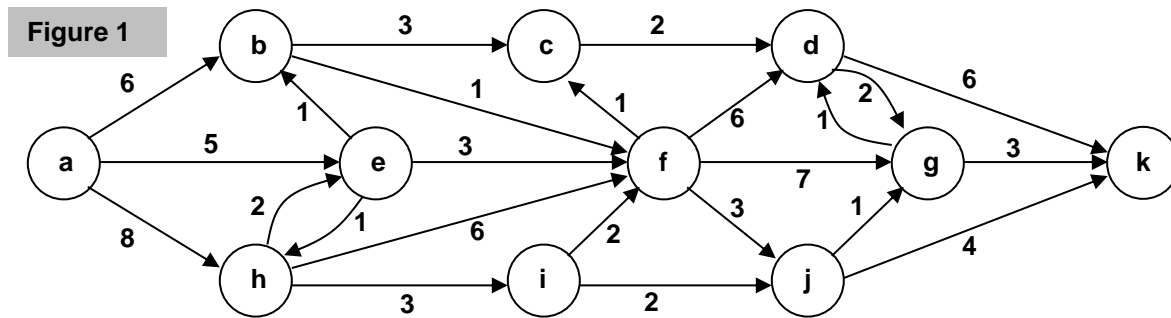


You will submit your solution to this assignment to the Curator System (as HW04). Your solution must be either a plain text file (e.g., NotePad++) or a typed MS Word document; submissions in other formats will not be graded.

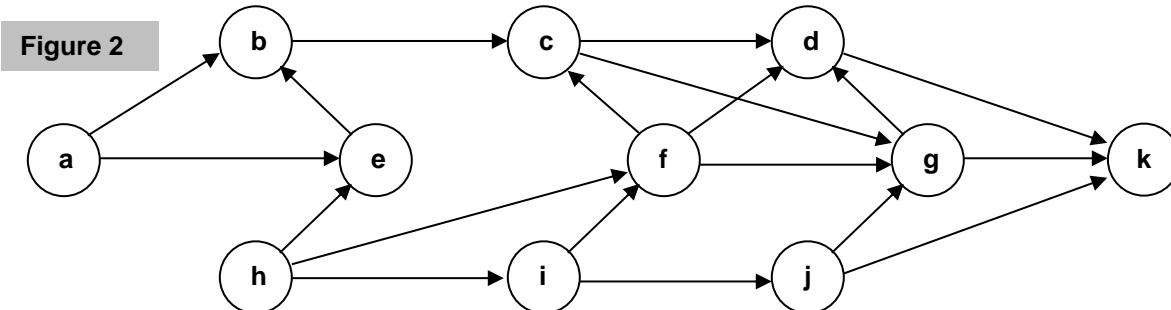
Credit will only be given if you show relevant work.

- [25 points] Apply Dijkstra's SSAD algorithm to find the shortest distance from vertex 0 to every other vertex in the graph shown in Figure 1 below. For uniformity, when choosing which node to visit next, take them in increasing alphabetic order. You must show supporting work in the form of a table; see the course website for an acceptable format. You do not need to list the paths in your answer, just the minimum distances.

**Note:** the example in the course notes shows an undirected graph, but the algorithm applies to directed graphs as well, and in the obvious manner.



- [25 points] Using a depth-first traversal, find a topological ordering of the nodes in the graph shown in Figure 2 below. For uniformity, when choosing which node to visit next, take them in increasing alphabetic order. You must show supporting work; see the course website for an acceptable format.



- [25 points] Many operations can be performed faster on sorted data than on unsorted data. For each of the following operations, explain whether it could be performed faster if the data values were sorted (do not take the cost of the sorting into account).
  - Determining if a set of integers contains all the factors of a given integer.
  - Determining if a given integer divides any integer in a set of integers.
  - Determining if a set of strings contains two different strings that are an mirrors of each other (e.g., *plum* and *mulp*).
  - Determining if any string in a set of strings has a specific string as a suffix.
  - Determining if any string in a set of strings is the prefix of another string in the set.
- [25 points] Implement a Java method that takes an array of 0's and 1's and sorts it into ascending order in  $\Theta(N)$  operations. Your answer should conform to the following interface:

```
void sortBits(int A[])
```