PRAKTIKUM ALGORITMA DAN STRUKTUR DATA

MODUL 5

PENGURUTAN

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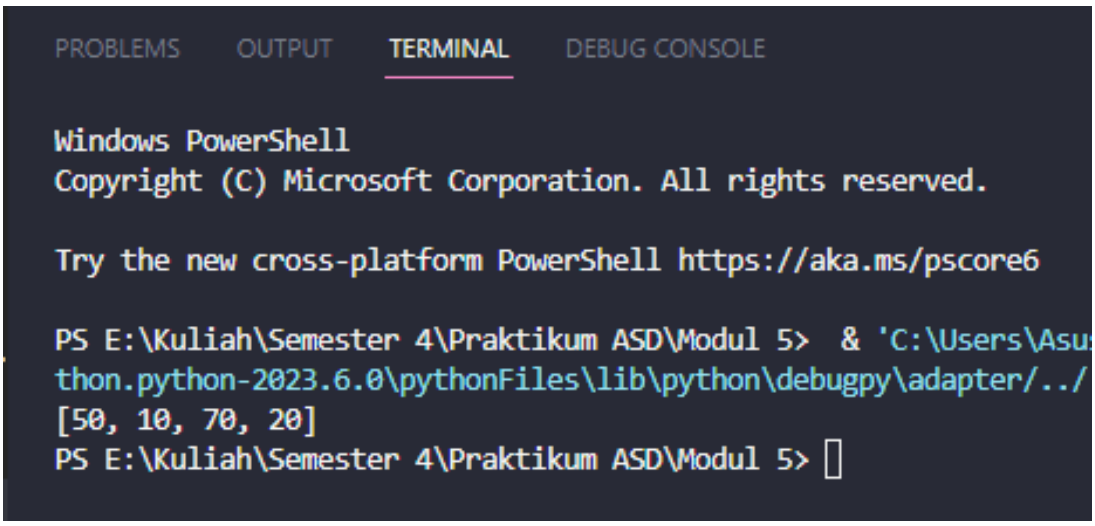
2023

I. Latihan

1) Routine swap untuk menukar A[p] dan A[q]

```python
def swap(A,p,q):
    tmp = A[p]
    A[p] = A[q]
    A[q] = tmp

k = [50,20,70,10]
swap(k,1,3)
print(k)
```



2) Routine untuk mencari index dari elemen yang terkecil

```python
def cariPosisiYangTerkecil(A, dariSini, sampaiSini):
    posisiYangTerkecil = dariSini
    for i in range (dariSini+1, sampaiSini):
        if A[i] < A[posisiYangTerkecil]:
            posisiYangTerkecil = i
        return posisiYangTerkecil

A = [18, 13, 44, 25, 66, 107, 78, 89]
j = cariPosisiYangTerkecil(A, 2, len(A))
print(j)
```

```
PROBLEMS  OUTPUT  TERMINAL  DEBUG CONSOLE

Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>  & 'C:\Users\Asus\A
thon.python-2023.6.0\pythonFiles\lib\python\debugpy\adapter/../..\
3
PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>
```

3) BubbleSort

```python
def swap(A,p,q):
    tmp = A[p]
    A[p] = A[q]
    A[q] = tmp

def bubbleSort(A):
    n = len(A)
    for i in range (n-1):
        for j in range (n-i-1):
            if A[j] > A[j+1]:
                swap(A, j, j+1)
```

4) SelectionSort

```python
def swap(A,p,q):
    tmp = A[p]
    A[p] = A[q]
    A[q] = tmp

def cariPosisiYangTerkecil(A, dariSini, sampaiSini):
    posisiYangTerkecil = dariSini
    for i in range (dariSini+1, sampaiSini):
        if A[i] < A[posisiYangTerkecil]:
            posisiYangTerkecil = i
        return posisiYangTerkecil

def selectionSort(A):
    n = len(A)
    for i in range(n-1):
        indexKecil = cariPosisiYangTerkecil(A, i, n)
        if indexKecil != i :
            swap(A, i, indexKecil)
```

5) InsertionSort

```python
def insertionSort(A):
    n = len(A)
    for i in range (1,n):
        nilai = A[i]
        pos = i
        while pos > 0 and nilai < A[pos - 1]:
            A[pos] = i
            pos = pos - 1
        A[pos] = nilai
```

II. Soal-soal

1) Buatlah suatu program untuk mengurutkan array mahasiswa berdasarkan NIM, yang elemennya terbuat dari class MhsTIF, yang telah kamu buat sebelumnya.

```python
class mhsTIF ():
    def __init__(self,x,y,z,v):
        self.nama = x
        self.nim = y
        self.kotaTinggal = z
        self.UangSaku = v

c0 = mhsTIF('Ika',102,'Sukoharjo',240000)
c1 = mhsTIF('Budi',104,'Sragen',230000)
c2 = mhsTIF('Ahmad',101,'Surakarta',250000)
c3 = mhsTIF('Chandra',107,'Surakarta',235000)
c4 = mhsTIF('Eka',105,'Boyolali',240000)
c5 = mhsTIF('Fandi',109,'Salatiga',250000)
c6 = mhsTIF('Deni',106,'Klaten',245000)
c7 = mhsTIF('Galuh',108,'Wonogiri',245000)
c8 = mhsTIF('Janto',103,'Klaten',245000)
c9 = mhsTIF('Hasan',120,'Karanganyar',270000)
c10 = mhsTIF('Khalid',114,'Purwodadi',265000)

daftar = [c0, c1, c2, c3, c4, c5, c6, c7, c8, c9, c10]

def swap(a,p,q):
    tmp = a[p]
    a[p]=a[q]
    a[q]=tmp

def bubbleSort(a):
    blank_list = []
    for i in a:
        blank_list.append(i.nim)
    print("Sebelum pengurutan : ",blank_list)

    n = len(blank_list)
    for i in range(n):
        for j in range(n-i-1):
            if blank_list[j] > blank_list[j+1]:
                swap(blank_list,j,j+1)
    return blank_list


print("Setelah pengurutan : ",bubbleSort(daftar))
```

```
PROBLEMS  OUTPUT  TERMINAL  DEBUG CONSOLE

Windows PowerShell
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PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>  & 'C:\Users\Asus\AppData\Local\Microsoft\Win
thon.python-2023.6.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '54394'
Sebelum pengurutan :  [102, 104, 101, 107, 105, 109, 106, 108, 103, 120, 114]
Setelah pengurutan :  [101, 102, 103, 104, 105, 106, 107, 108, 109, 114, 120]
PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>
```

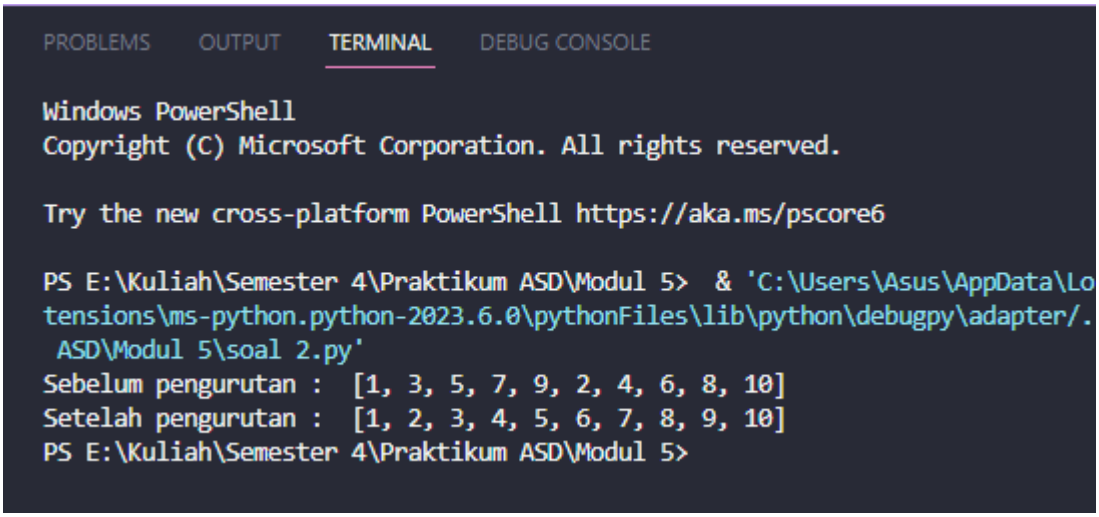
2) Misal terdapat dua buah array yang sudah urut A dan B. Buatlah suatu program untuk menggabungkan, secara efisien, kedua array itu menjadi suatu array C yang urut.

```python
a = [1,3,5,7,9]
b = [2,4,6,8,10]

def insertionSort(x,y):
    blank_list = []
    x.extend(y)
    for i in x:
        blank_list.append(i)
    print("Sebelum pengurutan : ",blank_list)

    n = len(blank_list)
    for i in range (1,n):
        nilai = blank_list[i]
        pos = i
        while pos > 0 and nilai < blank_list[pos-1]:
            blank_list[pos] = blank_list[pos-1]
            pos = pos-1
        blank_list[pos] = nilai
    return blank_list


print("Setelah pengurutan : ",insertionSort(a,b))
```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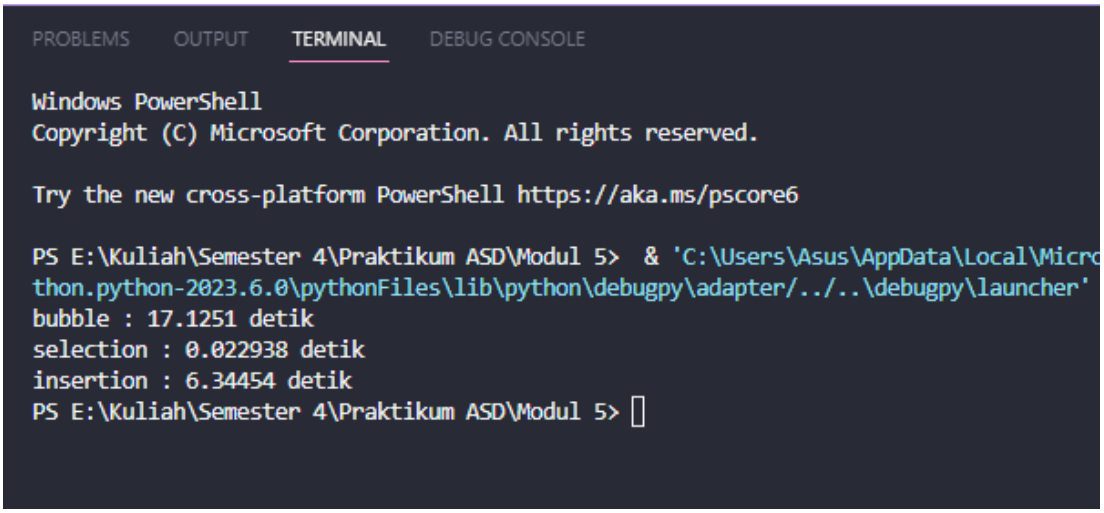
PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5> & 'C:\Users\Asus\AppData\Lo
tensions\ms-python.python-2023.6.0\pythonFiles\lib\python\debugpy\adapter/.
ASD\Modul 5\soal 2.py'
Sebelum pengurutan : [1, 3, 5, 7, 9, 2, 4, 6, 8, 10]
Setelah pengurutan : [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>

3) Kamu mungkin sudah menduga, bubble sort lebih lambat dari selection sort dan juga insertion sort. Tapi manakah yang lebih cepat antara selection sort dan insertion sort?7 Untuk memulai menyelidikinya, kamu bisa membandingkan waktu yang diperlukan untuk mengurutkan sebuah array yang besar, misal sepanjang 6000 (enam ribu) elemen.

```python
from time import time as detak
from random import shuffle as kocok

def swap(A,p,q):
    tmp = A[p]
    A[p] = A[q]
    A[q] = tmp

def cariPosisiYangTerkecil(A, dariSini, sampaiSini):
    posisiYangTerkecil = dariSini
    for i in range (dariSini+1, sampaiSini):
        if A[i] < A[posisiYangTerkecil]:
            posisiYangTerkecil = i
        return posisiYangTerkecil

def bubbleSort(A):
    def swap(A,p,q):
        tmp = A[p]
        A[p] = A[q]
        A[q] = tmp

    n = len(A)
    for i in range (n-1):
        for j in range (n-i-1):
            if A[j] > A[j+1]:
                swap(A, j, j+1)

def selectionSort(A):
    n = len(A)
    for i in range(n-1):
        indexKecil = cariPosisiYangTerkecil(A, i, n)
        if indexKecil != i :
            swap(A, i, indexKecil)

def insertionSort(A):
    n = len(A)
    for i in range (1,n):
        nilai = A[i]
        pos = i
        while pos > 0 and nilai < A[pos - 1]:
            A[pos] = i
            pos = pos - 1
        A[pos] = nilai


k = []
for i in range (1,6001):
    k.append(i)
kocok(k)

u_bub = k[:]
u_sel = k[:]
u_ins = k[:]

aw = detak(); bubbleSort(u_bub); ak = detak();print('bubble : %g detik' % (ak-aw));
aw = detak(); selectionSort(u_sel); ak = detak();print('selection : %g detik' % (ak-aw));
aw = detak(); insertionSort(u_ins); ak = detak();print('insertion : %g detik' % (ak-aw));
```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PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5> & 'C:\Users\Asus\AppData\Local\Micro
thon.python-2023.6.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher'
bubble : 17.1251 detik
selection : 0.022938 detik
insertion : 6.34454 detik
PS E:\Kuliah\Semester 4\Praktikum ASD\Modul 5>