LAB#23

Example#1: Write a program to sort an unsorted array by using shell sort algorithm:

Solution:

```python
shell_sort.py > ...
1    from array import array
2
3  def shell_sort(arr):
4        n = len(arr)
5        gap = n // 2
6
7        while gap > 0:
8            for i in range(gap, n):
9                temp = arr[i]
10               j = i
11               while j >= gap and arr[j - gap] > temp:
12                   arr[j] = arr[j - gap]
13                   j -= gap
14               arr[j] = temp
15           gap //= 2
16
17       return arr
18
19  a1 = array('i', [14, 12, 7, 3, 5])
20  sorted_a1 = shell_sort(a1)
21  for x in sorted_a1:
22      print(x, end=' ')
```

Result:

```
3 5 7 12 14
```

Explanation of the code:

From array import array

def shell_sort(arr):

    n=len(arr)

    n=5

    gap=5//2

    gap=2

    while gap>0:

        for i in range(gap,5):   #gap=2

```
a1 = array('i', [14, 12, 7, 3, 5])
```

            temp=arr[i]

            temp=arr[2]

            temp=7

            j=i

            j=2

            while j>=gap and a[j-gap]>temp:

                            `j>=2 and a[2-2]>temp`

                            `2>=2 and a[0]>7`

                            `2>=2 and 14>7`

                a[2]=a[0]

                a[2]=14

0	1	2	3	4
14	12	14	3	5

                j=j-gap

                j=2-2

                j=0

            while 0>=2 first condition false:

                X

            a[0]=temp

              a[0]=7

0	1	2	3	4
7	12	14	3	5

For i in range(3,5):

temp=arr[i]

temp=arr[3]

temp=3

j=i

j=3

while j>=gap and a[j-gap]>temp:

a[3]=a[1]

a[3]=12

0	1	2	3	4
7	12	14	12	5

j=j-gap

j=3-2

j=1

while1>=2   first condition is false

X

a[1]=temp

a[1]=3

0	1	2	3	4
7	3	14	12	5

For i in range(4,5):

    temp=arr[4]

    temp=arr[4]

    temp=5

    j=i

    j=4

    while j>=gap and a[j-gap]>temp:

0	1	2	3	4
7	3	14	12	5

j>=2 and a[4-2]>temp

4>=2 and a[2]>5

4>=2 and 14>5

        a[4]=a[2]

        a[4]=14

        j=j-gap

        j=4-2

        j=2

0	1	2	3	4
7	3	14	12	14

    while 2>=2   and a[2-2]>temp:

j>=2 and a[2-2]>temp

2>=2 and a[0]>5

2>=2 and 7>5

        a[2]=a[2-2]

        a[2]=a[0]

        a[2]=7

        j=j-gap

        j=2-2

        j=0

0	1	2	3	4
7	3	7	12	14

while 0>=2:

    X

a[0]=temp

a[0]=5

0	1	2	3	4
5	3	7	12	14

gap//2

gap=gap//2

gap=1

while(gap>0):

                          #gap=1

For i in range(1,5):

    temp=a[1]

    temp=3

    J=1

0	1	2	3	4
5	3	7	12	14

    While j>=gap and a[1-1]>temp:

        #a[0]>temp   where temp=3 and a[0]=5

    a[1]=a[1-1]

    a[1]=a[0]

    a[1]=5

    j=j-gap

    j=1-1

    j=0

0	1	2	3	4
3	5	7	12	14

    while j>=gap   # first condition false

        X

    a[0]=temp

For i in range(2,5):

temp=a[2]

temp=7

J=2

While 2>=1 and a[2-1]>temp: # 5>7

    X

a[j]=temp

a[2]=7

0	1	2	3	4
3	5	7	12	14

For i in range(3,5):

temp=a[3]

temp=12

J=3

While 3>=1 and a[3-1]>temp: # 7>12

    X

a[j]=temp

a[3]=12

0	1	2	3	4
3	5	7	12	14

For i in range(4,5):

temp=a[4]

temp=14

J=4

While 4>=1 and a[4-1]>temp: # 12>14

    X

a[j]=temp

a[4]=14

0	1	2	3	4
3	5	7	12	14

```
gap=gap//2

gap=1//2

gap=0


    while gap>0            #gap=0
        X
return arr                 #arr=[3,5,7,12,14]
```