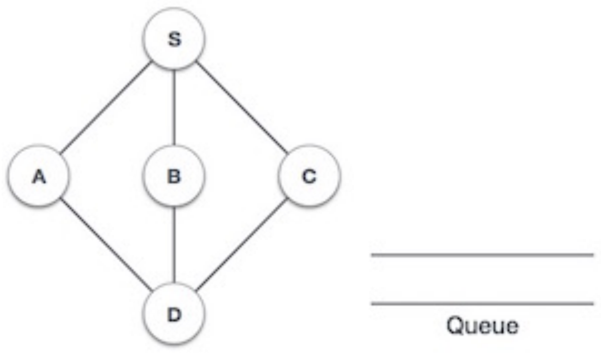
Breadth First Traversal in C

We shall not see the implementation of Breadth First Traversal (or Breadth First Search) in C programming language. For our reference purpose, we shall follow our example and take this as our graph model −



Implementation in C

```
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>

#define MAX 5

struct Vertex {
   char label;
   bool visited;
};

//queue variables

int queue[MAX];
int rear = -1;
int front = 0;
int queueItemCount = 0;

//graph variables

//array of vertices
struct Vertex* lstVertices[MAX];
```

```
//adjacency matrix
int adjMatrix[MAX][MAX];

//vertex count
int vertexCount = 0;

//queue functions

void insert(int data) {
   queue[++rear] = data;
   queueItemCount++;
}

int removeData() {
   queueItemCount--;
   return queue[front++];
}

bool isQueueEmpty() {
   return queueItemCount == 0;
}

//graph functions

//add vertex to the vertex list
void addVertex(char label) {
   struct Vertex* vertex = (struct Vertex*) malloc(sizeof(struct Vertex));
   vertex->label = label;
   vertex->visited = false;
   lstVertices[vertexCount++] = vertex;
}

//add edge to edge array
void addEdge(int start,int end) {
   adjMatrix[start][end] = 1;
   adjMatrix[end][start] = 1;
}

//display the vertex
void displayVertex(int vertexIndex) {
   printf("%c ",lstVertices[vertexIndex]->label);
}
```

```
//get the adjacent unvisited vertex
int getAdjUnvisitedVertex(int vertexIndex) {
   int i;

   for(i = 0; i<vertexCount; i++) {
      if(adjMatrix[vertexIndex][i] == 1 && lstVertices[i]->visited == false)
         return i;
   }

   return -1;
}

void breadthFirstSearch() {
   int i;

   //mark first node as visited
   lstVertices[0]->visited = true;

   //display the vertex
   displayVertex(0);

   //insert vertex index in queue
   insert(0);
   int unvisitedVertex;

   while(!isQueueEmpty()) {
      //get the unvisited vertex of vertex which is at front of the queue
      int tempVertex = removeData();

      //no adjacent vertex found
      while((unvisitedVertex = getAdjUnvisitedVertex(tempVertex)) != -1) {
         lstVertices[unvisitedVertex]->visited = true;
         displayVertex(unvisitedVertex);
         insert(unvisitedVertex);
      }

   }

   //queue is empty, search is complete, reset the visited flag
   for(i = 0;i<vertexCount;i++) {
      lstVertices[i]->visited = false;
   }
}
```

```
int main() {
   int i, j;

   for(i = 0; i<MAX; i++) // set adjacency {
      for(j = 0; j<MAX; j++) // matrix to 0
         adjMatrix[i][j] = 0;
   }

   addVertex('S');   // 0
   addVertex('A');   // 1
   addVertex('B');   // 2
   addVertex('C');   // 3
   addVertex('D');   // 4

   addEdge(0, 1);    // S - A
   addEdge(0, 2);    // S - B
   addEdge(0, 3);    // S - C
   addEdge(1, 4);    // A - D
   addEdge(2, 4);    // B - D
   addEdge(3, 4);    // C - D

   printf("\nBreadth First Search: ");

   breadthFirstSearch();

   return 0;
}
```

If we compile and run the above program, it will produce the following result −

Output

```
Breadth First Search: S A B C D
```