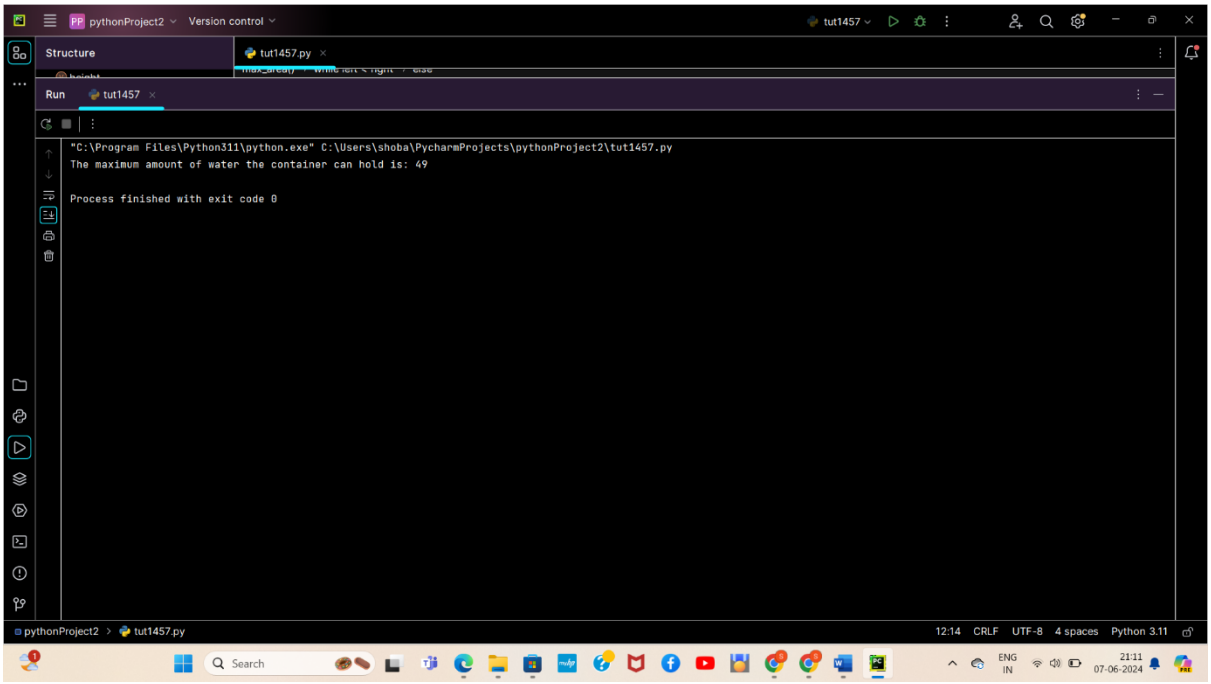
Assignment 2

1. Container With Most Water.

Program:

```
def max_area(height):
    left = 0
    right = len(height) - 1
    max_water = 0
    while left < right:
        width = right - left
        min_height = min(height[left], height[right])
        current_water = width * min_height
        max_water = max(max_water, current_water)
        if height[left] < height[right]:
            left += 1
        else:
            right -= 1
    return max_water
height = [1,8,6,2,5,4,8,3,7]
print("The maximum amount of water the container can hold is:",
max_area(height))
```

Output:

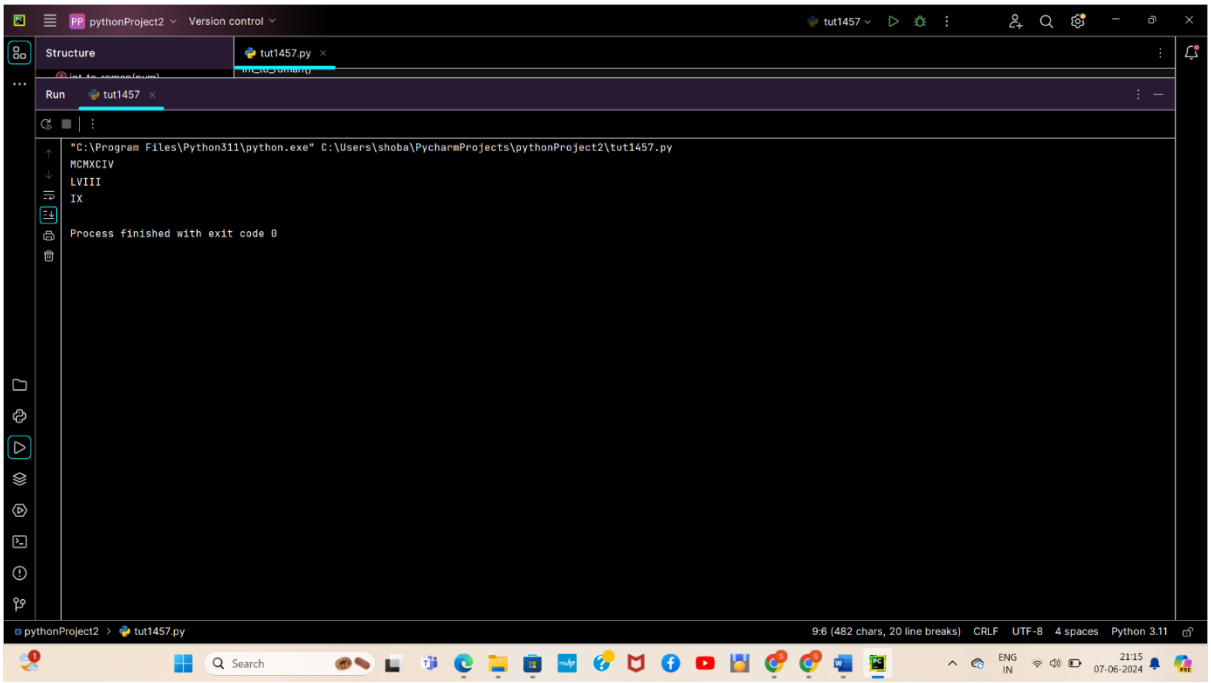


2. Integer to Roman.

Program:

```
def int_to_roman(num):
    val = [
        1000, 900, 500, 400, 100, 90, 50, 40,
        10, 9, 5, 4, 1
    ]
    syms = [
        "M", "CM", "D", "CD", "C", "XC", "L",
        "XL", "X", "IX", "V", "IV", "I"
    ]
    roman_numeral = ""
    i = 0
    while num > 0:
        for _ in range(num // val[i]):
            roman_numeral += syms[i]
            num -= val[i]
        i += 1
    return roman_numeral
print(int_to_roman(1994))
print(int_to_roman(58))
print(int_to_roman(9))
```

Output:



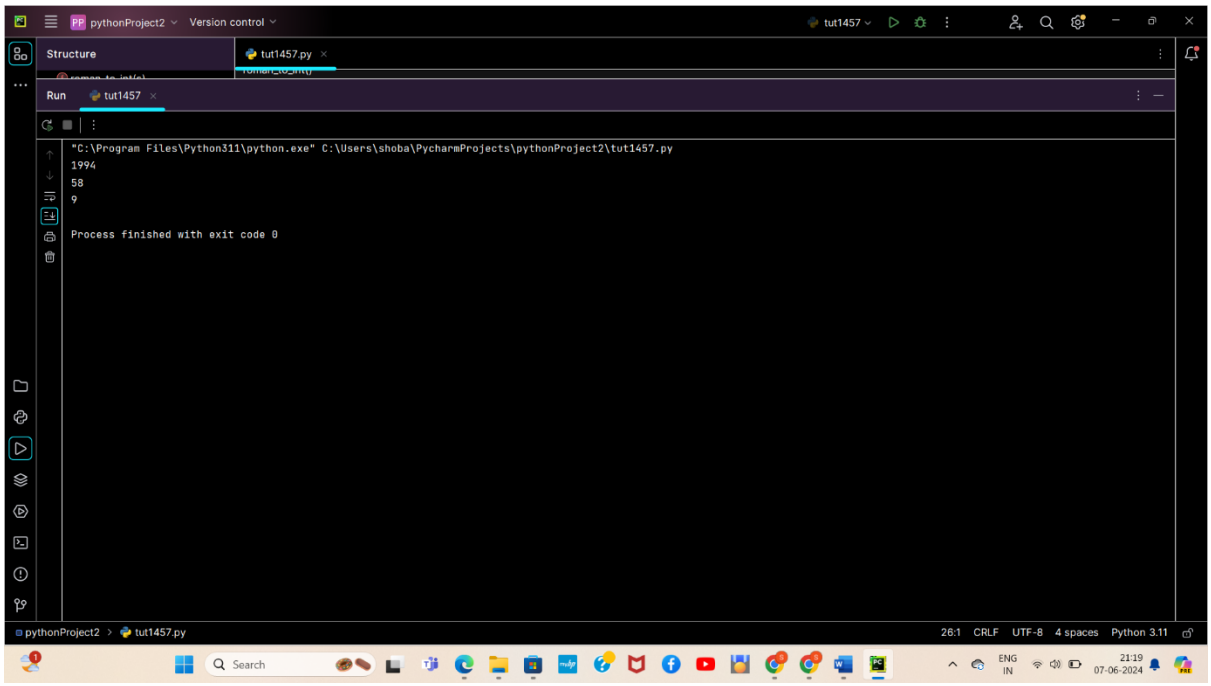
3. Roman to Integer.

Program:

```
def roman_to_int(s):
    roman_values = {
        'I': 1,
```

```
        'V': 5,
        'X': 10,
        'L': 50,
        'C': 100,
        'D': 500,
        'M': 1000
    }

    total = 0
    prev_value = 0

    for char in reversed(s):
        current_value = roman_values[char]

        if current_value < prev_value:
            total -= current_value
        else:
            total += current_value

        prev_value = current_value

    return total
print(roman_to_int("MCMXCIV"))
print(roman_to_int("LVIII"))
print(roman_to_int("IX"))
```

Output:



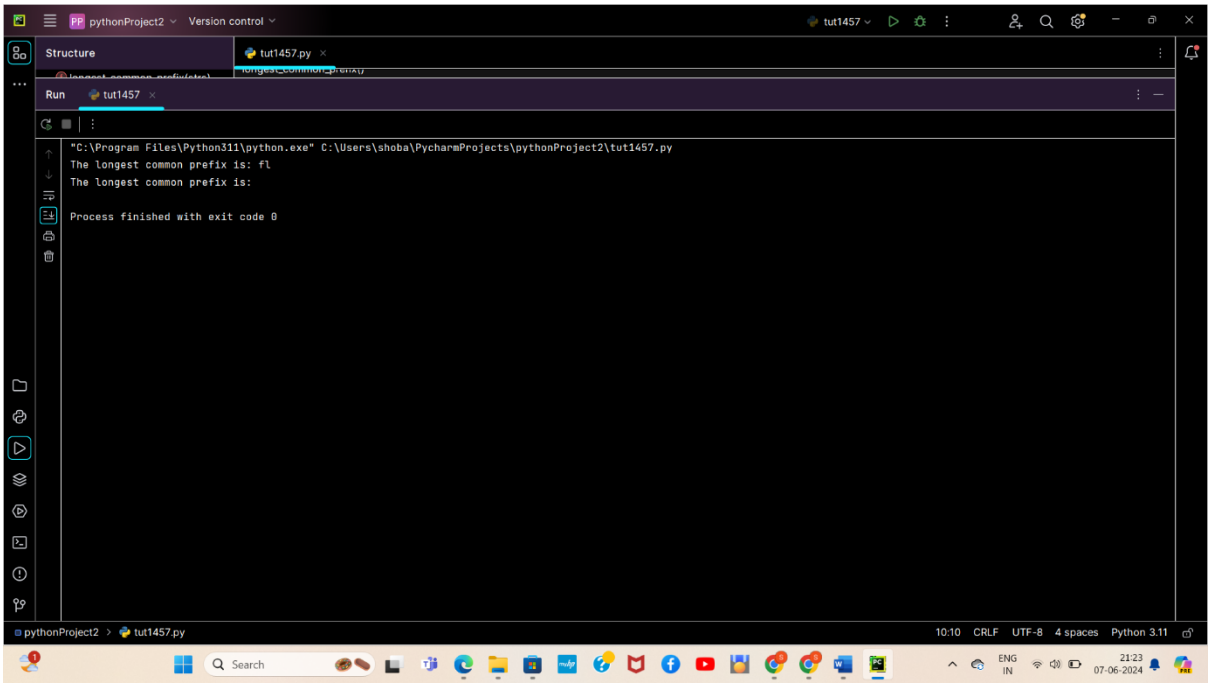
4. Longest Common Prefix

Program:

```
def longest_common_prefix(strs):
    if not strs:
```

```python
        return ""

    strs.sort()

    first = strs[0]
    last = strs[-1]

    i = 0
    while i < len(first) and i < len(last) and first[i] == last[i]:
        i += 1

    return first[:i]


strs = ["flower", "flow", "flight"]
print("The longest common prefix is:", longest_common_prefix(strs))

strs = ["dog", "racecar", "car"]
print("The longest common prefix is:", longest_common_prefix(strs))
```

Output :

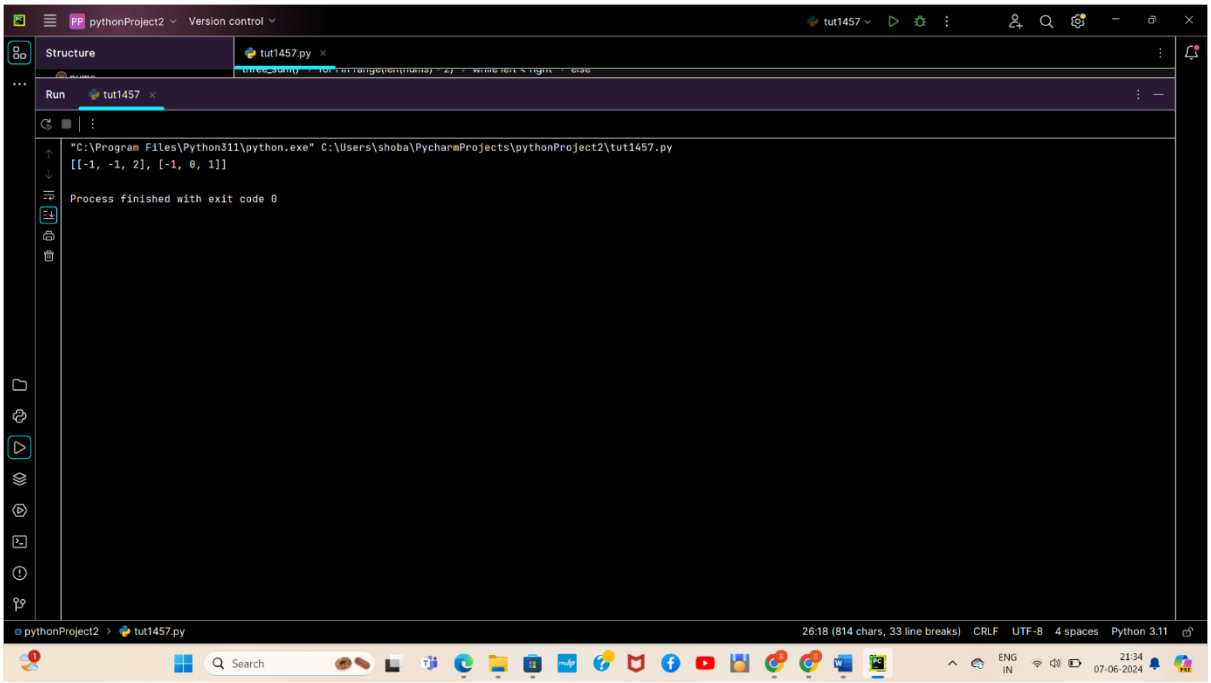


5. 3Sum

Program:

```
def three_sum(nums):
    nums.sort()
    res = []

    for i in range(len(nums) - 2):
        if i > 0 and nums[i] == nums[i - 1]:
            continue

        left, right = i + 1, len(nums) - 1
        while left < right:
            current_sum = nums[i] + nums[left] + nums[right]

            if current_sum == 0:
                res.append([nums[i], nums[left], nums[right]])

                while left < right and nums[left] == nums[left + 1]:
                    left += 1
                while left < right and nums[right] == nums[right - 1]:
                    right -= 1

                left += 1
                right -= 1

            elif current_sum < 0:
                left += 1
            else:
                right -= 1

    return res


nums = [-1, 0, 1, 2, -1, -4]
print(three_sum(nums))
```

Output:

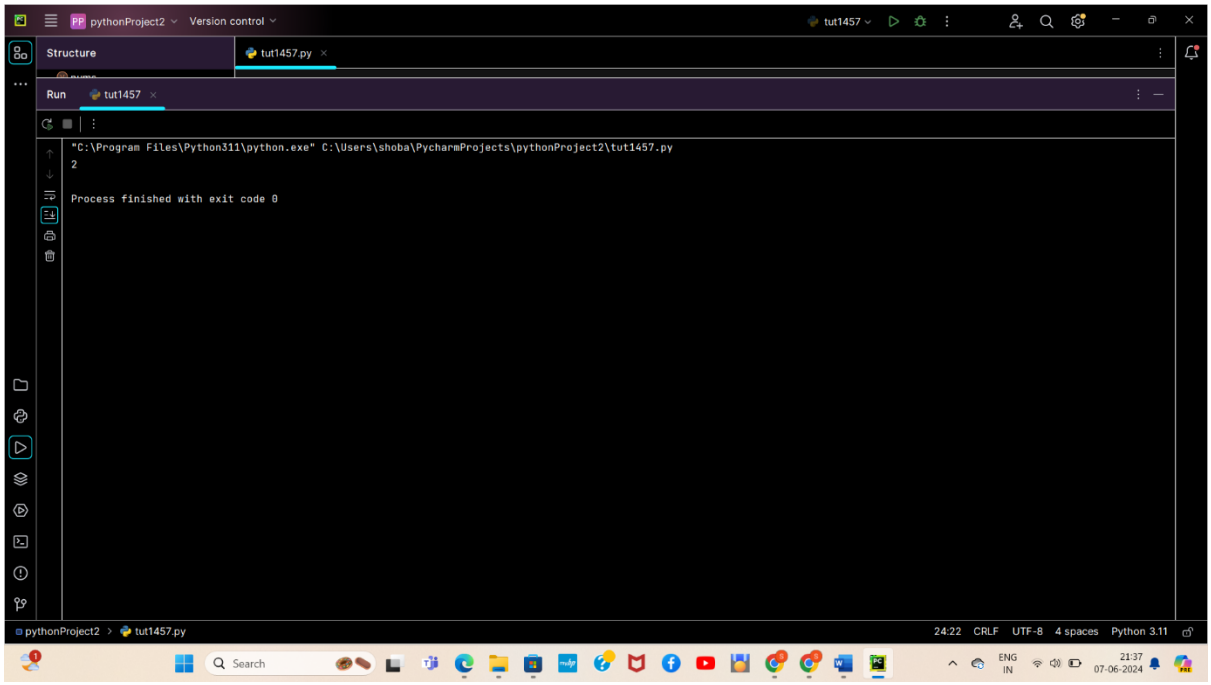


6. 3 Sum Closet

Program:

```
def three_sum_closest(nums, target):
    nums.sort()
    closest_sum = float('inf')

    for i in range(len(nums) - 2):
        left, right = i + 1, len(nums) - 1
        while left < right:
            current_sum = nums[i] + nums[left] + nums[right]

            if abs(current_sum - target) < abs(closest_sum - target):
                closest_sum = current_sum

            if current_sum == target:
                return current_sum
            elif current_sum < target:
                left += 1
            else:
                right -= 1

    return closest_sum



nums = [-1, 2, 1, -4]
target = 1
print(three_sum_closest(nums, target))  # Output: 2
```

Output:



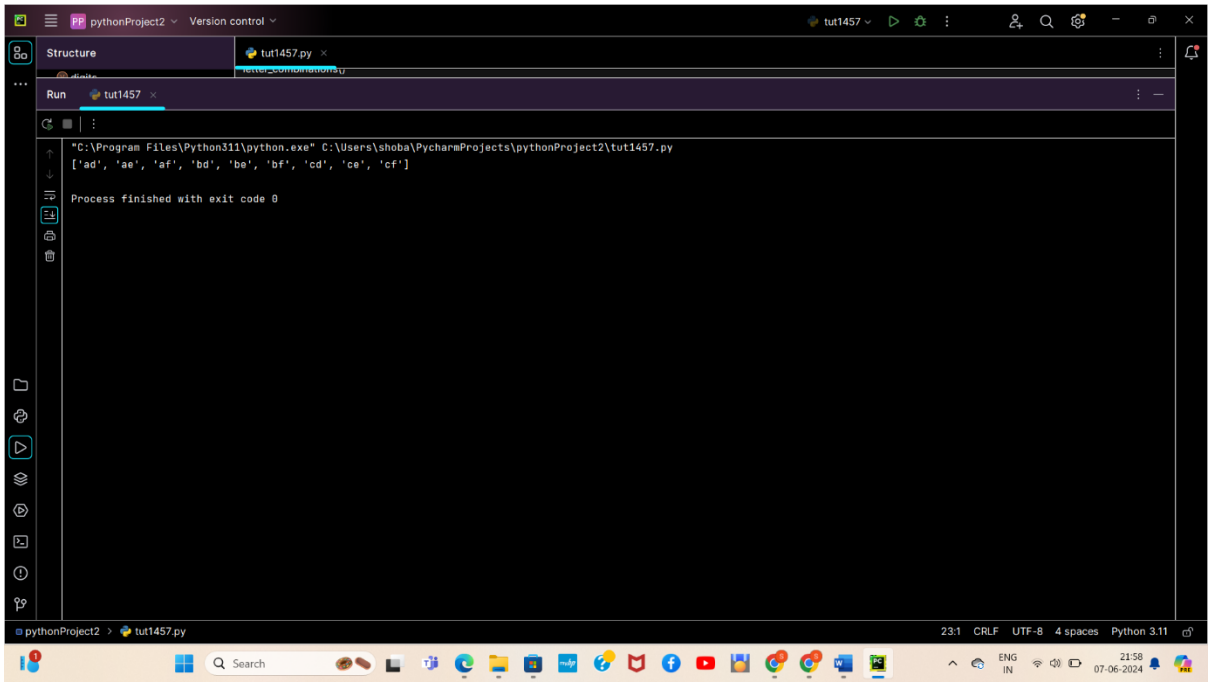
7. Letter Combination of a phone Number.

Program:

```
def letter_combinations(digits):
    if not digits:
        return []

    phone_map = {
        '2': 'abc', '3': 'def', '4': 'ghi', '5': 'jkl',
        '6': 'mno', '7': 'pqrs', '8': 'tuv', '9': 'wxyz'
    }

    res = []

    def backtrack(index, path):
        if index == len(digits):
            res.append(''.join(path))
            return

        possible_letters = phone_map[digits[index]]

        for letter in possible_letters:
            path.append(letter)
            backtrack(index + 1, path)
            path.pop()

    backtrack(0, [])
```

```
    return res

digits = "23"
print(letter_combinations(digits))
```

Output:



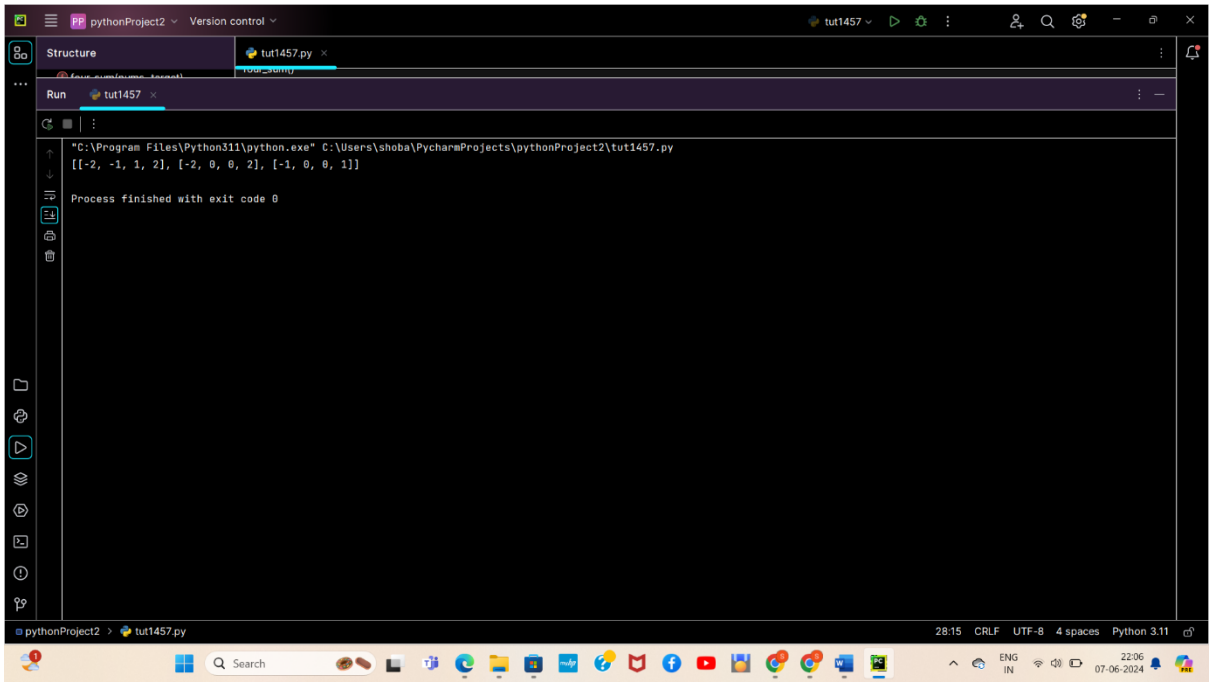
8. Four Sum

Program:

```
def four_sum(nums, target):
    nums.sort()
    res = []
    length = len(nums)

    for i in range(length - 3):
        if i > 0 and nums[i] == nums[i - 1]:
            continue
        for j in range(i + 1, length - 2):
            if j > i + 1 and nums[j] == nums[j - 1]:
                continue
            left, right = j + 1, length - 1
            while left < right:
                current_sum = nums[i] + nums[j] + nums[left] + nums[right]
                if current_sum == target:
                    res.append([nums[i], nums[j], nums[left], nums[right]])
                    while left < right and nums[left] == nums[left + 1]:
                        left += 1
                    while left < right and nums[right] == nums[right - 1]:
                        right -= 1
                    left += 1
```

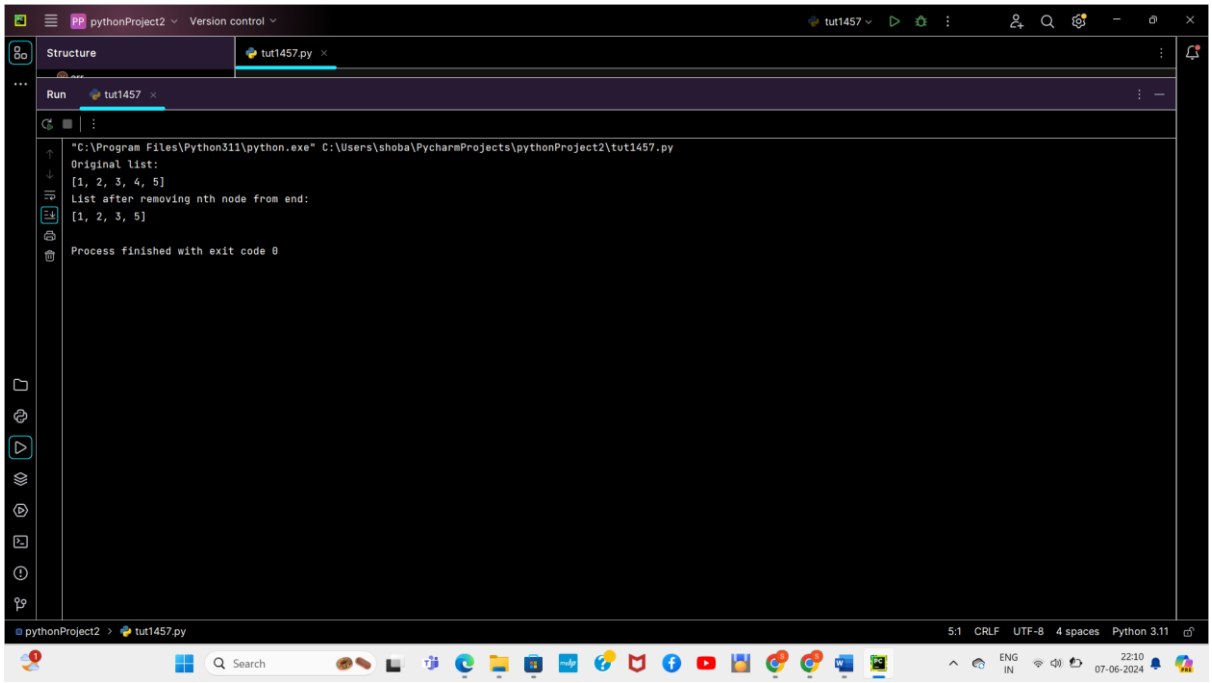
```
                    right -= 1
                elif current_sum < target:
                    left += 1
                else:
                    right -= 1

    return res

nums = [1, 0, -1, 0, -2, 2]
target = 0
print(four_sum(nums, target))
```

Output:

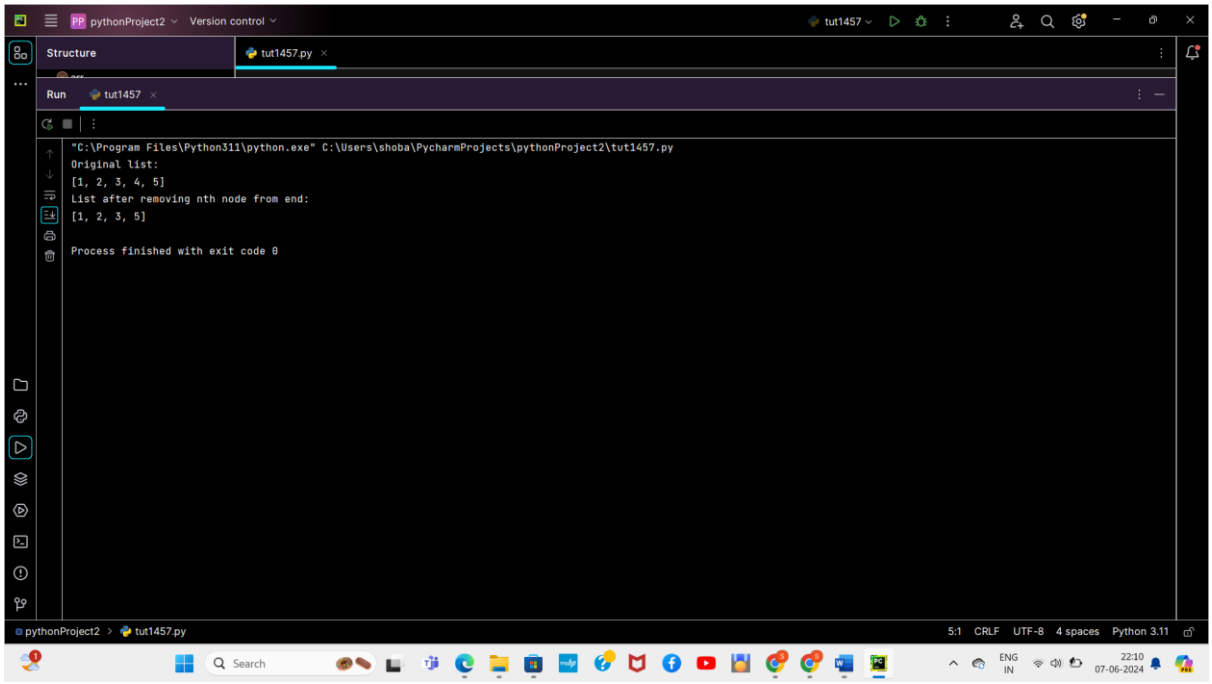


9. Remove Nth Node From End of List.

Program:



Output:



10. Valid Parentheses.

Program:

```python
def is_valid(s):
    matching_bracket = {')': '(', '}': '{', ']': '['}
    stack = []

    for char in s:
        if char in matching_bracket:
            top_element = stack.pop() if stack else '#'
            if matching_bracket[char] != top_element:
                return False
        else:
            stack.append(char)

    return not stack

print(is_valid("()"))
print(is_valid("()[]{}"))
print(is_valid("(]"))
print(is_valid("([)]"))
print(is_valid("{[]}"))
```

Output: