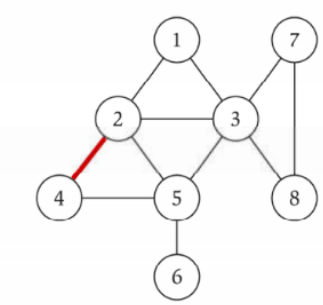
Tugas Praktikum Analisis Algoritma

Disusun oleh:
Rahma Batari
140810180051

Program Studi S1 Teknik Informatika
Fakultas Matematika & Ilmu Pengetahuan Alam
Universitas Padjadjaran

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

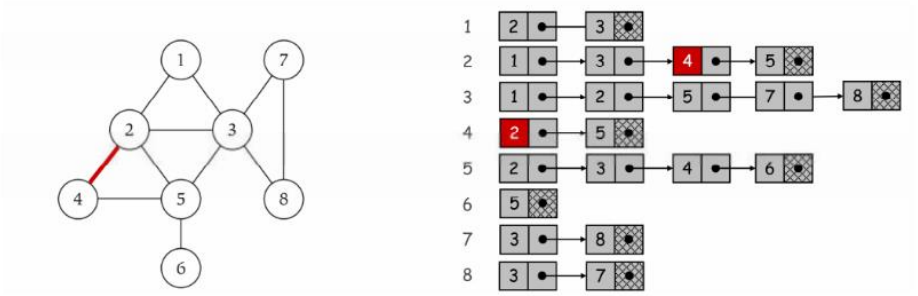
```
/*
Nama : Rahma Batari
NPM  : 140810180051
Kelas: A
*/

/*
 * C++ Program to Implement Adjacency Matrix
 */
#include <iostream>
#include <cstdlib>
using namespace std;
#define MAX 20
/*
 * Class untuk Adjacency Matrix
 */
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;
            }
        }
    }
    /*
     * Menambahkan edge ke graf
     */
    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;
        }
    }
    /*
     * Mencetak graf
     */
    void display()
    {
        int i,j;
        for(i = 0;i < n;i++)
        {
            for(j = 0; j < n; j++)
                cout<<adj[i][j]<<"  ";
            cout<<endl;
        }
    }
};
/*
 * Main
 */
int main()
{
    int nodes, max_edges, origin, destin;
    cout<<"Enter number of nodes: ";
    cin>>nodes;
    AdjacencyMatrix am(nodes);
    max_edges = nodes * (nodes - 1);
```

```
   for (int i = 0; i < max_edges; i++)
   {
      cout<<"Enter edge (-1 -1 to exit): ";
      cin>>origin>>destin;
      if((origin == -1) && (destin == -1))
         break;
      am.add_edge(origin, destin);
   }
   am.display();
   return 0;
}
```

```
C:\Users\WINDOWS\Documents\Kuliah\Semester 4\Analisis Algoritma\Praktikum\AnalgoKu6\1. AdjacencyMatrix.exe
Enter number of nodes: 4
Enter edge (-1 -1 to exit): 1 3
Enter edge (-1 -1 to exit): 3 1
Enter edge (-1 -1 to exit): 2 2
Enter edge (-1 -1 to exit): -1 -1
0  0  1  0
0  1  0  0
1  0  0  0
0  0  0  0

--------------------------------
Process exited after 12.19 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++.

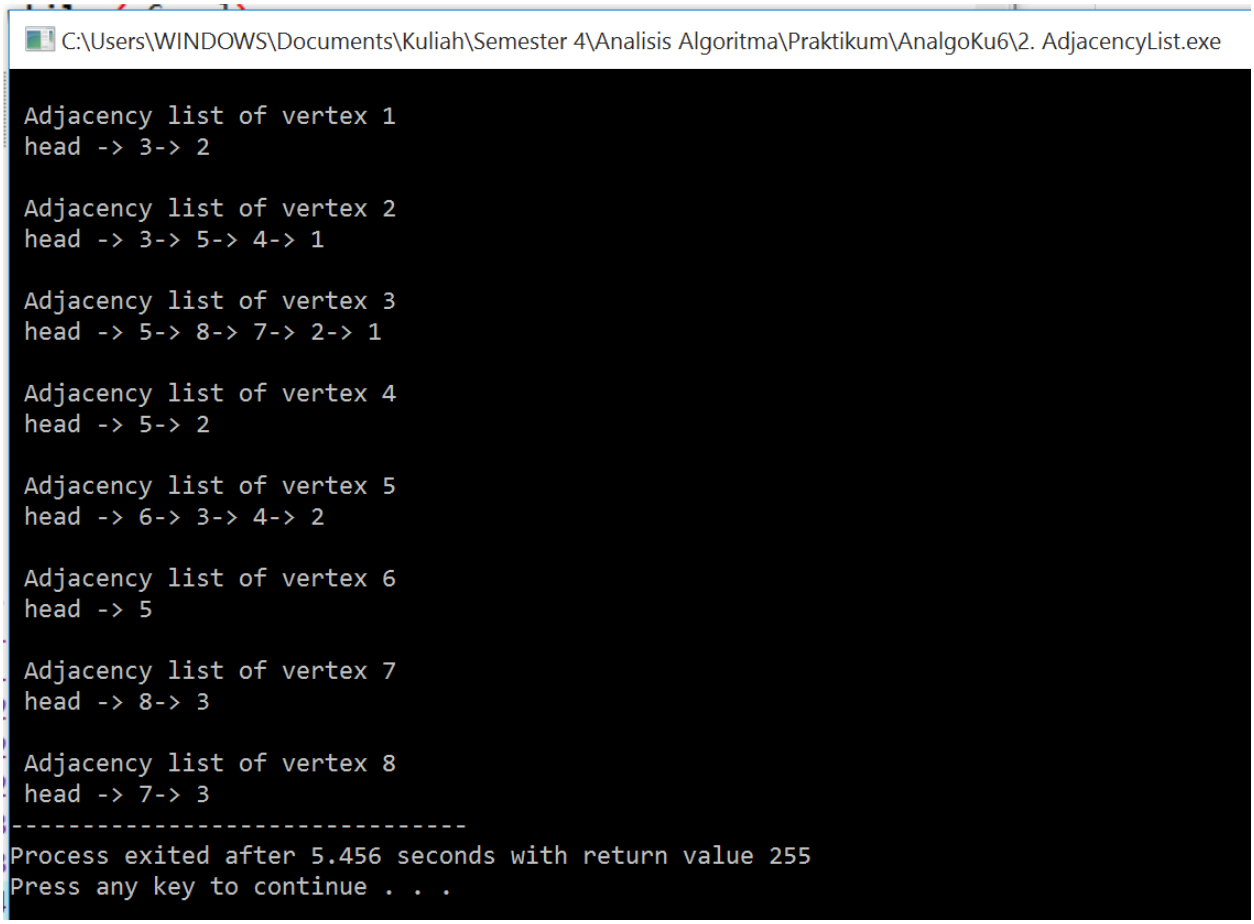



```
/*
Nama : Rahma Batari
NPM  : 140810180051
Kelas: A
*/
```

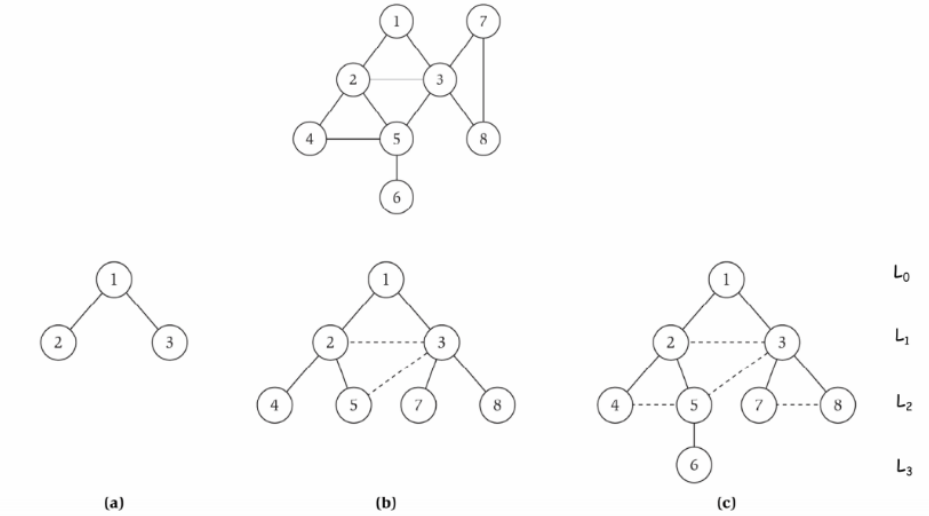
```
/*
 * C++ Program to Implement Adjacency List
 */
#include <iostream>
#include <cstdlib>
using namespace std;

/*
 * 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 = 0; 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;
       }
    }
};

/*
 * Main
 */
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);
   // print the adjacency list representation of the above graph
   gh.printGraph();

   return 0;
}
```



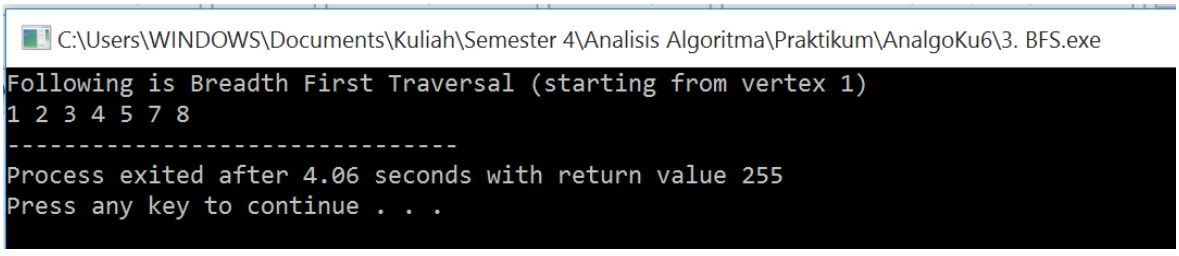
3. Buatlah program Breadth First Search dari algoritma BFS yang telah diberikan. Kemudian uji coba program Anda dengan menginputkan *undirected graph* sehingga menghasilkan tree BFS. Hitung dan berikan secara asimptotik berapa kompleksitas waktunya dalam Big-Θ!



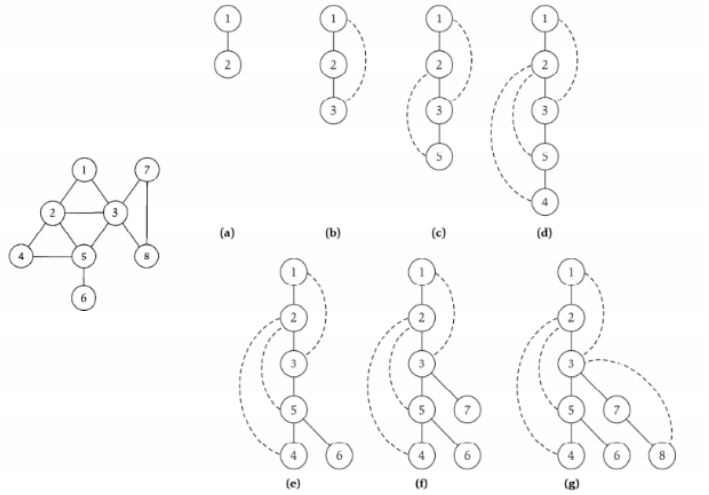

```
/*
Nama : Rahma Batari
NPM  : 140810180051
Kelas: A
*/

// Program to print BFS traversal from a given
// source vertex. BFS(int s) traverses vertices
// reachable from s.
#include<iostream>
#include <list>

using namespace std;

// This class represents a directed graph using
// adjacency list representation
class Graph
{
int V; // No. of vertices

// Pointer to an array containing adjacency
// lists
list<int> *adj;
public:
Graph(int V); // Constructor

// function to add an edge to graph
```

```
void addEdge(int v, int w);

// prints BFS traversal from a given source s
void BFS(int s);
};

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

void Graph::addEdge(int v, int w)
{
adj[v].push_back(w); // Add w to v's list.
}

void Graph::BFS(int s)
{
// Mark all the vertices as not visited
bool *visited = new bool[V];
for(int i = 0; i < V; i++)
visited[i] = false;

// Create a queue for BFS
list<int> queue;

// Mark the current node as visited and enqueue it
visited[s] = true;
queue.push_back(s);

// 'i' will be used to get all adjacent
// vertices of a vertex
list<int>::iterator i;

while(!queue.empty())
{
// Dequeue a vertex from queue and print it
s = queue.front();
cout << s << " ";
queue.pop_front();

// Get all adjacent vertices of the dequeued
```

```
// vertex s. If a adjacent has not been visited,
// then mark it visited and enqueue it
for (i = adj[s].begin(); i != adj[s].end(); ++i)
{
        if (!visited[*i])
        {
                visited[*i] = true;
                queue.push_back(*i);
        }
}
}
}

// Driver program to test methods of graph class
int main()
{
// Create a graph given in the above diagram
Graph g(8);
   g.addEdge(1, 2);
   g.addEdge(1, 3);
g.addEdge(2, 4);
        g.addEdge(2, 5);
        g.addEdge(2, 3);
        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 << "Following is Breadth First Traversal "
<< "(starting from vertex 1) \n";
g.BFS(1);

return 0;
}
```



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 : Rahma Batari
NPM  : 140810180051
Kelas: A
*/

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

// Graph class merepresentasikan graf berarah menggunakan representasi adjacency list
class Graph
{
int V; // No. simpul

// Pointer ke array yang memiliki adjacency lists
list<int> *adj;

// Fungsi rekursif yang digunakan DFS
void DFSUtil(int v, bool visited[]);
public:
Graph(int V); // Constructor

// fungsi untuk menambah tepian ke graf
void addEdge(int v, int w);
```

```
// DFS traversal dari simpul yang terjangkau dari v
void DFS(int v);
};

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

void Graph::addEdge(int v, int w)
{
adj[v].push_back(w); // Menambah w ke list v.
}

void Graph::DFSUtil(int v, bool visited[])
{
// Menandakan node bersangkutan sudah dikunjungi lalu cetak
visited[v] = true;
cout << v << " ";

// Ulang simpul berdekatan ke node ini
list<int>::iterator i;
for (i = adj[v].begin(); i != adj[v].end(); ++i)
if (!visited[*i])
        DFSUtil(*i, visited);
}

// DFS traversal dari simpul terjangkau dari v.
// Menggunakan rekursif DFSUtil()
void Graph::DFS(int v)
{
// Menandakan semua simpul belum dikunjungi
bool *visited = new bool[V];
for (int i = 0; i < V; i++)
visited[i] = false;

// Memanggil fungsi rekursif pembantu untuk mencetak DFS traversal
DFSUtil(v, visited);
}

int main()
{
```

```
// Membuat graf di diagram
Graph g(8);
g.addEdge(1, 2);
g.addEdge(1, 3);
g.addEdge(2, 5);
g.addEdge(2, 4);
g.addEdge(5, 6);
g.addEdge(3, 7);
g.addEdge(3, 8);
g.addEdge(7, 8);

cout << "Depth First Traversal"
        " (dimulai dari node 1) \n";
g.DFS(1);

return 0;
}
```