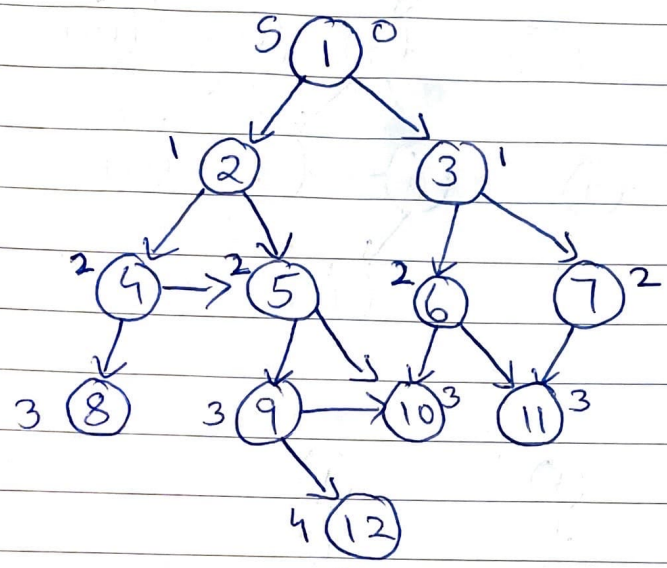
Harsimran Singh Dhillon B00983136

# Design & Analysis of Algorithms
## Theory Assignment - 3.2

Q1]

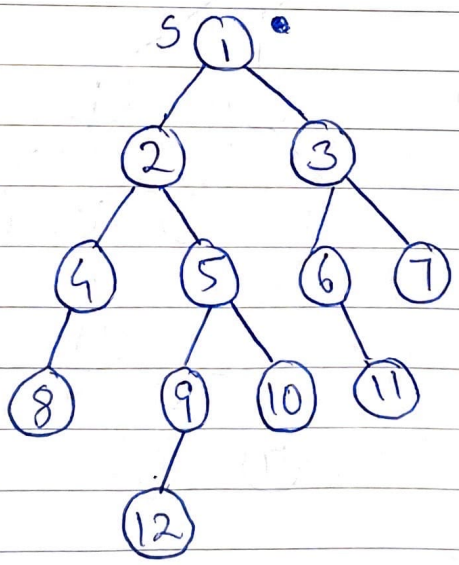
a] Perform a breadth first search on the directed graph

Part 1) and 2)



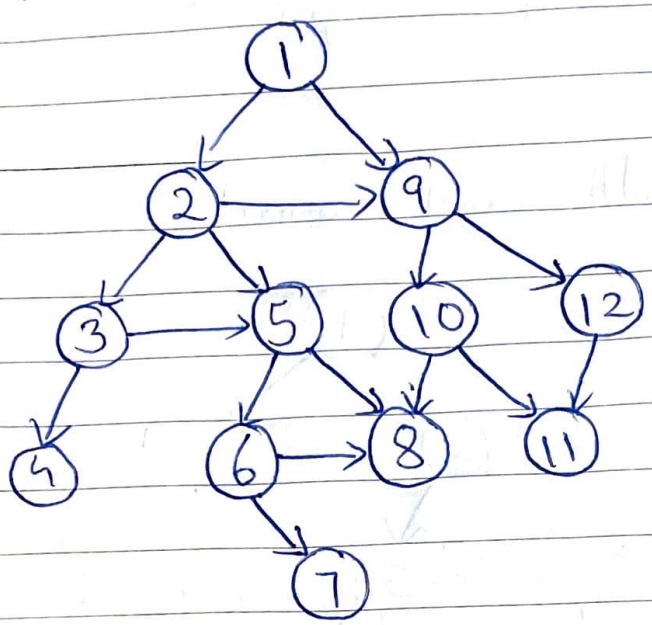

Part 2)

BFS Tree

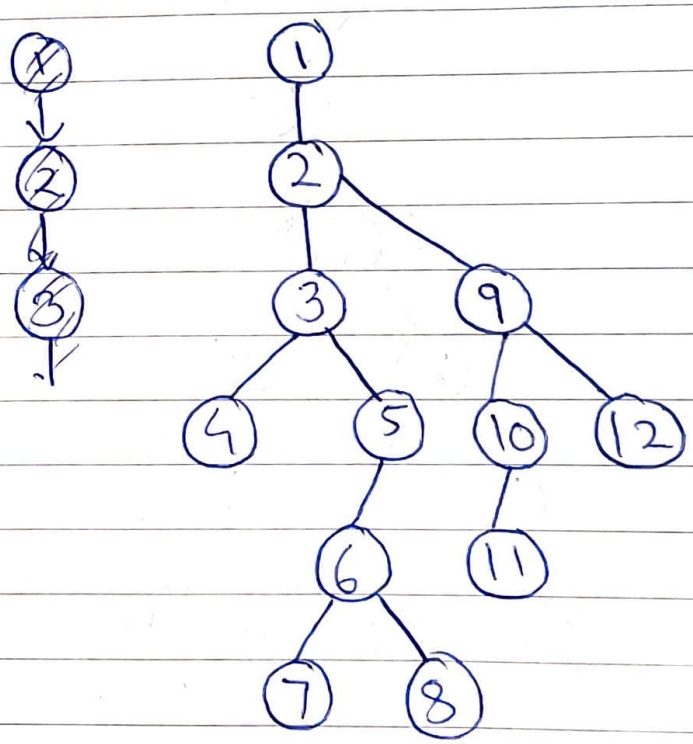


b] Perform a depth first search on the directed graph

Part 1)




Part 2)



Q2] Please modify the depth first search algorithm (slide 36 and 37 of the graphs basics lecture notes) to find all connected components in an undirected graph. Comment on where you made the modification.

→

```
DFS (G:graph; var color:carrey; parent:parray);

    for each vertex u do
        color[u] = white; parent[u] = nil;
    end for.

    ComponentIndex = 0.          // Added a variable to keep count.

    for each vertex u do
    if color[u] == white then
        ComponentIndex = ComponentIndex + 1   // increamenting the counter
        MultipleComponents[ComponentIndex]=[] // initializing Every index of array with empty values
        print (ComponentIndex)//printing Components.
        DFS-Visit(u);
    end if
    end for

end DFS
```

```
DFS-Visit(u)
{
    color[u] = gray;
    MultipleComponents[ComponentIndex].append(u)

// Appending the value of u to our array MultipleComponents
to the index of ComponentIndex.
    Print(u) // printing the vertex.
    for each v in adj[u] do
        if color[v] = white {
            parent[v] = u;
            DFS-Visit(v);
        }

    color[u] = red;
}
```