3307. Find the Maximum Sum of Node Values

Difficulty : Hard

https://leetcode.com/problems/find-the-maximum-sum-of-node-values

There exists an **undirected** tree with n nodes numbered 0 to n - 1. You are given a **0-indexed** 2D integer array edges of length n - 1, where edges[i] = [u_i, v_i] indicates that there is an edge between nodes u_i and v_i in the tree. You are also given a **positive** integer k, and a **0-indexed** array of **non-negative** integers nums of length n, where nums[i] represents the **value** of the node numbered i.

Alice wants the sum of values of tree nodes to be **maximum**, for which Alice can perform the following operation **any** number of times (**including zero**) on the tree:

- Choose any edge [u, v] connecting the nodes u and v, and update their values as follows:
    - nums[u] = nums[u] XOR k
    - nums[v] = nums[v] XOR k

Return *the **maximum** possible **sum** of the **values** Alice can achieve by performing the operation **any** number of times*.

Example 1:
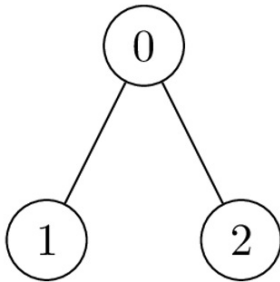
Input: nums = [1,2,1], k = 3, edges = [[0,1],[0,2]]
Output: 6
Explanation: Alice can achieve the maximum sum of 6 using a single operation:
- Choose the edge [0,2]. nums[0] and nums[2] become: 1 XOR 3 = 2, and the array nums becomes: [1,2,1] -> [2,2,2].
The total sum of values is 2 + 2 + 2 = 6.
It can be shown that 6 is the maximum achievable sum of values.
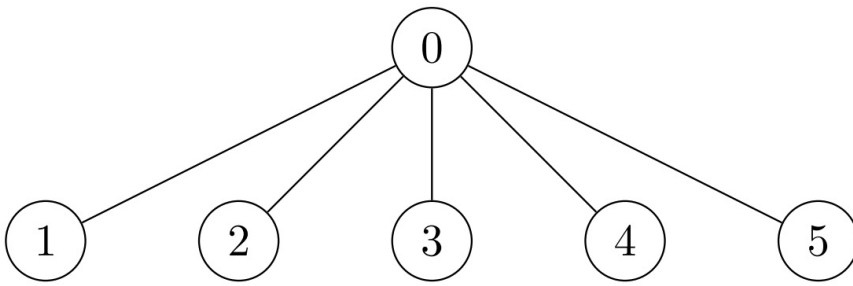
Example 2:

Input: nums = [2,3], k = 7, edges = [[0,1]]
Output: 9
Explanation: Alice can achieve the maximum sum of 9 using a single operation:
- Choose the edge [0,1]. nums[0] becomes: 2 XOR 7 = 5 and nums[1] become: 3 XOR 7 = 4, and the array nums becomes: [2,3] -> [5,4].
The total sum of values is 5 + 4 = 9.
It can be shown that 9 is the maximum achievable sum of values.

Example 3:

Input: nums = [7,7,7,7,7,7], k = 3, edges = [[0,1],[0,2],[0,3],[0,4],[0,5]]
Output: 42
Explanation: The maximum achievable sum is 42 which can be achieved by Alice performing no operations.

Constraints:

- $2 <= n == nums.length <= 2 * 10^4$
- $1 <= k <= 10^9$
- $0 <= nums[i] <= 10^9$
- edges.length == n - 1
- edges[i].length == 2
- $0 <= edges[i][0], edges[i][1] <= n - 1$
- The input is generated such that edges represent a valid tree.