COMP 352: Principles of Programming Languages

Assignment 1 on Logical Programming

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Question 1:

a) $O(n)$
b) $O(n)$

```
algorithm Method
     input: String S of n characters
     Output: String with each character and its number of repetitions

     result ← ""

     S += '\0'

     A ← S as character array
     current ← A[0]
     count ← 1

     for i ← 1 to n - 1 do
          if A[i] = current then
               count++
               continue
          num ← count > 1 ? count : "";
          result += current + num
          current ← A[i];
          count ← 1
     return result
```

Question 2:

```
algorithm Method
     input: Array A of n Integers
     Output: Void

     smallestDiff ← 2147483647 // Stores the smallest difference
encountered yet
     largestDiff ← -1


     firstSmallestIndex ← null
     secondSmallestIndex ← null

     firstLargestIndex ← null
     secondLargestIndex ← null

     for i ← 0 to n - 1 do
          if |A[i] - A[i + 1]| < smallestDiff then
               smallestDiff ← |A[i] - A[i + 1]|
               firstSmallestIndex ← i
               secondSmallestIndex ← i + 1

          if abs(A[i] - A[i + 1]) > largestDiff then
               largestDiff ← |A[i] - A[i + 1]|
               firstLargestIndex ← i
               secondLargestIndex ← i + 1

     print "The two conductive indices with smallest difference
     between their values are: index $(firstSmallestIndex) and index
     $(secondSmallestIndex), storing values $(A[firstSmallestIndex])
     and $(A[secondSmallestIndex])."

     print "The two conductive indices with largest difference
     between their values are: index $(firstLargestIndex) and index
     $(secondLargestIndex), storing values $(A[firstLargestIndex])
     and $(A[secondLargestIndex])."
```

ii) Iterate through the array and compare the consecutive numbers

iii) $O(n)$. Because we have 1 loop of n iterations

iv) $O(1)$. Because there's no recursion meaning that the function is called only once

Question 3:

a) False, $O(n^9)$
b) True
c) False
d) True
e) False
f) False