Traversing of Graph.

- Breadth - first search (BFS)
- Depth - first search (DFS)

↳ Breadth-first search → BFS is one of the simplest algorithms for searching a graph.

→ Prim's minimum-spanning-tree algorithm and Dijkstra's algorithm use ideas similar to those in breadth-first search

→ Breadth-first search discover every vertex that is reachable from s (source vertex).

→ It computes the distance from s to each reachable vertex. It also produces a "breadth-first tree" with root s that contains all reachable vertices.

→ For any vertex v reachable from s, the path in the breadth-first tree from s to v corresponds to a "shortest path" from s to v in G.

→ BFS algorithm works on both directed and undirected graphs.

→ BFS algorithm use Queue data structure.

key Point:→ This algorithm discovers all vertices at distance k from s before discovering any vertices at distance k+1.

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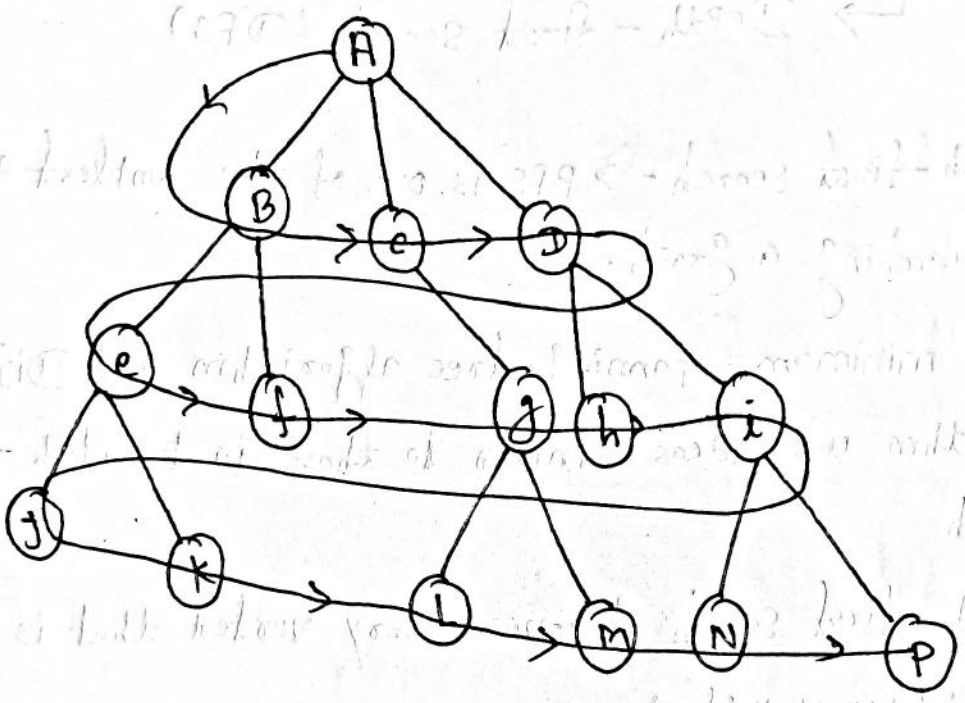

Algorithm

BFS (G, s)

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1  for each vertex u ∈ V[G] - {s}
2     do colour[u] ← WHITE
3        π[u] ← ∞
4.       π[u] ← NIL
5.  color[s] ← GRAY
6.  d[s] ← 0
7.  π[s] ← NIL
8.   Q ← ϕ
9.  ENQUEUE (Q, s)
10. while Q ≠ ϕ
11.      do u ← DEQUEUE (Q)
12.         for each v ∈ Adj [u]
13.            do if color[v] = WHITE
14.                  then color[v] ← GRAY
15.                       d[v] ← d[u] + 1
16.                       π[v] ← u
17.                       ENQUEUE (Q, v)
18.         colour[u] ← BLACK .
```

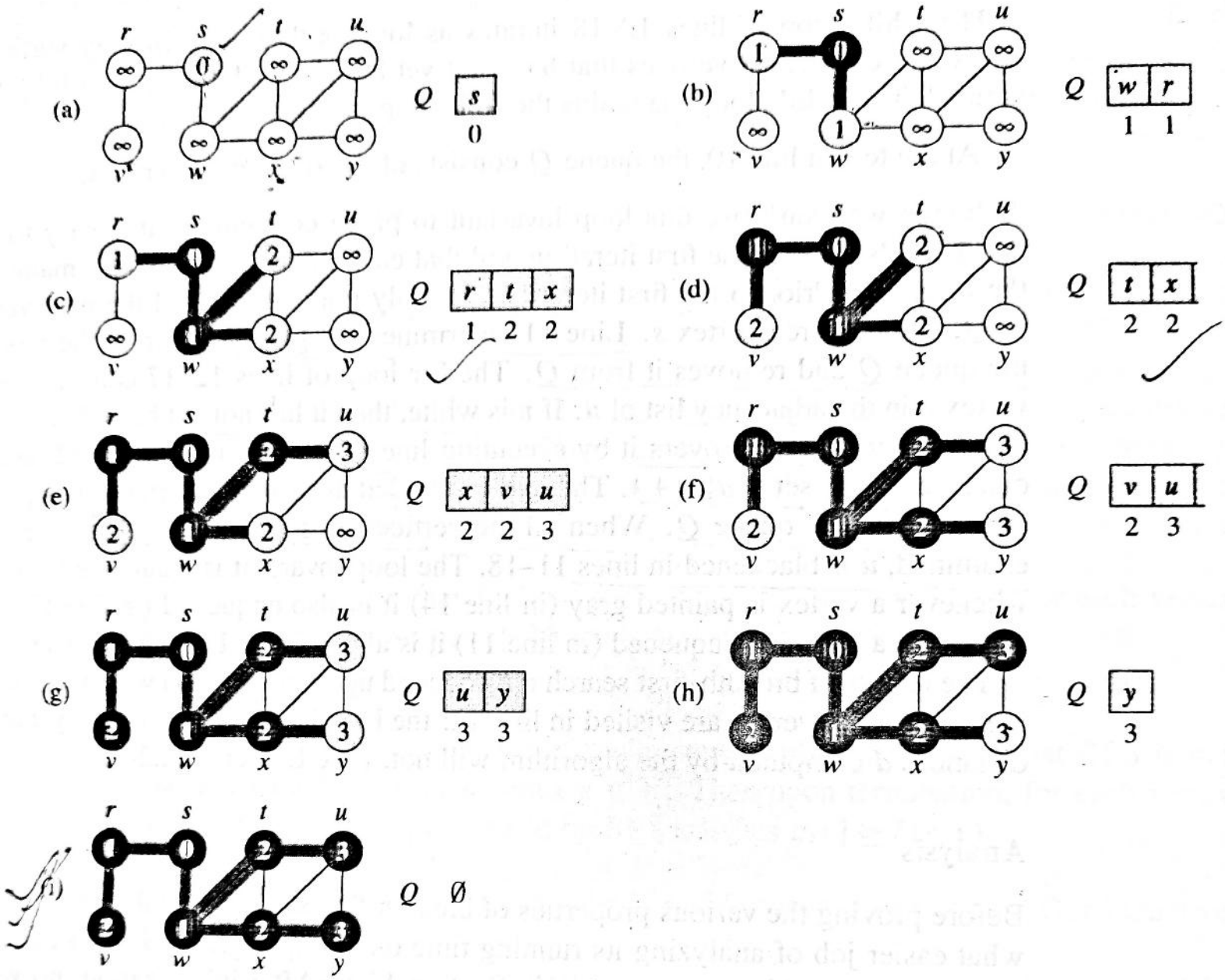

Figure 22.3 The operation of BFS on an undirected graph. Tree edges are shown shaded as the are produced by BFS. Within each vertex u is shown $d[u]$. The queue Q is shown at the beginnir of each iteration of the **while** loop of lines 10–18. Vertex distances are shown next to vertices in th queue.

Figure 22.3 illustrates the progress of BFS on a sample graph.

The procedure BFS works as follows. Lines 1–4 paint every vertex white, se $d[u]$ to be infinity for each vertex u, and set the parent of every vertex to be NIL. Line 5 paints the source vertex s gray, since it is considered to be discovered whe the procedure begins. Line 6 initializes $d[s]$ to 0, and line 7 sets the predecesso of the source to be NIL. Lines 8–9 initialize Q to the queue containing just th vertex s.