution must be different from the proposed solution. Show how this new solution is different and that it is not optimal.

