1 Finding a Path with at Most the Specified Number of Bus Changes

A path from the starting point to the destination that uses at most the given number of bus changes can be found, for example, by using a modified depth first search (DFS) traversal. While traversing the graph, your algorithm needs to keep track of the nodes along the path that the DFS traversal has followed. If the current path already has the maximum allowed number of bus changes, then no more bus changes can be added to it.

For example, consider the graph shown in the assignment and let the number of allowed bus changes be 1. Assume that the algorithm visits first nodes 0, 4, and 5. As the algorithm traverses the graph, all visited nodes get marked. While at vertex 5, the algorithm cannot next visit nodes 6 or 1, since then two bus changes would have been used in the path. Hence, the algorithm goes next to vertex 9. From there only vertex 8 can be reached without an additional bus change. Since the destination cannot be reached from here, the algorithm must go back to vertex 5, and then back to nodes 4 and 0. Note that nodes 4, 5, 8, and 9 must be unmarked when the DFS traversal traces its steps back, otherwise the algorithm will not be able to find a solution. Next, the algorithm will move from vertex 0 to nodes 1, 5, and 6. From 6 the exit 10 is reached on the next step while changing buses only once, as required. So, the solution produced by the algorithm is: $0, 1, 5, 6, 10$.

You do not have to implement the above algorithm if you do not want to. Please try to design your own solution for the problem.