Q).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.

Program:

```python
def minimizeCost(s):
    from collections import defaultdict
    n = len(s)
    char_count = defaultdict(int)
    result = []
    total_cost = 0
    for i in range(n):
        if s[i] == '?':
            min_char = min(char_count, key=lambda c: char_count[c], default='a')
            result.append(min_char)
```

```python
            char_count[min_char] += 1
        else:
            result.append(s[i])
            char_count[s[i]] += 1
        total_cost += char_count[result[-1]] - 1
    return ''.join(result), total_cost
s = "a?b?c"
result, cost = minimizeCost(s)
print(f"Modified string: {result},Cost:{cost}")
```

Output:

```
C:\Users\srika\Desktop\CSA0863\pythonProject\.venv\Scripts\python.exe C:\Users\srika\Desktop\CSA0863\pythonProject\problem.py
Modified string: aabbc,Cost:2

Process finished with exit code 0
```

Time complexity:O(n)