***REHEMA HOPE MUMBI***

***SCT212-0144/2022***

***ICS 2105***

***DATA STRUCTURES AND ALGORITHMS***

***QUIZ 1***

**Question One (1) Remove Duplicates from Sorted Array**

*Given a sorted array nums, remove the duplicates in-place such that each element appears only once and returns the new length.*

*Do not allocate extra space for another array, you must do this by modifying the input array in-place with O(1) extra memory.*

def remove\_duplicates(nums):

if not nums:

return 0

# Initialize pointers

i = 1 # Pointer for iteration

j = 1 # Pointer for updating unique elements

# Iterate through the array

while i < len(nums):

# If current element is different from previous one

if nums[i] != nums[i - 1]:

# Update the array with the unique element

nums[j] = nums[i]

# Move the updating pointer forward

j += 1

# Move the iteration pointer forward

i += 1

return j # Length of the array with unique elements

# Example usage:

nums = [1, 1, 2, 2, 3, 4, 4, 4, 5]

new\_length = remove\_duplicates(nums)

print(new\_length) # Output: 5

print(nums[:new\_length]) # Output: [1, 2, 3, 4, 5]

**Question Two (2) - Rotate Array**

*Given an array, rotate the array to the right by k steps, where k is non-negative.*

def rotate\_array(nums, k):

# Handle cases where k is greater than the length of the array

k %= len(nums)

# Reverse the entire array

nums.reverse()

# Reverse the first k elements

nums[:k] = reversed(nums[:k])

# Reverse the remaining elements

nums[k:] = reversed(nums[k:])

# Example usage:

nums = [1, 2, 3, 4, 5, 6, 7]

k = 3

rotate\_array(nums, k)

print(nums) # Output: [5, 6, 7, 1, 2, 3, 4]

**Question Three (3) - Contains Duplicate**

*Given an array of integers, find if the array contains any duplicates.*

*Your function should return true if any value appears at least twice in the array, and it should return false if every element is distinct.*

def contains\_duplicate(nums):

seen = set()

for num in nums:

if num in seen:

return True

seen.add(num)

return False

# Example usage:

nums\_with\_duplicates = [1, 2, 3, 4, 5, 1]

nums\_without\_duplicates = [1, 2, 3, 4, 5]

print(contains\_duplicate(nums\_with\_duplicates)) # Output: True

print(contains\_duplicate(nums\_without\_duplicates)) # Output: False

**Question Four (4) - Single Number**

*Given a non-empty array of integers nums, every element appears twice except for one. Find that single one.*

def single\_number(nums):

result = 0

for num in nums:

result ^= num

return result

# Example usage:

nums = [2, 1, 4, 4, 5, 3, 2, 1, 3]

print(single\_number(nums)) # Output: 5