

Name: _____ Andrew Id: _____

15-121 Sample Assessment 6

Up to 50 minutes. No calculators, no notes, no books, no computers. Show your work!

1. Searching and Sorting Short Answer

(a) (2 points) Name an $O(N^2)$ (worst case) sort. Write your answer, and nothing else, in the box below.

(b) (2 points) Name an $O(N \log N)$ (worst case) sort.

(c) (2 points) Assume that you are given the following array of unsorted numbers: $[90, 2, 58, 39]$. If it is sorted using the Bubble Sort algorithm that we practiced in class, how many swap operations are performed while sorting? (Your answer to this question is a number: The number of swaps that occur while sorting that array with Bubble Sort.) Write your answer, and nothing else, in the box below, but show your work in the empty space next to the box.

(d) (2 points) What does it mean for a sort to be stable?

2. Searching and Sorting

Consider the following list of integers:

14, 5, 7, 18, 2, 16, 3, 1, 20

- (a) (5 points) Assuming that the list provided at the beginning of this problem receives a single pass from the loop in the Bubble Sort algorithm, what will be the new state of the list? Write your answer in the provided boxes below. Show your work. Answers without appropriate work will receive no credit.

Final Answer for Part a:

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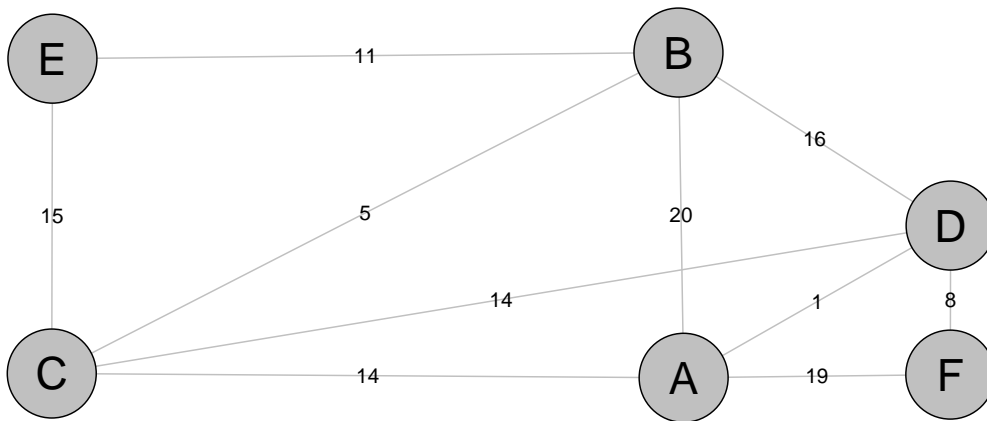
- (b) (5 points) Assuming that the list provided at the beginning of this problem is partitioned using the partition algorithm from Quick Sort (use 14 as your pivot), what will be the new state of the list? Write your answer in the provided boxes below. Show your work. Answers without appropriate work will receive no credit.

Final Answer for Part b:

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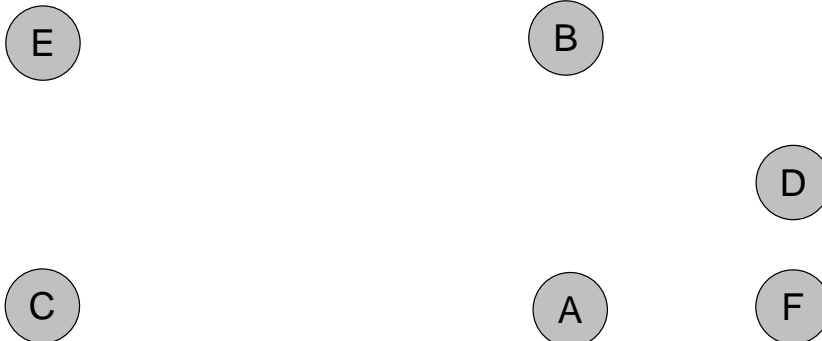
3. Graphs

Consider the following weighted graph:



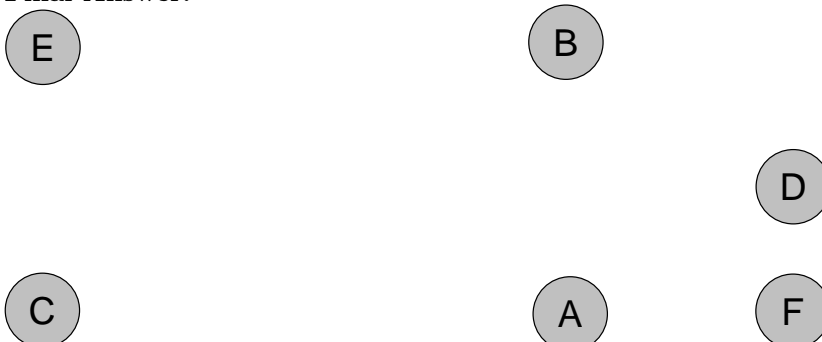
- (a) (6 points) Find a minimum spanning tree for this graph using Kruskal's algorithm. Be sure to show your work in such a way that it is clear you understand how the algorithm works (for example, by explicitly stating the order in which edges are added to the MST). Answers without appropriate work will receive no credit. Draw your final MST onto the provided graph below.

Final Answer:

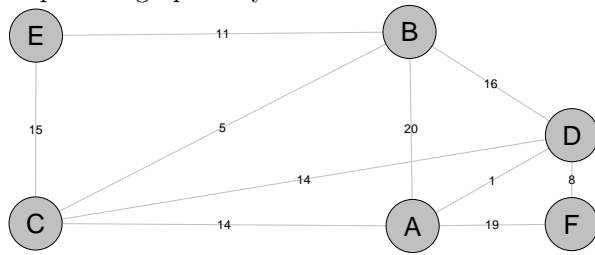


- (b) (6 points) Find a minimum spanning tree for this graph using Prim's algorithm. Be sure to show your work in such a way that it is clear you understand how the algorithm works (for example, by explicitly stating the order in which edges are added to the MST). Answers without appropriate work will receive no credit. Draw your final MST onto the provided graph below.

Final Answer:



Reprint of graph for your convenience:



- (c) (10 points) Using Dijkstra's algorithm, find the shortest paths from B to every node in the graph. Be sure to show your work. Answers without appropriate work will receive no credit. Write your final answer (your done / visited table) in the table below. Do *not* write your unvisited / working table in the table below.

Final Answer:

Node	Cost	Previous
B	0	