#Aim: Write Python program for finding the second largest element in an array A of size n using Tournament Method. Discuss Time Complexity.

def second\_smallest\_in\_array(A):

comparisonCount = 0

#indexes that are to be compared

idx=range(0,len(A))

#list of knockout for all elements

knockout=[[] for i in idx]

#play tournaments,until we have only one node left

while len(idx)>1:

#index of nodes that win this tournament

idx1=[]

#nodes in idx odd,if yes then last automatically goes to next round

odd=len(idx)%2

#iterate over even indexes,as we do a paired tournament

for i in range(0,len(idx)- odd,2):

firstIndex=idx[i]

secondIndex=idx[i+1]

comparisonCount+= 1

# perform tournament

if A[firstIndex]<A[secondIndex]:

#firstIndex qualifies for next round

idx1.append(firstIndex)

#add A[secondIndex] to knockout list of firstIndex

knockout[firstIndex].append(A[secondIndex])

else:

idx1.append(secondIndex)

knockout[secondIndex].append(A[firstIndex])

if odd == 1:

idx1.append(idx[i+2])

#perform new tournament

idx = idx1

print("Smallest element=",A[idx[0]])

print("Total comparasion",comparisonCount)

print("Nodes knocked off by the smallest=",knockout[idx[0]],"\n")

#compute second smallest

a=knockout[idx[0]]

if len(a)>0:

v=a[0]

for i in range(1,len(a)):

comparisonCount+=1

if v > a[i]:

v=a[i]

print("Second smallest element=",v)

print("Total comparision=",comparisonCount)

n=int(input("Input how many elements in array??: "))

A=[]

print("Enter numbers in array: ")

for i in range(n):

m=input()

A.append(m)

print("array is: ",A)

print(second\_smallest\_in\_array(A))