16 Advanced BFS

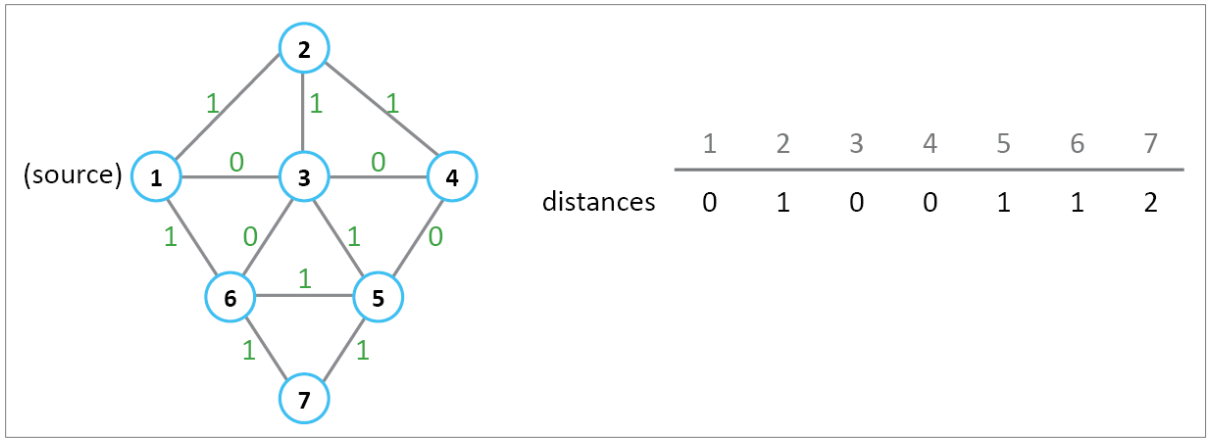
01 BFS

Sample Input

```
7 12
1 6 1
1 2 1
2 4 1
4 5 0
5 6 1
6 3 0
3 1 0
2 3 1
3 4 0
3 5 1
6 7 1
7 5 1
```

Sample Output

```
0 1 0 0 1 1 2
```



Exercise 1: Matrix

Given a matrix of size N x M consisting of integers 1, 2, 3 and 4. Each value represents one of the four possible movements from that cell:

1 : move up

2 : move right

3 : move down

4 : move left

There is no diagonal movement.

What is the minimum number of possible changes required in the matrix so that there exists a path from top-left cell (1, 1) to the bottom-right cell (N, M).

Sample Input	**Sample Output**
3 4 3 2 3 3 2 1 4 3 1 3 2 1	1

BFS with Splitting Edges

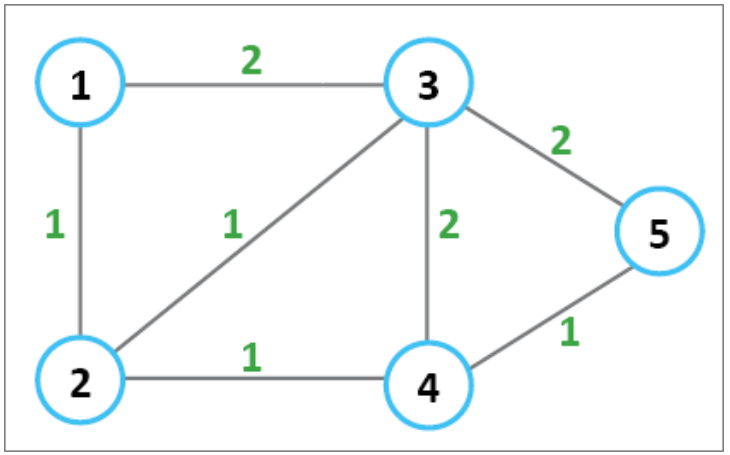
Calculate the distance of the shortest path from node 1 to node N in an undirected weighted graph where the edge costs are either 1 or 2.

Sample Input

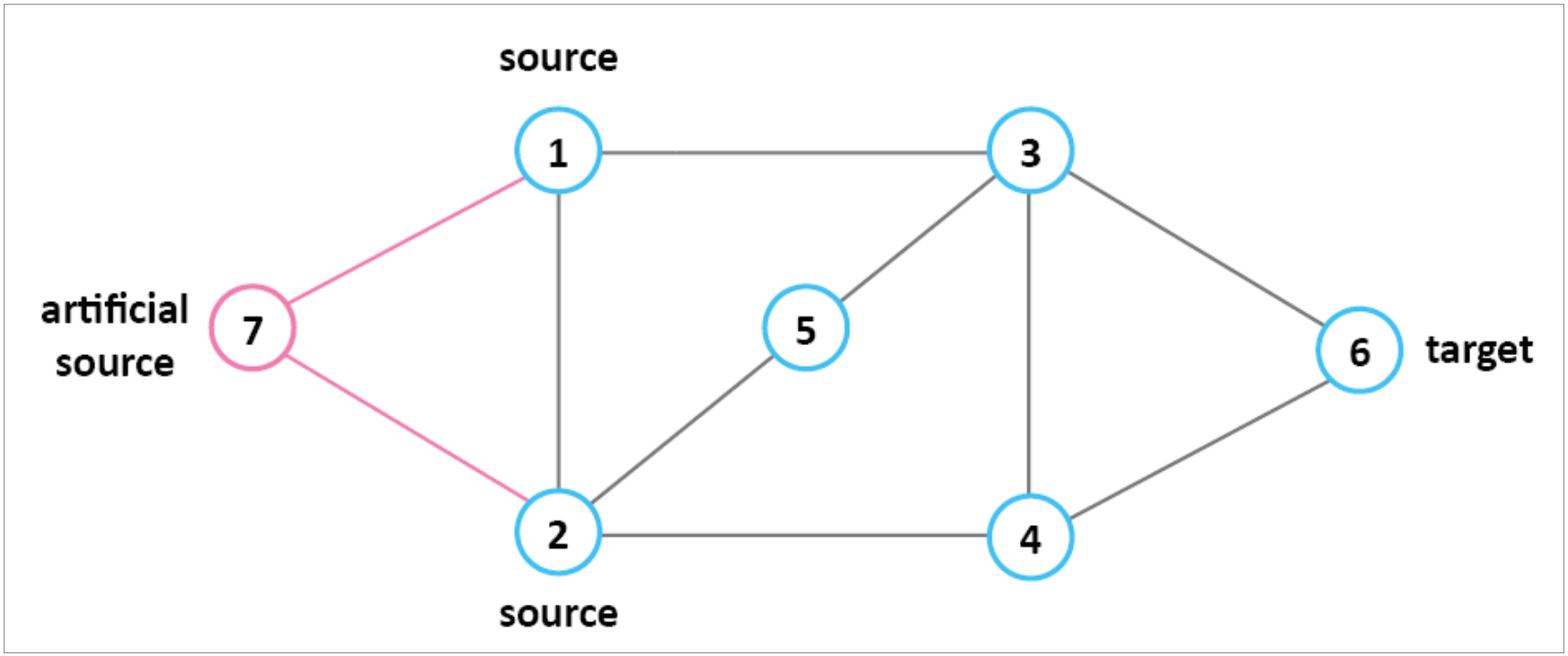
5 7
1 3 2
1 2 1
2 3 1
4 2 1
3 4 2
4 5 1
5 3 2

Sample Output

3

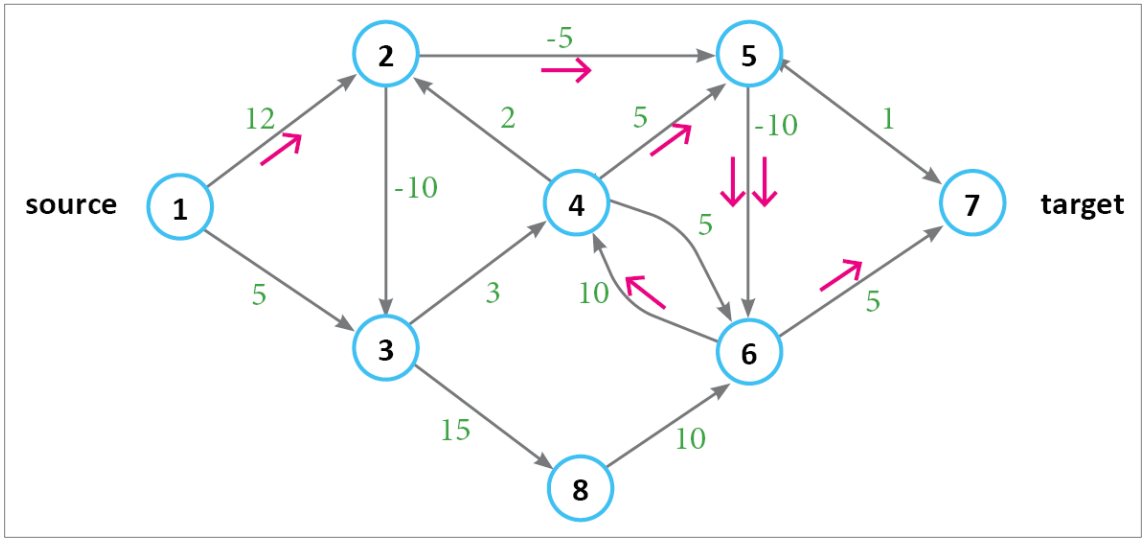


Multisource BFS



Minimum Cost Path with K Edges on a Weighted Graph

Given a weighted, directed graph G(V, E), find the minimum cost path from a given source to a target node with exactly k edges on the path.

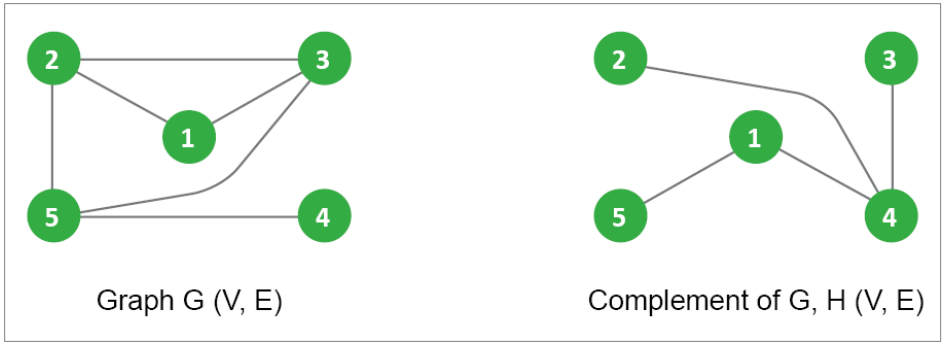


BFS on a Complementary Graph

Calculate all shortest distances from the source node 1 to all other nodes on the complementary graph.

Sample Input

```
6 2 1          //N, K, root
1 30 2 7 8 9
1 2
1 5
5 3
5 4
5 6
```

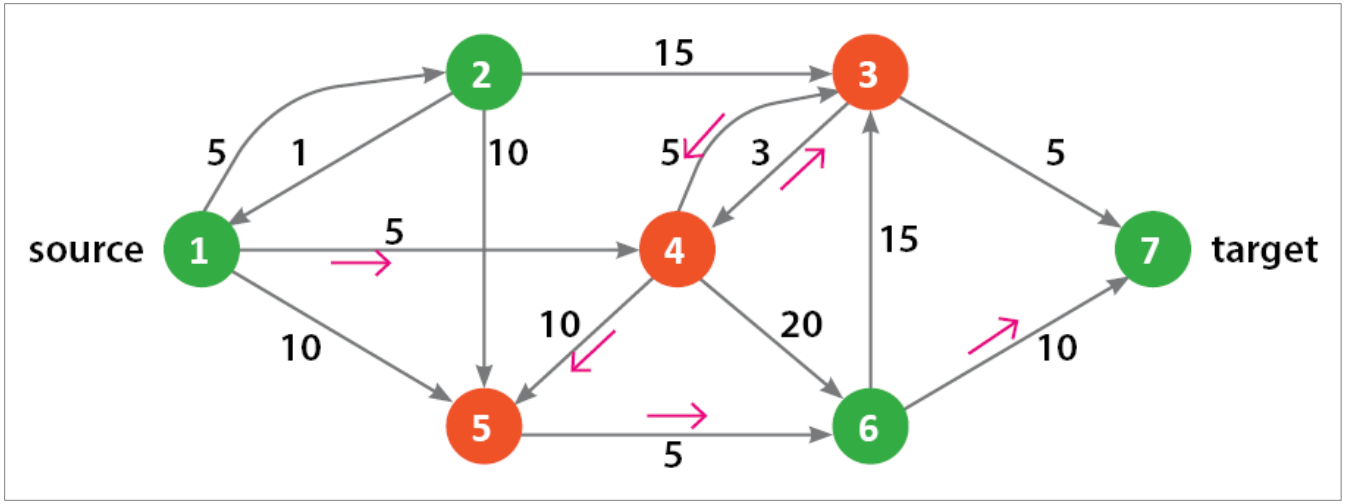


Sample Output

```
9
```

BFS with Bit Masking

Given a weighted, directed graph G (V, E), and a set X of vertices. Find the Minimum Cost Path passing through all the vertices of the set X, from a given source vertex S to a target vertex T. The size of X is K. Source and target nodes are not member of X.



Exercise 2: Minimum Cost Path with K Different Edges

Given a weighted, directed graph G(V, E), find the minimum cost path from a given source to a target node with exactly k different edges on the path.