LAPORAN PRAKTIKUM
ANALISIS ALGORITMA

DISUSUN OLEH

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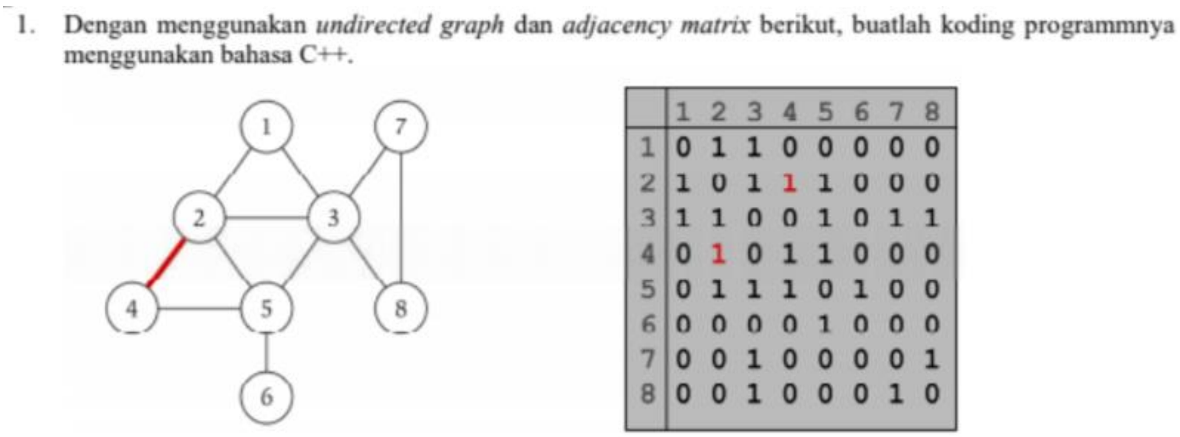
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

TEKNIK INFORMATIKA

2020

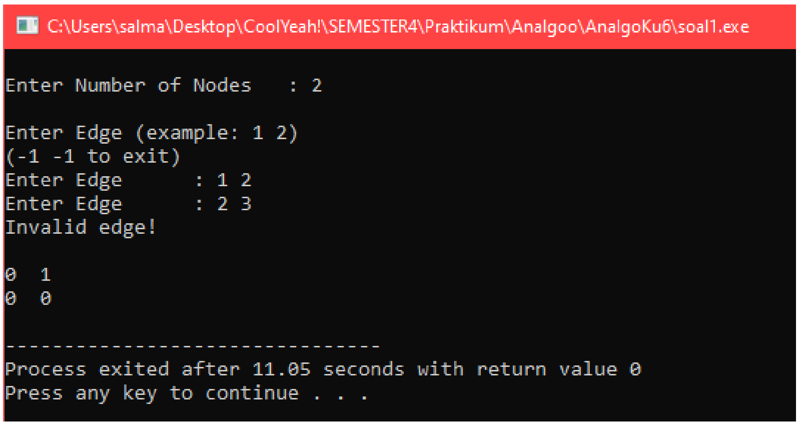


1. Dengan menggunakan *undirected graph* dan *adjacency matrix* berikut, buatlah koding programmnya menggunakan bahasa C++.

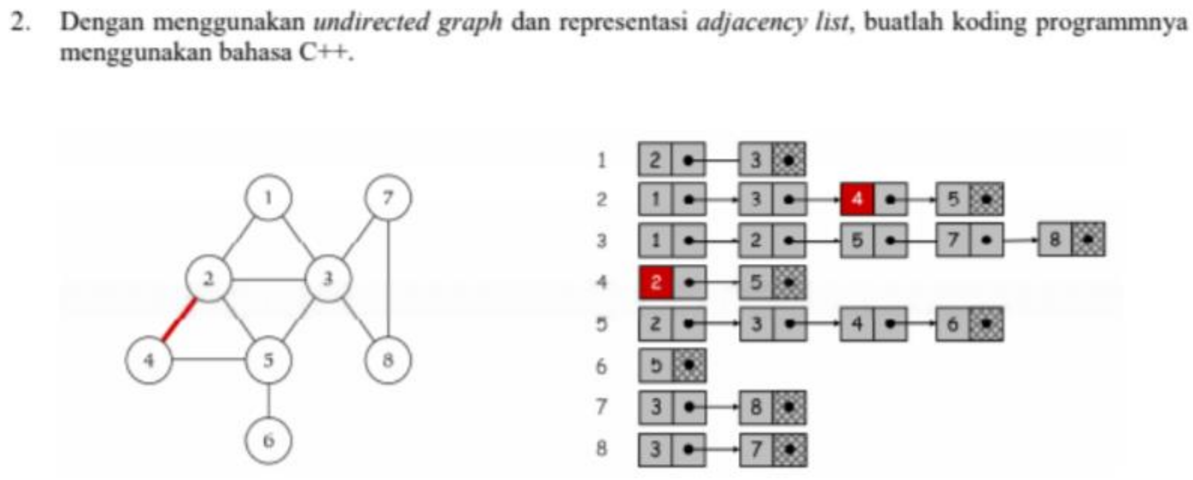
	1	2	3	4	5	6	7	8
1	0	1	1	0	0	0	0	0
2	1	0	1	1	1	0	0	0
3	1	1	0	0	1	0	1	1
4	0	1	0	1	1	0	0	0
5	0	1	1	1	0	1	0	0
6	0	0	0	0	1	0	0	0
7	0	0	1	0	0	0	0	1
8	0	0	1	0	0	0	1	0

SOURCECODE

```
/*
Nama    : Salma Alifia Shafira
NPM     : 140810180058
Kelas   : B
Program : Undirected and Adjacency Matrix
*/

#include <iostream>
#include <cstdlib>

using namespace std;

#define MAX 20

class AdjacencyMatrix{
    private:
        int n;
        int **adj;
        bool *visited;

    public:
        AdjacencyMatrix(int n){
            this->n = n;
            visited = new bool [n];
            adj = new int* [n];
            for (int i=0; i<n; i++){
                adj[i] = new int [n];
                for(int j=0; j<n; j++){
                    adj[i][j] = 0;
                }
            }
        }

    void add_edge(int origin, int destin){
        if( origin>n || destin>n || origin<0 || destin<0){
            cout << "Invalid edge!\n";
        }
        else{
            adj[origin - 1][destin - 1] = 1;
        }
    }

    void display(){
        int i;
        int j;
        for(i=0; i<n; i++){
            for(j=0; j<n; j++){
                cout << adj[i][j]<<"  ";
            }
            cout << endl;
        }
    }
};

int main(){
    int nodes;
    int max_edges;
    int origin;
    int destin;

    cout << "\nEnter Number of Nodes\t: "; cin >> nodes;

    AdjacencyMatrix am(nodes);
    max_edges = nodes * (nodes - 1);
    cout<<"\nEnter Edge (example: 1 2)\n(-1 -1 to exit)\n";
    for (int i=0; i<max_edges; i++){
        cout<<"Enter Edge\t: "; cin >> origin >> destin;
        if((origin==-1) && (destin==-1)){
            break;
        }
        am.add_edge(origin, destin);
    }
    cout << endl;
    am.display();
    return 0;}
```


C:\Users\salma\Desktop\CoolYeah!\SEMESTER4\Praktikum\Analgoo\AnalgoKu6\soal1.exe

```

Enter Number of Nodes   : 2

Enter Edge (example: 1 2)
(-1 -1 to exit)
Enter Edge      : 1 2
Enter Edge      : 2 3
Invalid edge!

0  1
0  0

--------------------------------
Process exited after 11.05 seconds with return value 0
Press any key to continue . . .
```

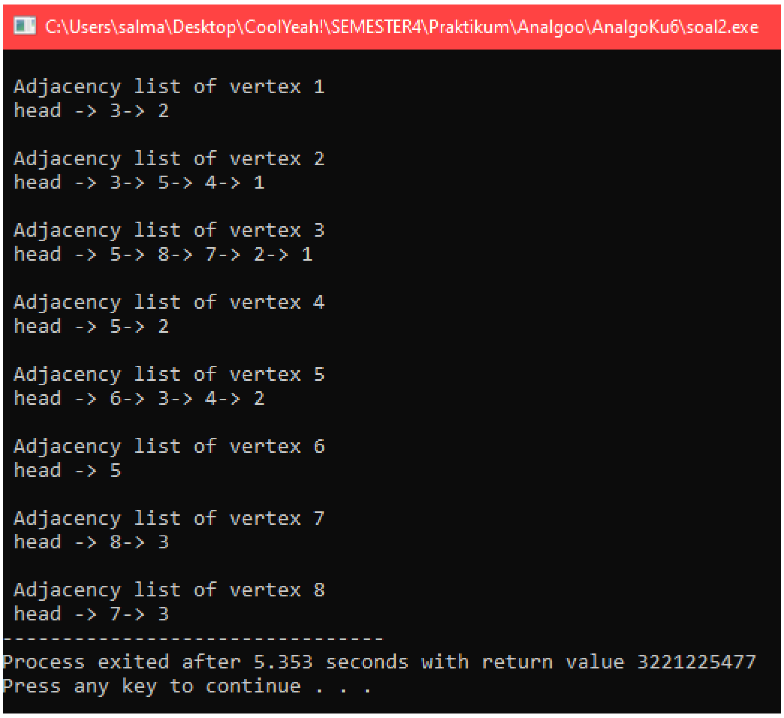


2. Dengan menggunakan *undirected graph* dan representasi *adjacency list*, buatlah koding programmnya menggunakan bahasa C++.

SOURCECODE

```
/*
Nama    : Salma Alifia Shafira
NPM     : 140810180058
Kelas   : B
Program : Undirected graph and Adjacency 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=0; 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 gh(8);

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

    return 0;
}
```



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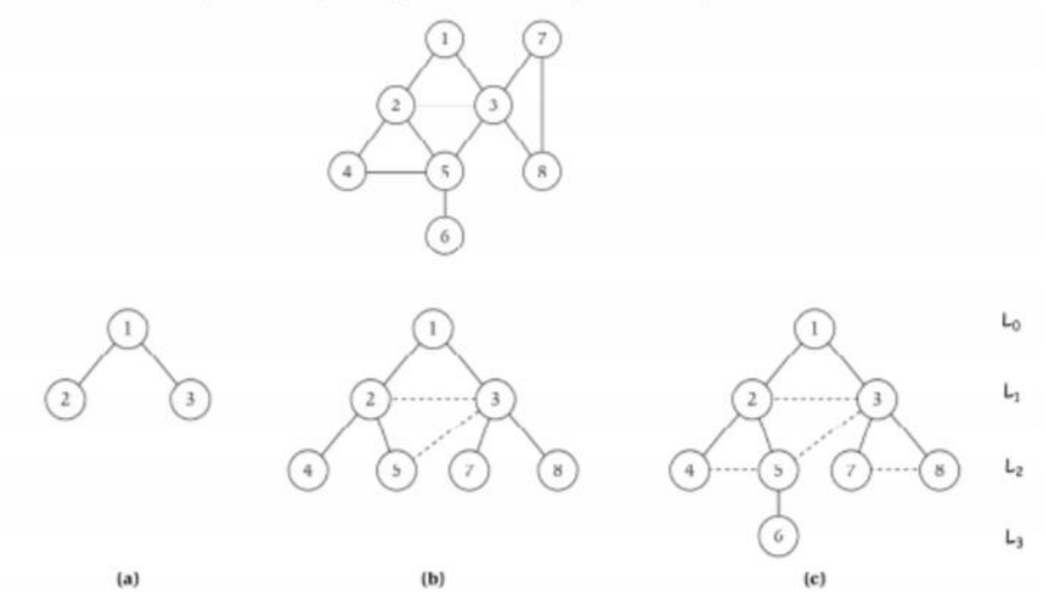
```

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

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

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

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

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

 Adjacency list of vertex 6
 head -> 5

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

 Adjacency list of vertex 8
 head -> 7-> 3
--------------------------------
Process exited after 5.353 seconds with return value 3221225477
Press any key to continue . . .
```

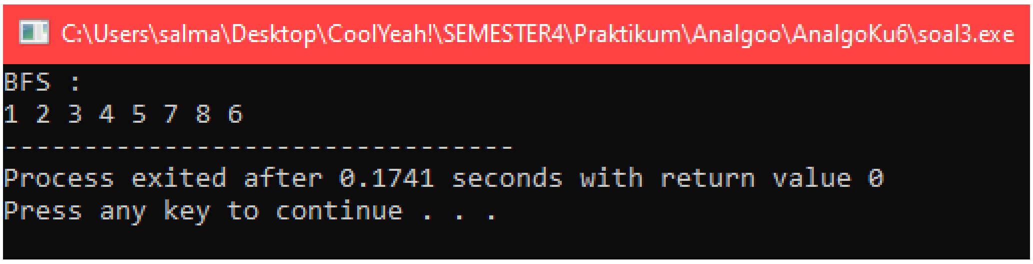
3. Buatlah program Breadth First Search dari algoritma BFS yang telah diberikan. Kemudian uji coba program Anda dengan menginputkan *undirected graph* sehingga menghasilkan tree BFS. Hitung dan berikan secara asimptotik berapa kompleksitas waktunya dalam Big-Θ!



SOURCECODE

```
/*
Nama    : Salma Alifia Shafira
NPM     : 140810180058
Kelas   : B
Program : Breadth First Search
*/

#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]<<" ";
    }
}
```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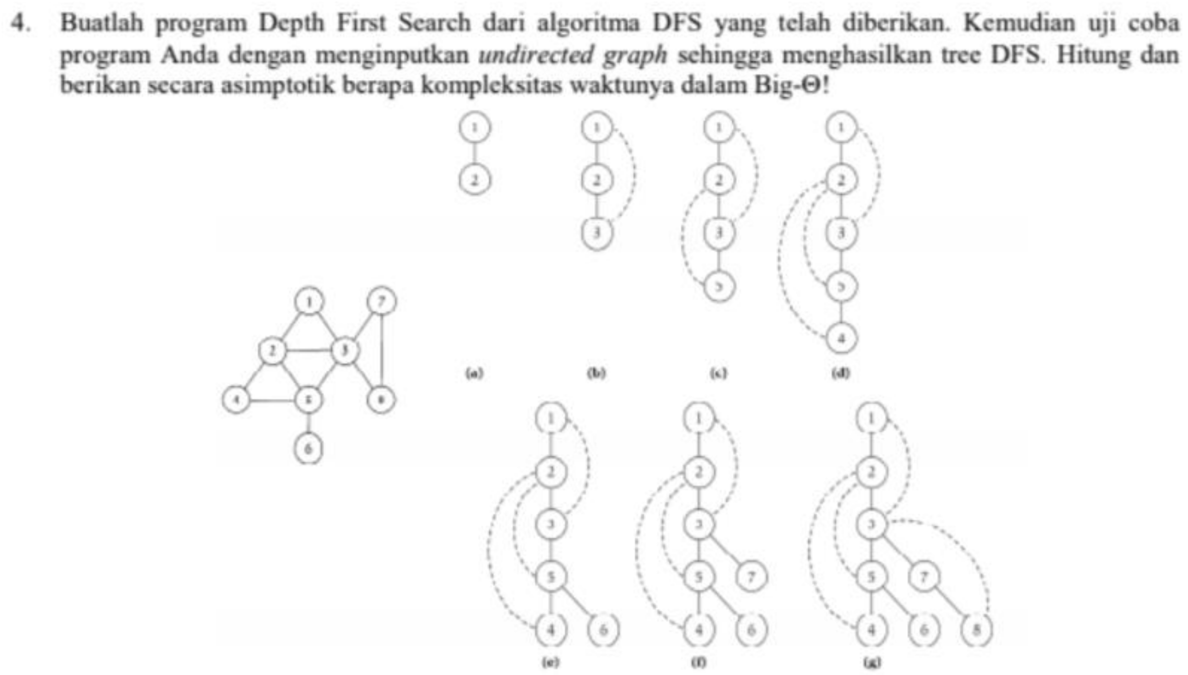
```
BFS :
1 2 3 4 5 7 8 6
--------------------------------
Process exited after 0.1741 seconds with return value 0
Press any key to continue . . .
```

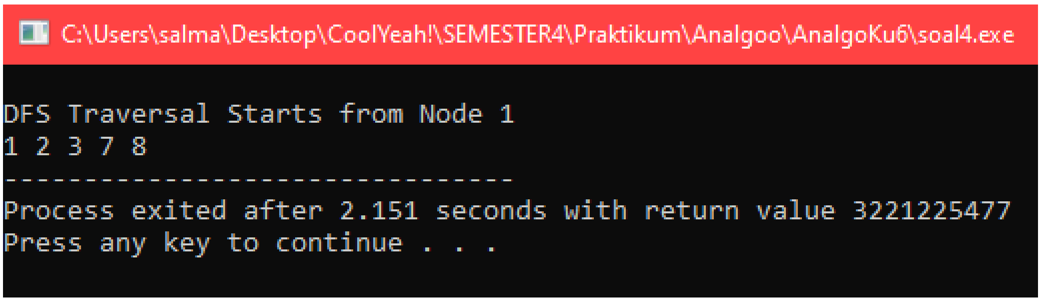


4. Buatlah program Depth First Search dari algoritma DFS yang telah diberikan. Kemudian uji coba program Anda dengan menginputkan *undirected graph* sehingga menghasilkan tree DFS. Hitung dan berikan secara asimptotik berapa kompleksitas waktunya dalam Big-Θ!

SOURCECODE

```
/*
Nama    : Salma Alifia Shafira
NPM     : 140810180058
Kelas   : B
Program : Depth First Search
*/

#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 Traversal Starts from Node 1" << endl;
    g.DFS(1);

    return 0;
}
```



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```

DFS Traversal Starts from Node 1
1 2 3 7 8
--------------------------------
Process exited after 2.151 seconds with return value 3221225477
Press any key to continue . . .
```