23. You are given a string s. s[i] is either a lowercase English letter or '?'. For a string t having length m containing only lowercase English letters, we define the function cost(i) for an index i as the number of characters equal to t[i] that appeared before it, i.e. in the range [0, i - 1]. The value of t is the sum of cost(i) for all indices i. For example, for the string t = "aab":

cost(0) = 0

cost(1) = 1

cost(2) = 0

Hence, the value of "aab" is 0 + 1 + 0 = 1. Your task is to replace all occurrences of '?' in s with any lowercase English letter so at the value of s is minimized.

```
def minimize_string_value(s):
    n = len(s)
    result = []
    last_seen = {}
    for i in range(n):
        if s[i] != '?':
            result.append(s[i])
            if s[i] in last_seen:
                last_seen[s[i]] += 1
            else:
                last_seen[s[i]] = 1
        else:
            min_char = None
            min_count = float('inf')
            for char in 'abcdefghijklmnopqrstuvwxyz':
                if char not in last_seen:
                    min_char = char
                    min_count = 0
                    break
                elif last_seen[char] < min_count:
                    min_char = char
                    min_count = last_seen[char]
            result.append(min_char)
            if min_char in last_seen:
                last_seen[min_char] += 1
```

```python
        else:
            last_seen[min_char] = 1
    return ''.join(result)
s = "a?b??a"
print(minimize_string_value(s))
```

INPUT: a?b??

TIME COMPLEXITY:O(n)

OUTPUT:

abbcda
PS C:\Users\surya> & C:/Users/surya/AppData/Local/Programs/Python/Python312/python.exe c:/Users/surya/Untitled-1.py
abbcda
PS C:\Users\surya> & C:/Users/surya/AppData/Local/Programs/Python/Python312/python.exe c:/Users/surya/Untitled-1.py
abbcda
PS C:\Users\surya> & C:/Users/surya/AppData/Local/Programs/Python/Python312/python.exe c:/Users/surya/Untitled-1.py
abbcda
PS C:\Users\surya> & C:/Users/surya/AppData/Local/Programs/Python/Python312/python.exe c:/Users/surya/Untitled-1.py
abbcda
PS C:\Users\surya> & C:/Users/surya/AppData/Local/Programs/Python/Python312/python.exe c:/Users/surya/Untitled-1.py
abbcda