Data Structures and Algorithms

Tut 8 – Sort & Graph

1. Given a list = {1, 13, 7, 2, 35, 24, 9, 20, 17}, show the sorting process **step-by-step** of the following algorithms:
    a. Straight Insertion Sort
    b. Shell Sort (K = 3 -> K = 1)

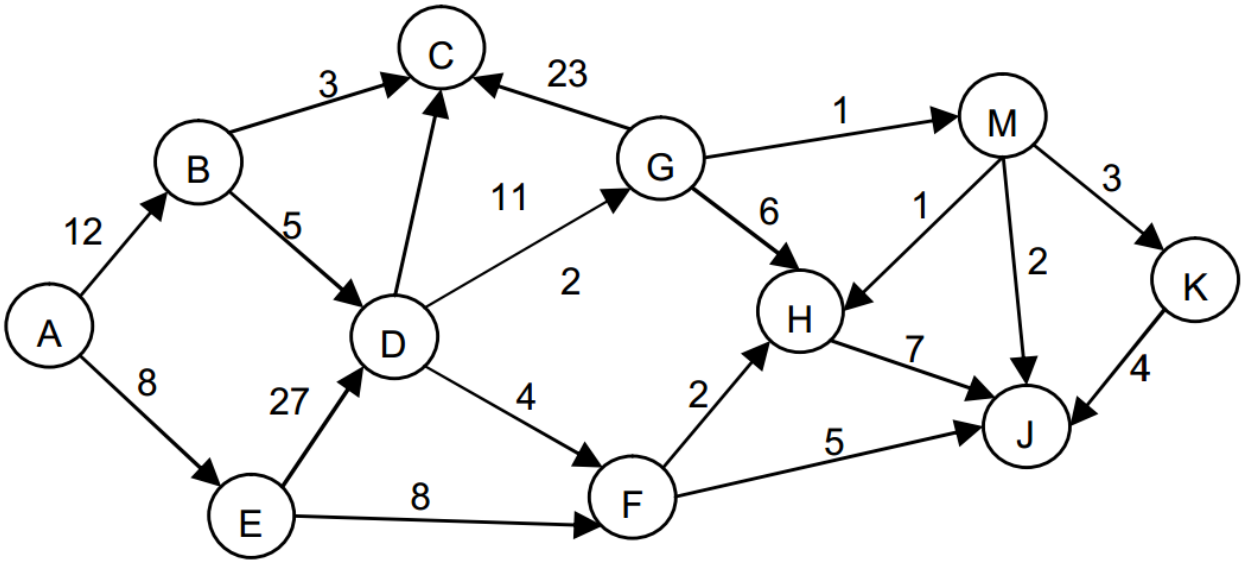
2. Given a list = {20, 27, 10, 12, 22, 18, 12, 21}, show the sorting process **step-by-step** of the following algorithms:
    a. Straight Selection Sort
    b. Heap Sort
    c. Bubble Sort

3. Given a list = {53, 59, 56, 52, 55, 58, 51, 57, 54}, show the sorting process **step-by-step** of the following algorithms:
    a. Quick Sort (the pivot is the leftmost element)
    b. Merge Sort

4. As far as we know, every graph can be used to present relations (e.g. the social network). Given the following lists, draw the graph representing relations of related people.
    People = {George, Jim, Jean, Frank, Fred, John, Susan}
    Friendship = {(George, Jean), (Frank, Fred), (George, John), (Jim, Fred), (Jim, Frank), (Jim, Susan), (Susan, Frank)}
    From the graph, find the following:

a. All John's friends
b. All Susan's friends
c. All Jean's friends
d. All Jim's friends

5. Given the below graph:



a. Find one topological sort (topological ordering) of the graph.
b. Remove all directions in the graph (to transform it into an undirected graph) and then, find a minimum spanning tree of the graph by using the Prim's algorithm.