

Question 1. For part 1 see Figure 1 below.

Forward edges are $(f, l), (a, j)$.

Backward edges are $(i, c), (n, f), (b, g)$.

Cross edges are $(i, d), (m, i), (f, c), (n, l), (j, e), (k, b)$.

The strongly connected components are $\{a\}, \{g, b, k, o\}, \{j\}, \{f, n, e\}, \{l\}, \{c, i, m, h\}, \{d\}$.

Question 2. See Figure 2 below.

Question 3. For part 1 see Figure 3 below.

For part 2 the f array is $f[a] = 1, f[b] = 11, f[c] = 2, f[d] = 2, f[e] = 2, f[f] = 11, f[g] = 5, f[h] = 1, f[i] = 1, f[j] = 5, f[k] = 11, f[l] = 5, f[m] = 8, f[n] = 11, f[o] = 11$.

For part 3 the bridges are undirected edges $(m, j), (g, d), (d, a), (k, h)$.

For part 4 the articulation points are d, j, g, a, k, h .

Question 4. See Figure 4 below.

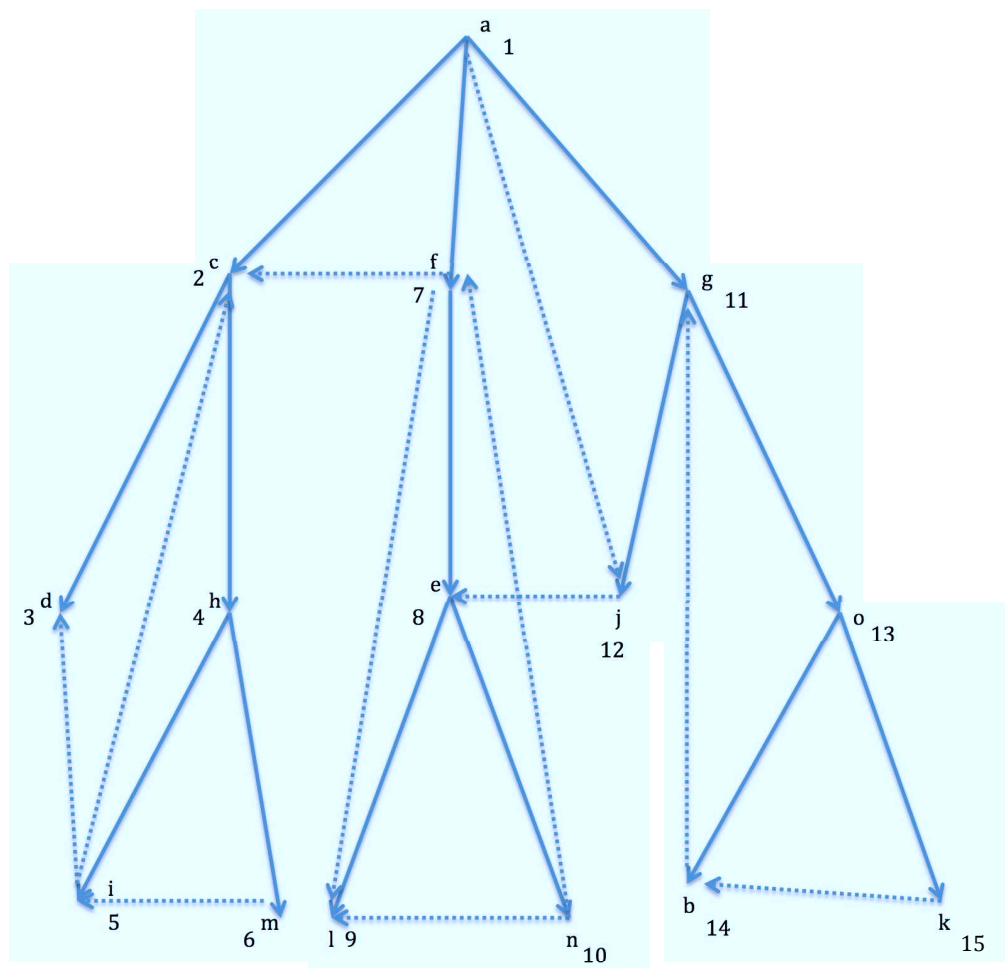


Figure 1: Depth-first search tree for Question 1

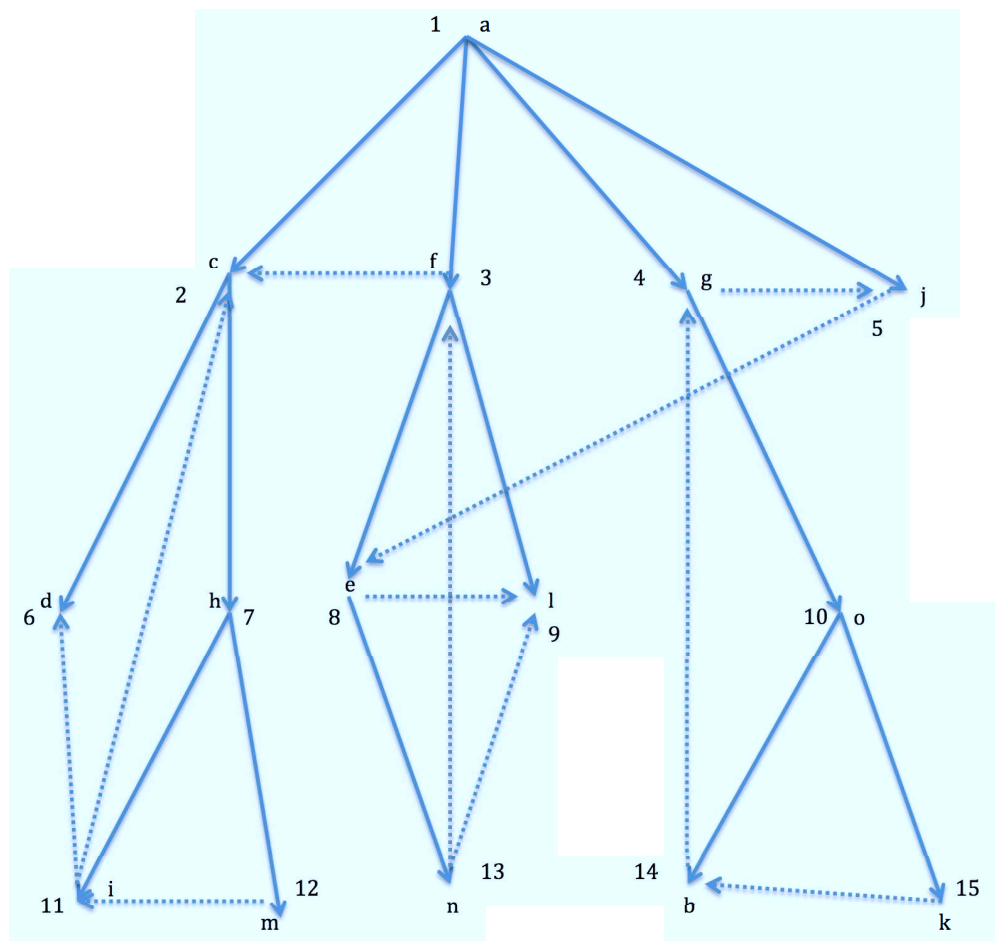


Figure 2: Breadth-first search tree for Question 2

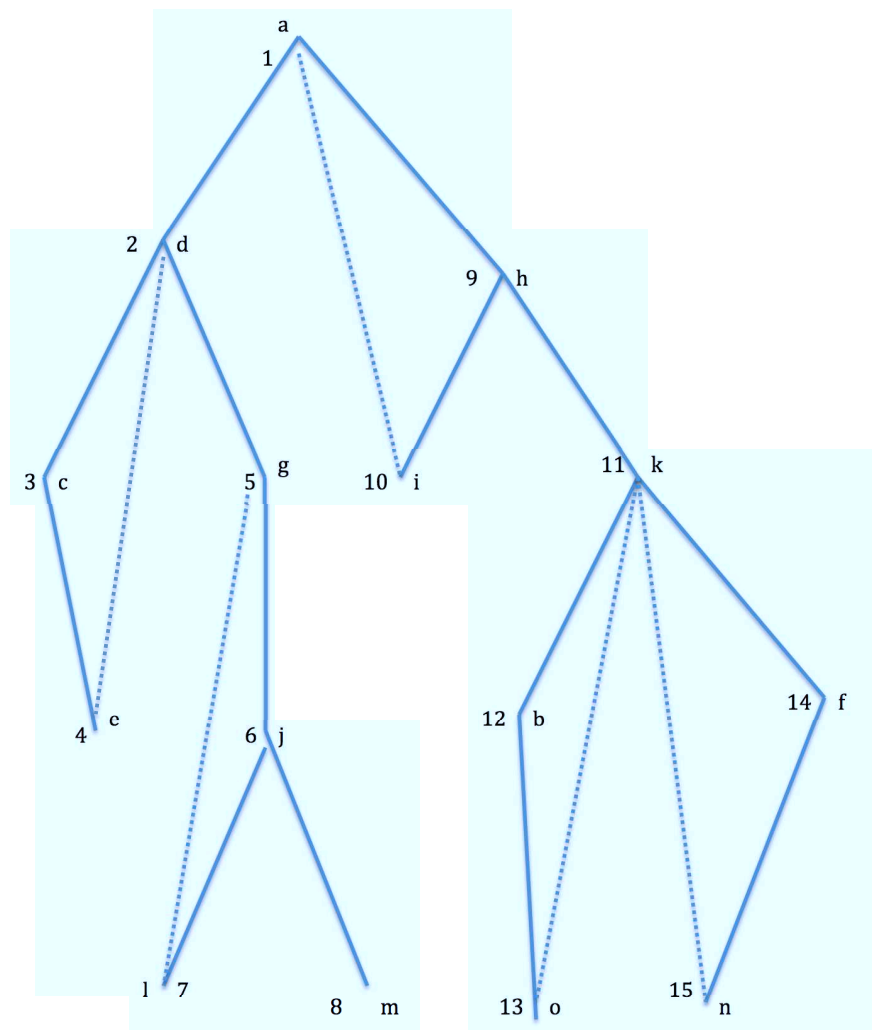


Figure 3: Depth-first search tree for Question 3

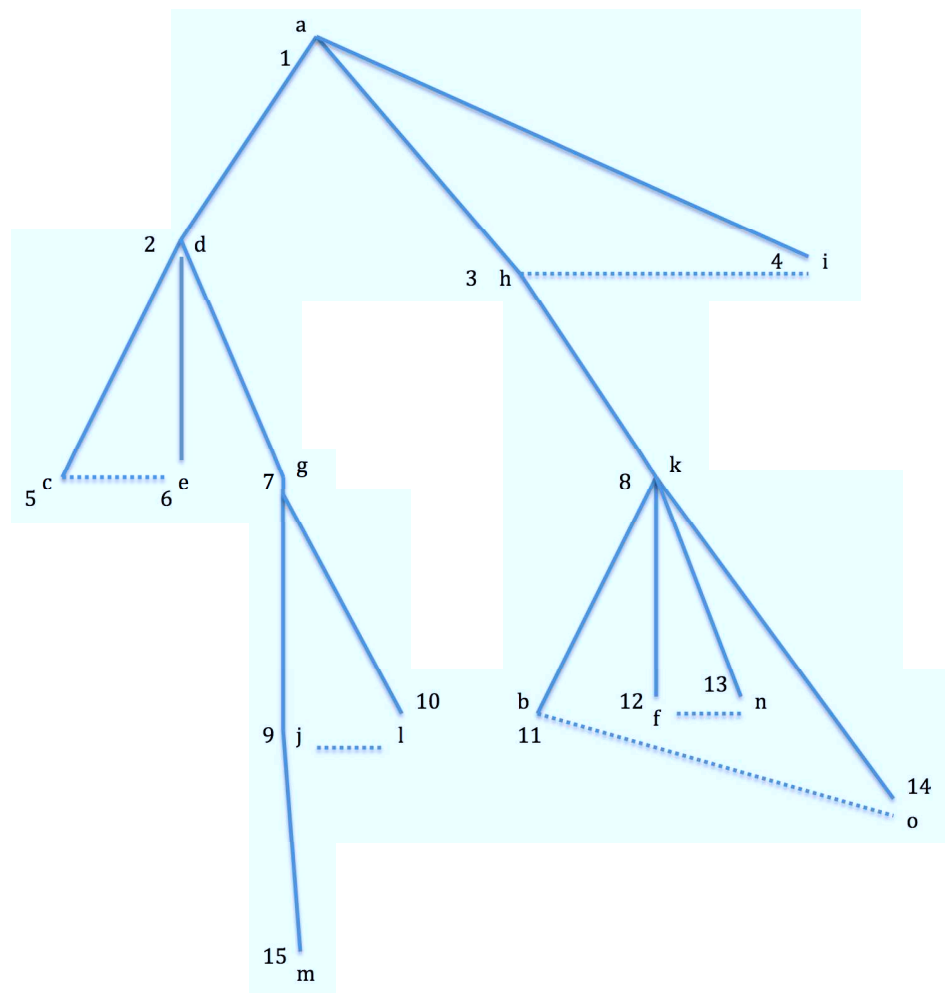


Figure 4: Breadth-first search tree for Question 4