7. Minimum Time to Collect All Apples in a Tree

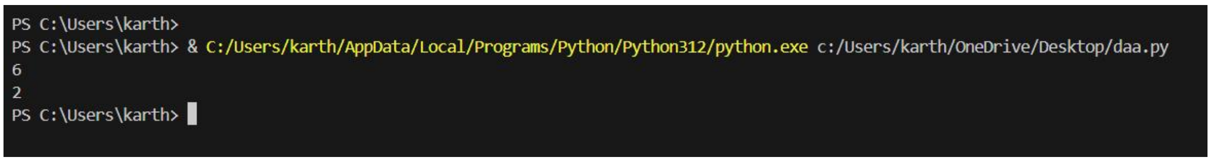
Given an undirected tree consisting of n vertices numbered from 0 to n-1, which has some apples in their vertices. You spend 1 second to walk over one edge of the tree. Return the minimum time in seconds you have to spend to collect all apples in the tree, starting at vertex 0 and coming back to this vertex.

The edges of the undirected tree are given in the array edges, where edges[i] = [ai, bi] means that exists an edge connecting the vertices ai and bi. Additionally, there is a boolean array hasApple, where hasApple[i] = true means that vertex i has an apple; otherwise, it does not have any apple.

Code:

```
def minTimeToCollectApples(n,edges,hasApple):
    graph = {i:[] for i in range(n)}
    for u, v in edges:
        graph[u].append(v)
        graph[v].append(u)
    def dfs(node,parent):
        time=0
        for neighbor in graph[node]:
            if neighbor !=parent:
                time+=dfs(neighbor, node)
        if hasApple[node] or time>0:
            return time+2
        return 0
    return max(0,dfs(0,-1)-2)
n = 7
edges=[[0,1],[0,2],[1,4],[1,5],[2,3],[2,6]]
hasApple=[False,True,False,False,True,True,False]
print(minTimeToCollectApples(n,edges,hasApple))
n=7
edges=[[0,1],[0,2],[1,4],[1,5],[2,3],[2,6]]
hasApple=[False,True,False,False,False,False,False]
print(minTimeToCollectApples(n,edges,hasApple))
```

output:



```
PS C:\Users\karth>
PS C:\Users\karth> & C:/Users/karth/AppData/Local/Programs/Python/Python312/python.exe c:/Users/karth/OneDrive/Desktop/daa.py
6
2
PS C:\Users\karth> 
```

Time complexity:

F(N)=o(logn)