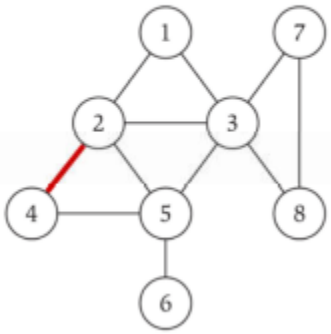
NAMA : **Shania Salsabila**
NPM : **140810180014**
Tugas 6

Tugas Anda

1. Dengan menggunakan *undirected graph* dan *adjacency matrix* berikut, buatlah koding programmnya menggunakan bahasa C++.



	1	2	3	4	5	6	7	8
1	0	1	1	0	0	0	0	0
2	1	0	1	1	1	0	0	0
3	1	1	0	0	1	0	1	1
4	0	1	0	1	1	0	0	0
5	0	1	1	1	0	1	0	0
6	0	0	0	0	1	0	0	0
7	0	0	1	0	0	0	0	1
8	0	0	1	0	0	0	1	0

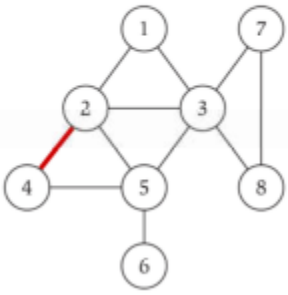
```
/*
Nama    : Shania Salsabila
Kelas   : B
NPM     : 140810180014
Nama program : adjecency matrik
*/

#include <iostream>
using namespace std;

int vertArr[20][20];
int count = 0;

void displayMatrix(int v){
    int i, j;
    for (i = 1; i <= v; i++){
        for (j = 1; j <= v; j++)
        {
            cout << vertArr[i][j] << " ";
        }
        cout << endl;
    }
}

void add_edge(int u, int v){
    vertArr[u][v] = 1;
    vertArr[v][u] = 1;
```

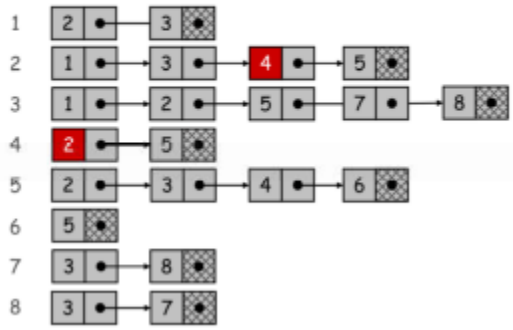
```
}

int main(int argc, char *argv[]){
    int v;
    cout << "Masukkan jumlah matrix : "; cin >> v;

    int pilihan,a,b;
    while(true){
        cout << "Menu : " << endl;
        cout << "1. Tambah edge " << endl;
        cout << "2. Print " << endl;
        cout << "3. Exit " << endl;
        cout << "Pilihan : "; cin >> pilihan;
        switch (pilihan){
            case 1:
                cout << "Masukkan node A : "; cin >> a;
                cout << "Masukkan node B : "; cin >> b;
                add_edge(a,b);
                cout << "Edge telah ditambahkan\n";
                system("Pause");
                system("CLS");
                break;
            case 2:
                displayMatrix(v);
                system("Pause");
                system("CLS");
                break;
            case 3:
                return 0;
                break;
            default:
                break;
        }
    }
}
```

```
"D:\DOCUMENTS\#SEMESTER 4\#PRAKTIKUM ANALG
Masukkan jumlah matrix : 8
Menu :
1. Tambah edge
2. Print
3. Exit
Pilihan : 1
Masukkan node A : 1
Masukkan node B : 2
Edge telah ditambahkan
Press any key to continue . . .
```

```
"D:\DOCUMENTS\#SEMESTER 4\#PRAKTIKUM AN
Menu :
1. Tambah edge
2. Print
3. Exit
Pilihan : 2
0 1 1 0 0 0 0 0
1 0 1 1 1 0 0 0
1 1 0 0 1 0 1 1
0 1 0 0 1 0 0 0
0 1 1 1 0 1 0 0
0 0 0 0 1 0 0 0
0 0 1 0 0 0 0 1
0 0 1 0 0 0 1 0
Press any key to continue . . .
```

2. Dengan menggunakan *undirected graph* dan representasi *adjacency list*, buatlah koding programmnya menggunakan bahasa C++.





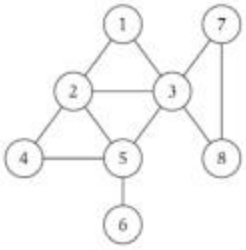

```
/*
Nama    : Shania Salsabila
Kelas   : B
NPM     : 140810180014
Nama program : adjecency list
*/

#include <iostream>
#include <cstdlib>
using namespace std;

struct AdjListNode{
    int dest;
    struct AdjListNode* next;
};

struct AdjList{
```

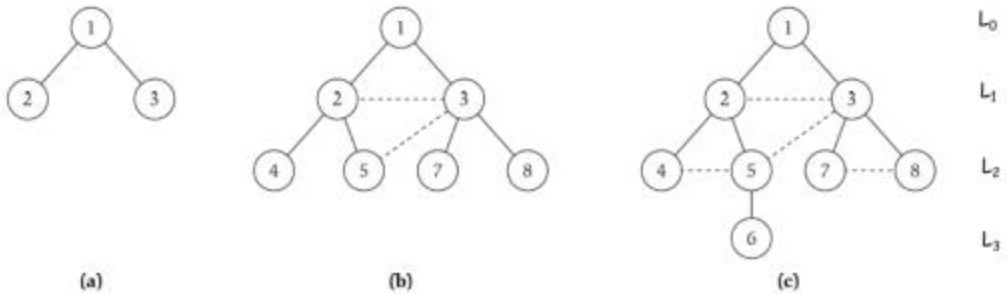
```
    struct AdjListNode *head;
};

class Graph{
    private:
        int V;
        struct AdjList* array;
    public:
        Graph(int V)
        {
            this->V = V;
            array = new AdjList [V];
            for (int i = 1; i <= V; ++i)
                array[i].head = NULL;
        }

        AdjListNode* newAdjListNode(int dest)
        {
            AdjListNode* newNode = new AdjListNode;
            newNode->dest = dest;
            newNode->next = NULL;
            return newNode;
        }

        void addEdge(int src, int dest)
        {
            AdjListNode* newNode = newAdjListNode(dest);
            newNode->next = array[src].head;
            array[src].head = newNode;
            newNode = newAdjListNode(src);
            newNode->next = array[dest].head;
            array[dest].head = newNode;
        }

        void printGraph()
        {
            int v;
            for (v = 1; v <= V; ++v)
            {
                AdjListNode* pCrawl = array[v].head;
                cout << "\n Adjacency list of vertex " << v << "\n head ";
                while (pCrawl)
                {
                    cout<<"-> "<<pCrawl->dest;
                    pCrawl = pCrawl->next;
```

```
                }
                cout<<endl;
            }
        }
};
int main()
{
    Graph g(8);
    g.addEdge(7, 8);
    g.addEdge(5, 6);
    g.addEdge(3, 8);
    g.addEdge(3, 7);
    g.addEdge(4, 5);
    g.addEdge(5, 3);
    g.addEdge(2, 5);
    g.addEdge(2, 4);
    g.addEdge(2, 3);
    g.addEdge(1, 3);
    g.addEdge(1, 2);

    g.printGraph();
}
```

```
"D:\DOCUMENTS\#SEMESTER 4\#PRAKTIKUM ANALGO\

Adjacency list of vertex 1
head -> 2-> 3

Adjacency list of vertex 2
head -> 1-> 3-> 4-> 5

Adjacency list of vertex 3
head -> 1-> 2-> 5-> 7-> 8

Adjacency list of vertex 4
head -> 2-> 5

Adjacency list of vertex 5
head -> 2-> 3-> 4-> 6

Adjacency list of vertex 6
head -> 5

Adjacency list of vertex 7
head -> 3-> 8

Adjacency list of vertex 8
head -> 3-> 7

Process returned 0 (0x0)   execution time
```

3. Buatlah program Breadth First Search dari algoritma BFS yang telah diberikan. Kemudian uji coba program Anda dengan menginputkan *undirected graph* sehingga menghasilkan tree BFS. Hitung dan berikan secara asimptotik berapa kompleksitas waktunya dalam Big-Θ!





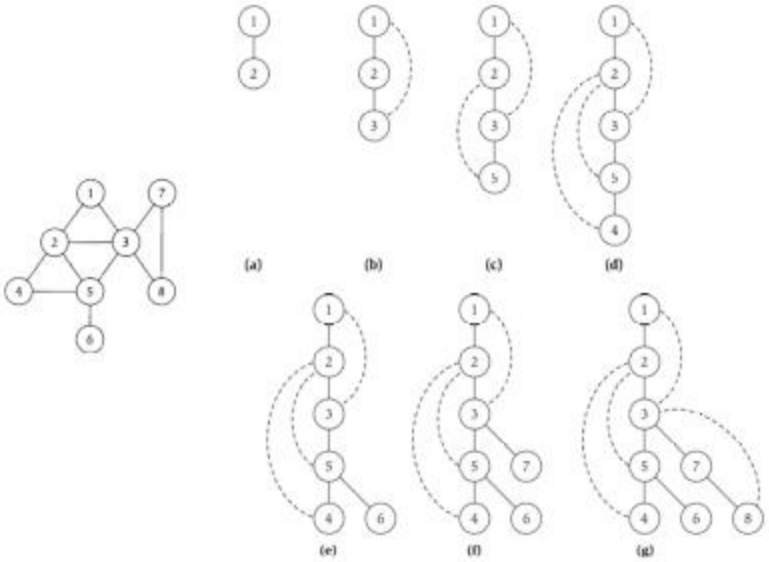

```
/*
Nama    : Shania Salsabila
Kelas   : B
NPM     : 140810180014
Nama program : breadth first seacrh
*/

#include<iostream>
using namespace std;

int main(){
    int vertexSize = 8;
    int adjacency[8][8] = {
        {0,1,1,0,0,0,0,0},
        {1,0,1,1,1,0,0,0},
        {1,1,0,0,1,0,1,1},
        {0,1,0,0,1,0,0,0},
        {0,1,1,1,0,1,0,0},
        {0,0,0,0,1,0,0,0},
        {0,0,1,0,0,0,0,1},
        {0,0,1,0,0,0,1,0}
    };
    bool discovered[vertexSize];
    for(int i = 0; i < vertexSize; i++){
        discovered[i] = false;
    }
```

```
    int output[vertexSize];

    //inisialisasi start
    discovered[0] = true;
    output[0] = 1;

    int counter = 1;
    for(int i = 0; i < vertexSize; i++){
        for(int j = 0; j < vertexSize; j++){
            if((adjacency[i][j] == 1)&&(discovered[j] == false)){
                output[counter] = j+1;
                discovered[j] = true;
                counter++;
            }
        }
    }
    cout<<"BFS : "<<endl;
    for(int i = 0; i < vertexSize; i++){
        cout<<output[i]<<" ";
    }
}
```

```
"D:\DOCUMENTS\#SEMESTER 4\#PRAKTIKUM ANALGO\AnalgoKu\AnalgoKu6\
BFS :
1 2 3 4 5 7 8 6
Process returned 0 (0x0)   execution time : 0.132 s
Press any key to continue.
```

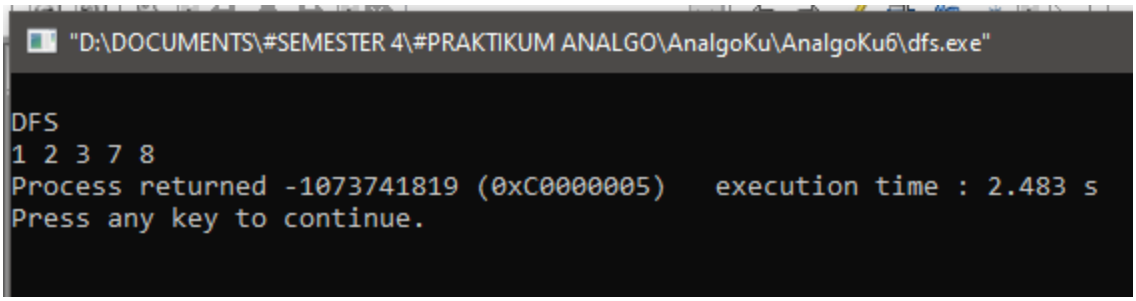
BFS adalah metode pencarian secara melebar, jadi mencari di 1 level dulu dari kiri ke kanan. Kalau sudah dikunjungi semua nodenya maka pencarian dilanjut ke level berikutnya. Kompleksitas waktu dari BFS adalah O(|V| + |E|). Karena Big-O dari BFS adalah O(V+E) dimana V itu jumlah vertex dan E itu adalah jumlah edges maka Big-O = O(n) dimana n = v+e. Maka dari itu Big-Θ nya adalah Θ(n).

4. Buatlah program Depth First Search dari algoritma DFS yang telah diberikan. Kemudian uji coba program Anda dengan menginputkan *undirected graph* sehingga menghasilkan tree DFS. Hitung dan berikan secara asimptotik berapa kompleksitas waktunya dalam Big-Θ!




```
/*
Nama    : Shania Salsabila
Kelas   : B
NPM     : 140810180014
Nama program : depth first seacrh
*/
#include <iostream>
#include <list>

using namespace std;

class Graph{
    int N;

    list<int> *adj;

    void DFSUtil(int u, bool visited[]){
        visited[u] = true;
        cout << u << " ";

        list<int>::iterator i;
        for(i = adj[u].begin(); i != adj[u].end(); i++){
            if(!visited[*i]){
                DFSUtil(*i, visited);
            }
        }
    }
```

```
    public :
    Graph(int N){
        this->N = N;
        adj = new list<int>[N];
    }

    void addEdge(int u, int v){
        adj[u].push_back(v);
    }

    void DFS(int u){
        bool *visited = new bool[N];
        for(int i = 0; i < N; i++){
            visited[i] = false;
        }
        DFSUtil(u, visited);
    }
};

int main(){
    Graph g(8);


    g.addEdge(1,2);
    g.addEdge(1,3);
    g.addEdge(2,3);
    g.addEdge(2,4);
    g.addEdge(2,5);
    g.addEdge(3,7);
    g.addEdge(3,8);
    g.addEdge(4,5);
    g.addEdge(5,3);
    g.addEdge(5,6);
    g.addEdge(7,8);

    cout << "\nDFS" << endl;
    g.DFS(1);

    return 0;
}
```



DFS merupakan metode pencarian mendalam, yang mengunjungi semua node dari yang terkiri lalu geser ke kanan hingga semua node dikunjungi. Kompleksitas ruang algoritma DFS adalah O(bm), karena kita hanya hanya perlu menyimpan satu buah lintasan tunggal dari akar sampai dau n, ditambah dengan simpul-simpul saudara kandungnya yang belum dikembangkan.