# COMP3711: Design and Analysis of Algorithms

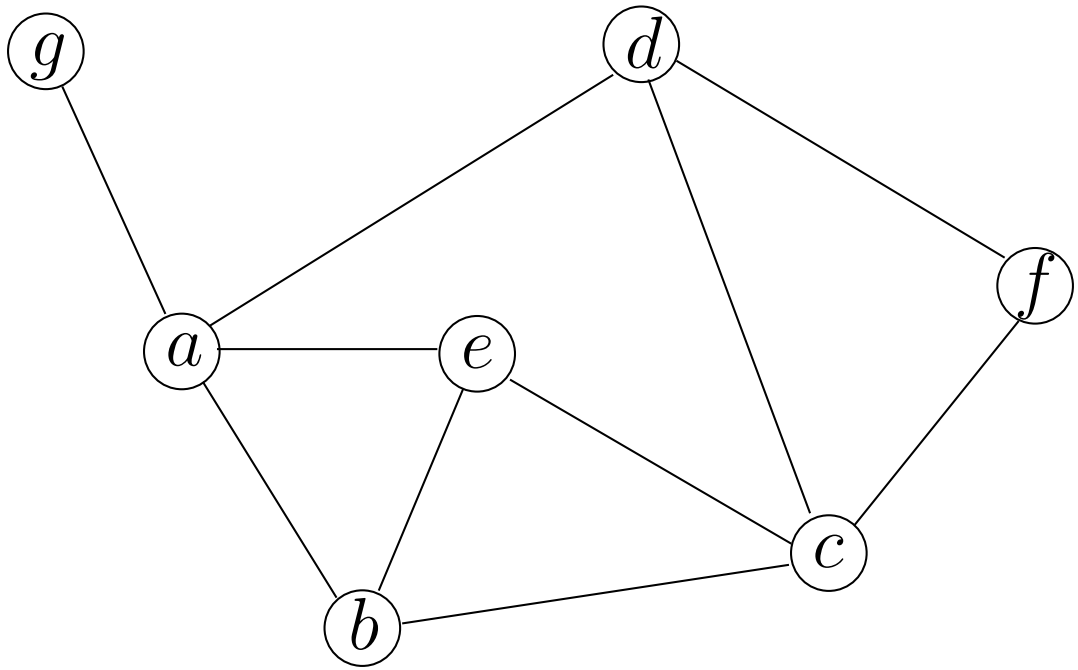
Tutorial 9

HKUST

# Question 1

The adjacency list representation of a graph $G$, which has 7 vertices and 10 edges, is:

$$
\begin{array}{ll}
a :\rightarrow d, e, b, g & b :\rightarrow e, c, a \\
c :\rightarrow f, e, b, d & d :\rightarrow c, a, f \\
e :\rightarrow a, c, b & f :\rightarrow d, c \\
g :\rightarrow a &
\end{array}
$$



# Question 1

(a) Show the breadth-first search tree by running BFS on graph G with the given adjacency list, use vertex *a* as the source.

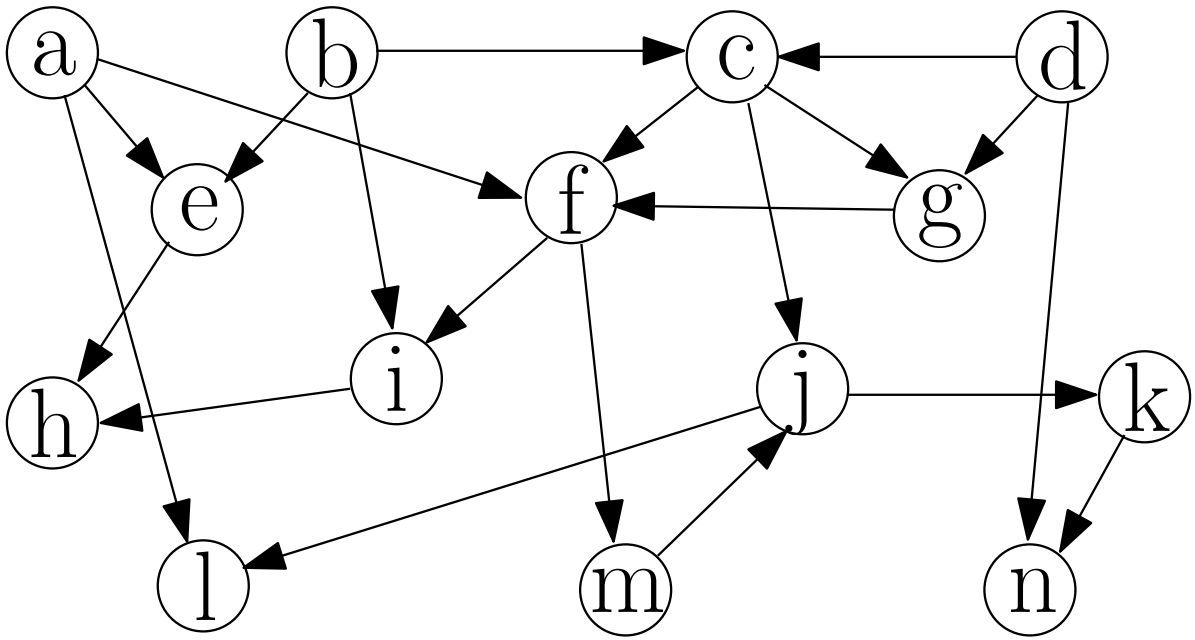
(b) Show the edges which are not presented in the BFS tree in part (a) by dashed lines.

(c) Show the depth-first search tree by running DFS on graph G with the given adjacency list, use vertex *a* as the source.

(d) Show the edges which are not presented in the DFS tree in part (c) by dashed lines.

# Question 2

Show the topological ordering of the following graph.



# Question 3

Given an undirected weighted graph $G = (V, E)$ with non-negative distinct edge weight and an MST T of it. (a) Replace the weight of each edge w by $w^2$. Is T still an MST for the new graph? (b) Next we consider a shortest path $u \to v$ in the original graph. Is this path still a shortest path from u to v in the new graph? If yes, prove so; if not, give a counter example.