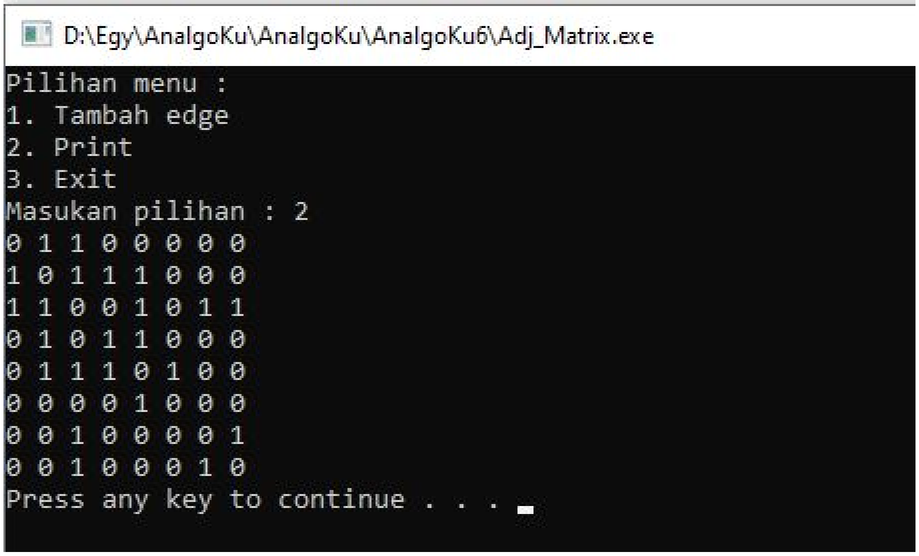
Nama : Ahmad Egy Aranda
NPM   : 140810180043
Tugas 6

1. Adjacency Matrix

```
/*
            Nama  : Ahmad Egy Aranda
            NPM             : 140810180043
            Kelas   : A
            Program         : Matriks Adjacency
*******************************************/

#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 << "Pilihan menu : " << endl;
        cout << "1. Tambah edge " << endl;
        cout << "2. Print " << endl;
        cout << "3. Exit " << endl;
        cout << "Masukan 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;
        }
    }
}
```



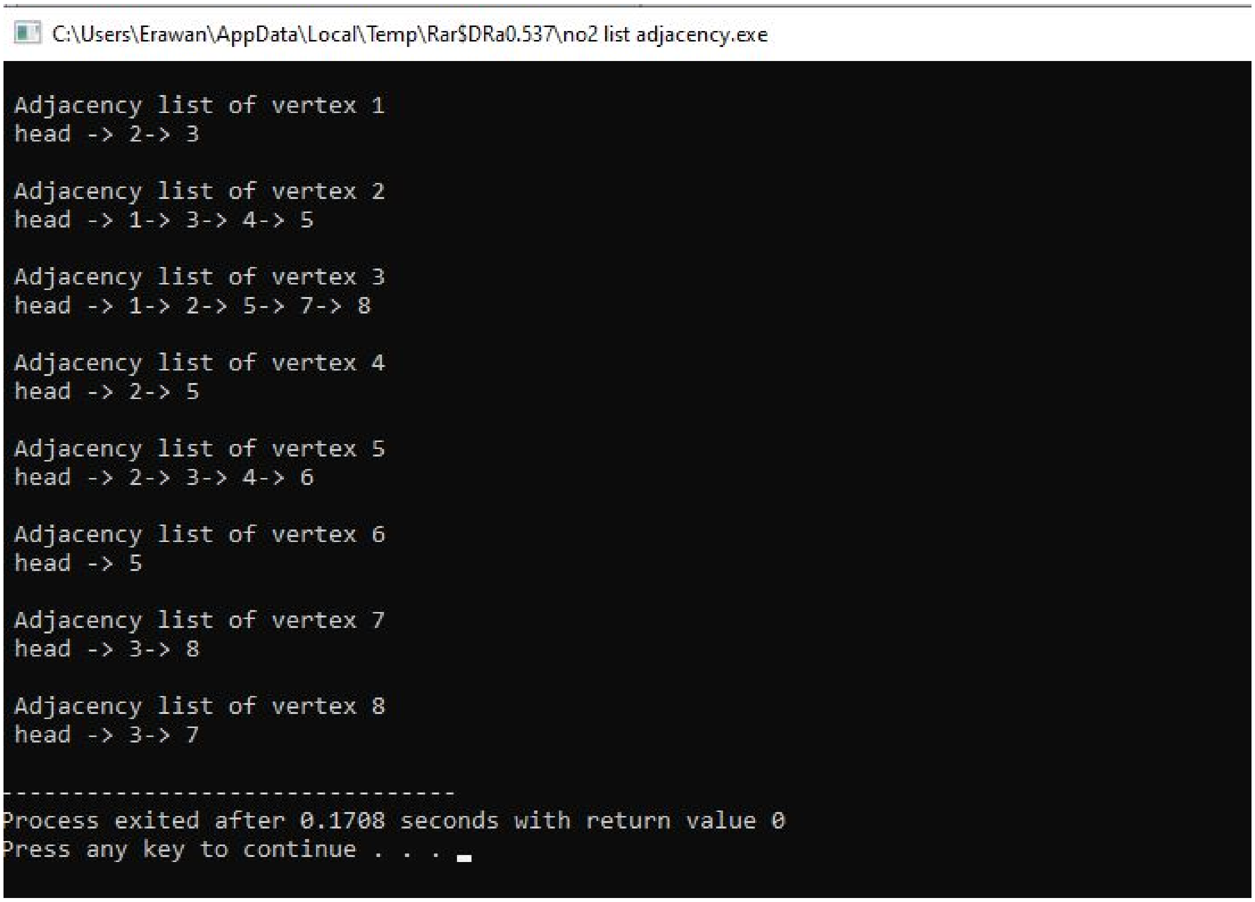
```
Pilihan menu :
1. Tambah edge
2. Print
3. Exit
Masukan pilihan : 2
0 1 1 0 0 0 0 0
1 0 1 1 1 0 0 0
1 1 0 0 1 0 1 1
0 1 0 1 1 0 0 0
0 1 1 1 0 1 0 0
0 0 0 0 1 0 0 0
0 0 1 0 0 0 0 1
0 0 1 0 0 0 1 0
Press any key to continue . . .
```

2. Adjacency List

```
/*
        Nama  : Ahmad Egy Aranda
        NPM             : 140810180043
        Kelas   : A
        Program         : Adjacency List
*****************************************/

/*
* C++ Program to Implement Adjacency List
*/
#include <iostream>
#include <cstdlib>
using namespace std;
/*
* Adjacency List Node
*/
struct AdjListNode{
   int dest;
   struct AdjListNode* next;
};

/*
* Adjacency List
*/
struct AdjList{
   struct AdjListNode *head;
};

/*
* Class Graph
*/
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;
}
/*
* Creating New Adjacency List Node
*/
AdjListNode* newAdjListNode(int dest)
{
    AdjListNode* newNode = new AdjListNode;
    newNode->dest = dest;
    newNode->next = NULL;
    return newNode;
}
/*
* Adding Edge to Graph
*/
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;
}
/*
* Print the graph
*/
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;
    }
}
```

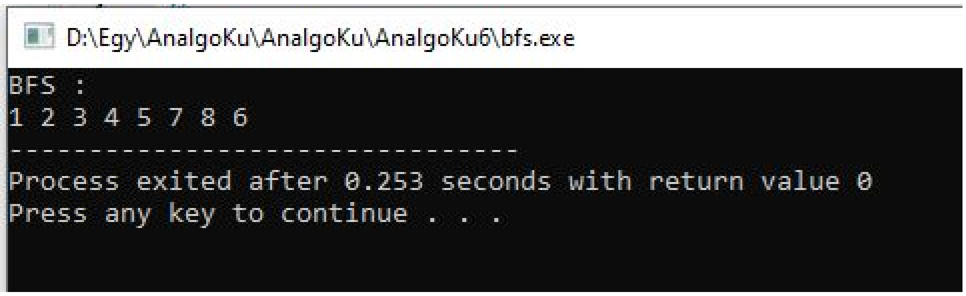
```
};


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();
}
```


C:\Users\Erawan\AppData\Local\Temp\Rar$DRa0.537\no2 list adjacency.exe

```
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 exited after 0.1708 seconds with return value 0
Press any key to continue . . .
```

3. BFS

```
/*
        Nama  : Ahmad Egy Aranda
        NPM             : 140810180043
        Kelas  : A
        Program         : BFS
*******************************************/

#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]<<" ";
        }
}
```



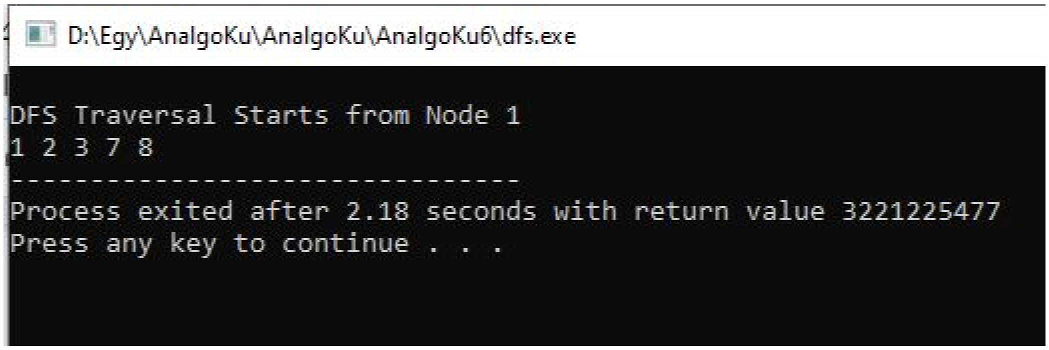
```
BFS :
1 2 3 4 5 7 8 6
--------------------------------
Process exited after 0.253 seconds with return value 0
Press any key to continue . . .
```

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. DFS

```
/*
        Nama  : Ahmad Egy Aranda
        NPM           : 140810180043
        Kelas  : A
        Program       : DFS
******************************************/
#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;
}
```



```

DFS Traversal Starts from Node 1
1 2 3 7 8
--------------------------------
Process exited after 2.18 seconds with return value 3221225477
Press any key to continue . . .
```

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.