University of Maryland Baltimore County
Department of Information Systems
Fall 2017

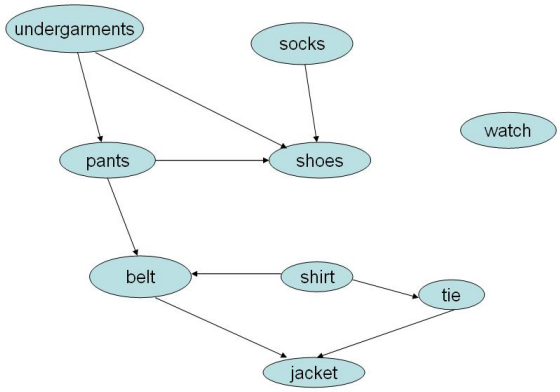
IS 709/809: Computational Methods for IS Research
Homework 3
(Handed Out: November 7, 2017 (Tuesday), Due: November 14, 2017 (Tuesday) Before Class)

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.

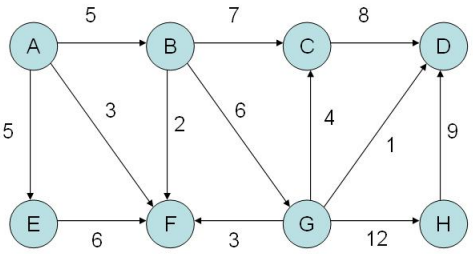
1. Given the array of elements $\{7, 0, 1, 2, 5, 4, 9, 8, 3, 6\}$, sort the elements in ascending order using
   (a) (**10 points**) Selection sort
   (b) (**10 points**) Insertion sort
   (c) (**10 points**) Merge sort
   (d) (**10 points**) Quick sort (assume that the first element is chosen as the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

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

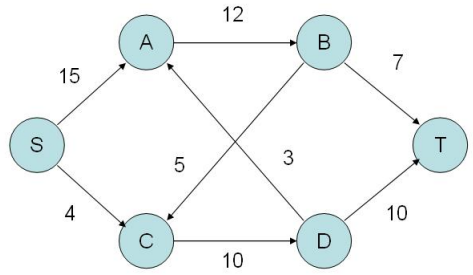
2. (**10 points**) Given the graph below, give a possible topological sort of the nodes.



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