3.2 GRAPHS TRAVERSALS – BFS

Graph Traversal is the process of visiting all the vertices (nodes) of a graph in a specific order, starting from a chosen node and moving through its edges according to a set of rules.

Breadth-first traversal

Traversing the graph means examining all the nodes and vertices of the graph.

Two standard methods

- Breadth First Search
- Depth First Search

Breadth First Search (BFS) Algorithm

- Breadth first search is a graph traversal algorithm that starts traversing the graph from root node and explores all the neighboring nodes.
- Then, it selects the nearest node and explore all the unexplored nodes.
- The algorithm follows the same process for each of the nearest node until it finds the goal.

Algorithm

Steps to implement breadth first search

Step 1: Choose any node in the graph, designate it as the search node and mark it as visited.

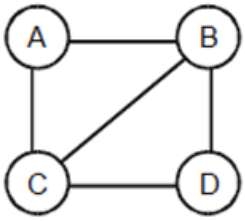
Step 2: Using the adjacency matrix of the graph, find all the unvisited adjacent nodes to the search node and enqueue them into the queue Q.

Step 3: Then the node is dequeued from the queue. Mark that node as visited and designate it as the new search node.

Step 4: Repeat step 2 and 3 using the new search node.

Step 5: This process continues until the queue Q which keeps track of the adjacent nodes is empty.

Example:



Adjacency matrix

	A	B	C	D
A	0	1	1	0
B	1	0	1	1
C	1	1	0	1
D	0	1	1	0

Implementation

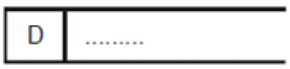
1. Let 'A' be the source vertex. Mark it to as visited.
2. Find the adjacent unvisited vertices of 'A' and enqueue then into the queue. Here B and C are adjacent nodes of A

and B and C are enqueued.

3. Then vertex 'B' is dequeued and its adjacent vertices C and D are taken from the adjacency matrix for enqueuing. Since vertex C is already in the queue, vertex D alone is enqueued.

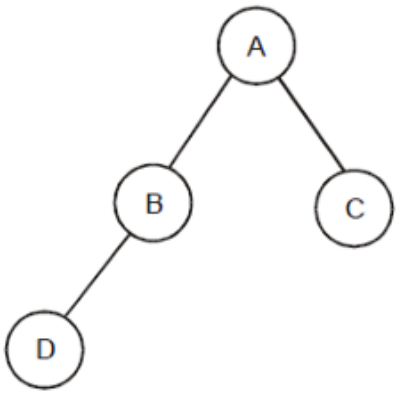
Here B is dequeued, D is enqueued.

4. Then vertex 'C' is dequeued and its adjacent vertices A, B and D are found out. Since vertices A and B are already visited and vertex D is also in the queue, no enqueue operation takes place.



Here C is dequeued

5. Then vertex 'D' is dequeued. This process terminates as all the vertices are visited and the queue is also empty.



Breadth first spanning tree

Applications of breadth first search

1. To check whether the graph is connected or not.