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ICS 2105 – Data Structures and Algorithms

Quiz One

Question One (1) - Remove Duplicates from Sorted Array

Here is a step-by-step solution:

1. Initialize a variable `i` to 0. This variable will be used to keep track of the position of the last non-duplicate element in the array.

2. Iterate over the array starting from the second element (index 1). For each element, check if it is equal to the element at index `i`. If it is not, increment `i` and replace the element at index `i` with the current element.

3. The new length of the array is `i + 1`.

Here is a Python solution:

```python
def removeDuplicates(nums):
    if not nums:
        return 0

    i = 0
    for j in range(1, len(nums)):
        if nums[j] != nums[i]:
            i += 1
            nums[i] = nums[j]

    return i + 1
```

Question Two (2) - Rotate Array

Here is a step-by-step solution:

1. Normalize `k` by taking its modulus with the length of the array. This is because rotating the array by its length or multiples of its length results in the same array.

2. Reverse the entire array.

3. Reverse the first `k` elements.

4. Reverse the remaining elements.

Here is a Python solution:

```python
def rotate(nums, k):
    k %= len(nums)
    nums.reverse()
    nums[:k] = reversed(nums[:k])
    nums[k:] = reversed(nums[k:])
```

Question Three (3) - Contains Duplicate

Here is a step-by-step solution:

1. Initialize an empty set.

2. Iterate over the array. For each element, check if it is in the set. If it is, return `True`. Otherwise, add it to the set.

3. If the loop completes without finding a duplicate, return `False`.

Here is a Python solution:

```python
def containsDuplicate(nums):
    seen = set()
    for num in nums:
        if num in seen:
            return True
        seen.add(num)
    return False
```

Question Four (4) - Single Number

Here is a step-by-step solution:

1. Initialize a variable `single` to 0.

2. Iterate over the array. For each element, perform a bitwise XOR operation with `single` and assign the result back to `single`.

3. After the loop, `single` will be the element that appears only once in the array.

Here is a Python solution:

```python
def singleNumber(nums):
    single = 0
    for num in nums:
        single ^= num
    return single
```