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## Tut 8 – C++ Sort & Graph

With the following struct:

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### Problem 1 \*

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Given a list = {1, 13, 7, 2, 35, 24, 9, 20, 17}, show the sorting process **step-bystep** of the following algorithms:

- a) Straight Insertion Sort.
- b) Shell Sort ( $K = 3 \rightarrow K = 1$ ).

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### Problem 2 \*

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Given a list = {20, 27, 10, 12, 22, 18, 12, 21}, show the sorting process **step-bystep** of the following algorithms:

- a) Straight Selection Sort
- b) Heap Sort
- c) Bubble Sort

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### Problem 3 \*

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Given a list = {53, 59, 56, 52, 55, 58, 51, 57, 54}, show the sorting process **stepby-step** of the following algorithms:

- a) Quick Sort (the pivot is the leftmost element)
- b) Merge Sort

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### Problem 4\*

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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}

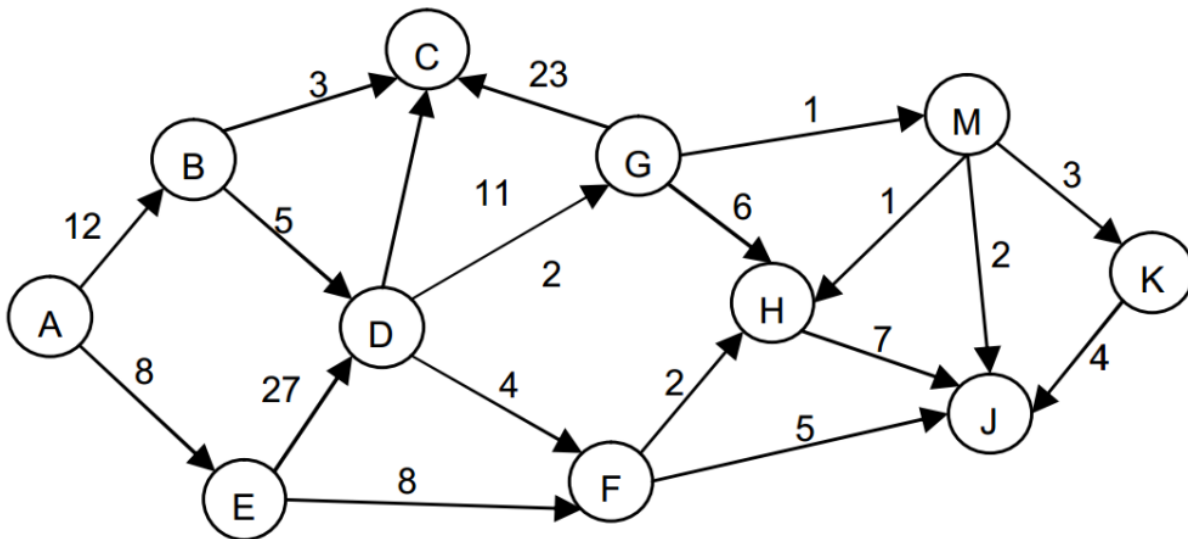
*Friendship* = {(George, Jean), (Frank, Fred), (George, John), (Jim, Fred), (Jim, Frank), (Jim, Susan), (Susan, Frank)}

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

### Problem 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.

### Problem 6 \*

Specify the worst-case and average-case Big-Oh complexity of the following algorithms, assuming an input array of size  $N$ : InsertionSort, HeapSort, MergeSort, QuickSort, SequentialSearch, BinarySearch