

IS 709/809: Computational Methods for IS Research

Homework 3

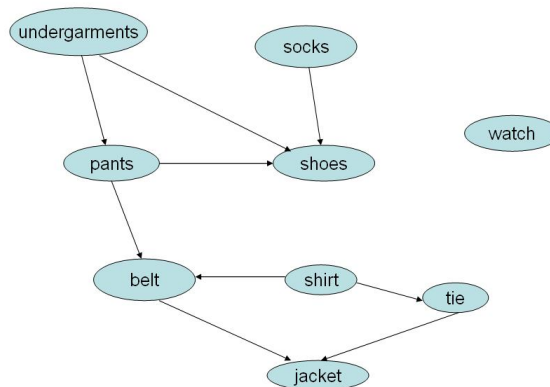
(Handed Out: Nov 4, 2021 (Thursday), Due: November 18, 2021 (Thursday) Midnight)

General Instructions: Use A4 paper for your answer sheets. Use blue or black ink. Number each page and write down the total number of pages on the upper right-hand corner of the first page. Thanks.

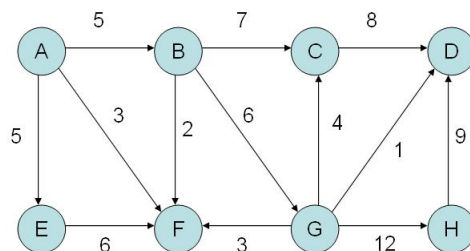
1. Given the array of elements $\{7, 0, 1, 2, 5, 4, 9, 8, 3, 6\}$, sort the elements in ascending order using
 - (a) **(10 points)** Selection sort
 - (b) **(10 points)** Insertion sort
 - (c) **(10 points)** Merge sort
 - (d) **(10 points)** Quick sort (assume that the first element is chosen as the pivot)

For each sorting algorithm above, show the intermediate array after each iteration.

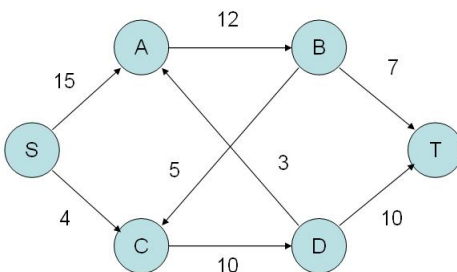
2. **(10 points)** Given the graph below, give a possible topological sort of the nodes.



3. (10 points) Given the graph below, use Dijkstra's algorithm to find the weighted shortest-paths starting at node A. Show the final shortest-paths tree.



4. (10 points) Given the graph below, compute the maximum flow from the source vertex S to the sink vertex T. Show the maximum flow graph.



5. Given the graph below, compute the minimum spanning tree using
- (a) **(15 points)** Prim's algorithm
 - (b) **(15 points)** Kruskal's algorithm

