Assignment #1

Date

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X

Answer 1

Brute Force Algorithm:-

```
int main() {
int CurrSum
    int arr[] = {1,2,-1,2,-4,6,-1,12,-10,1,2,-1};
    int CurrSum = arr[0];
    int maxSum = CurrSum;

for(int i=0; i<12 ; i++)  ——— O(n)
{
    CurrSum = arr[i];
    if( CurrSum > maxSum )
        maxSum = CurrSum;
for (int j=i+1; j<12 ; j++ )  —— O((n+1)n)
    {
        CurrSum += arr[j];
        if( CurrSum > maxSum )
            maxSum = CurrSum;
    }
}
}
```

Time Complexity
$O(n^2)$

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Algorithm in O(n) :-

```
int main()
{
    int arr[] = {1, 2, -1, 2, -4, 6, -1, 12, -10, 1, 2, -1};
    int CurrSum = 0;
    int MaxSum = 0;

    for(i=0; i<12; i++)        — T(O(n))
    {
        ~~CurrSum =~~
        if (CurrSum + arr[i] > arr[i])
            CurrSum = CurrSum + arr[i];
        else if (CurrSum + arr[i] < arr[i])
            CurrSum = arr[i];
        else if (CurrSum + arr[i] < 0)
            CurrSum = 0;

        if (CurrSum < ~~Global~~ MaxSum)
            MaxSum = CurrSum;
    }

}
```

Time Complexity is O(n)

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Writing Code for O(1):

Answer2

2.a)

```
A = [3,1,2,4]
B = [5,1,6,2]
X = 10

b = 0
A.Sort() // using divide and Conquer
         Sorting technique (nlogn)

while (b< len(b)
{
   temp = X - B[i]
    a = binary_search(A, temp, len(A))
    if a != -1
      return a, b
      a++=1
   else
    return N/A
```


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2b) for i ← 0 to A.length :
add A[i] to a vector P

for i ← 0 to B.length
j = linearSearch in vector P(X - B[i])
if (j != -1)
return B[i], A[j]
else ~~return~~
return (Not possible)

O(n)

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Answer3

```
int BinarySearch(int arr[], int l, int r)
{
    if (r >= l)
    {
        int mid = (l+r)/2;
        if (mid == arr[mid])
            return mid;
        if (mid > arr[mid])
        return binarySearch(arr, (mid+1), r);
        else
        return binarySearch(arr, l, (mid-1));
    }

    return -1;
}
```

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Answer 4

Writing Code for O(n);

```
int main()
{
int arr[10]={1,2,0,5,3,4,0,0,1,10};

int c=0
for(int i=0;i<10;i++)
  {
   if(arr[i]!=0)
     arr[c++] = arr[i];
  }

for(int j=c ;j<10 ;j++ )
   arr[j]=0;

}
```

Time Complexity : O(n)

Space Complexity: O(1)

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Answer 5

Answer 5.a)

Array = {0, 2, 4, 6, 8, 10, 12, 14, 16, 19}

key = 19

Binary Search:-

arr[mid] = (l+r)/2 = 10

Since key > 9 check 2nd division of array.

l			r
12	14	16	19

arr[mid] = (l+r)/2 = 14 again check 2nd division of array.

l	r
15	18

arr[mid] = (l+r)/2 = 15 again check 2nd division

18

key founded.

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~~Using~~ Jump Search:-

mid = $\sqrt{10} = 3.1 \simeq 3$

[0] 2, [4] 6, [8] 10, [12] 14, [16] 19

→ linear Search since 19 > 16.

not found

key found [19]

Binary Search is a faster and efficient algorithm that works on divide and Conquer principle Binary Search can only be used when data is sorted.

Jump Search is less costly then ~~is~~ Binary Search as it requires less Comparisions then linear Search. Meanwhile JumpSearch only works on Sorted Arrays and less efficient then binary Search.

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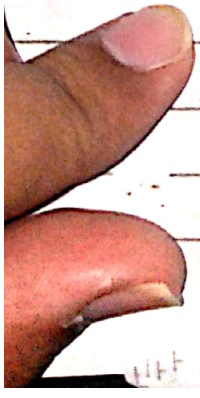
Answer 5b

Interpolation Search :-

It is an improvement of binary search as it is applicable on array with uniformly distributed values. Here we search for element having closest value, then we check if the value is smaller or greater then key and we discard the portion not containing the key, then again search for the position using low and high values.

Exponential Search.

It has same procedure as jump search except we multiply i with 2 if key not found hence doubling the amount jump at each iteration till arr[i] > key, then we apply binary search.



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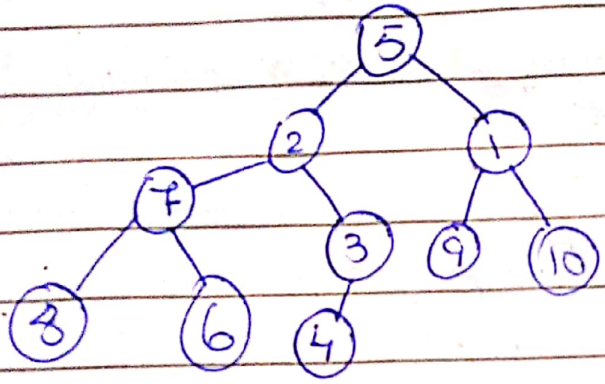
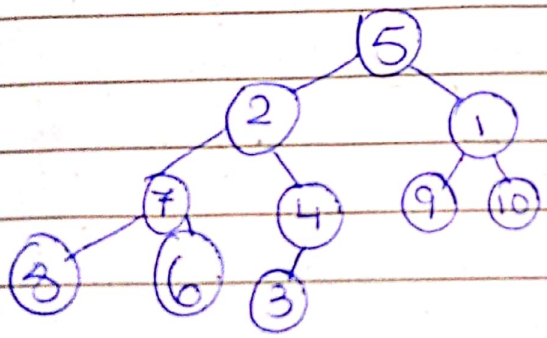
Answer 6

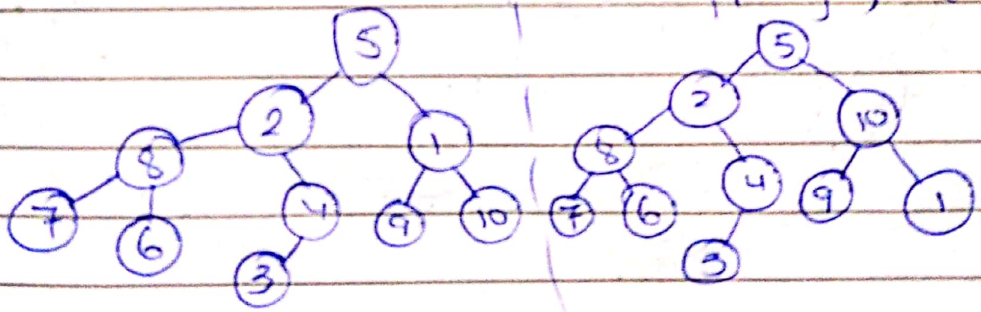
[5, 2, 1, 7, 3, 9, 10, 8, 6, 4]



Swapping 3, 4



Swapping 7, 8



Swapping 1, 10, 9

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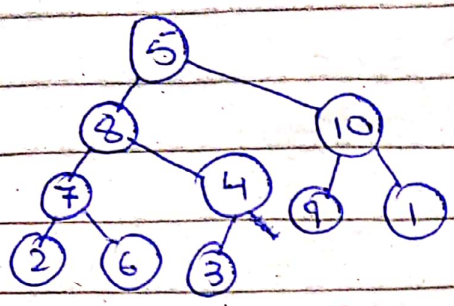
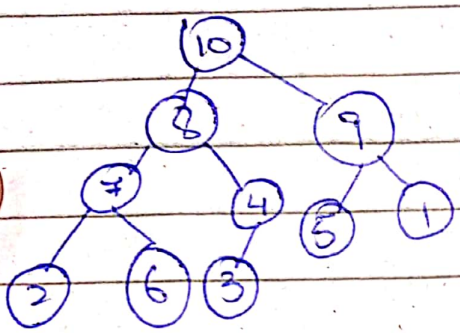
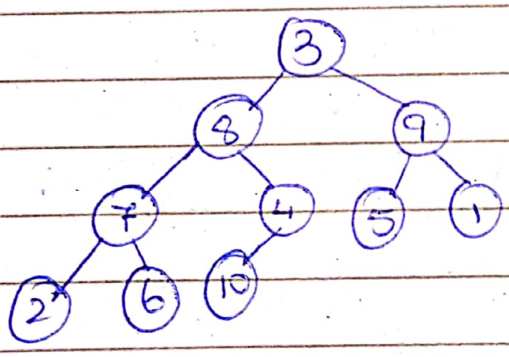
Swapping 2,8 & 2,7



Swapping 5,10 & 5,9



Swapping 10, 3



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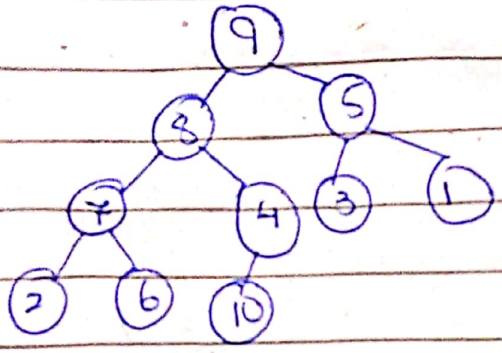
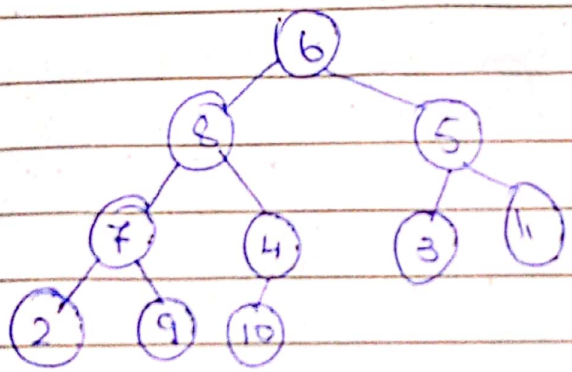
Dao Sorting Using heapsort

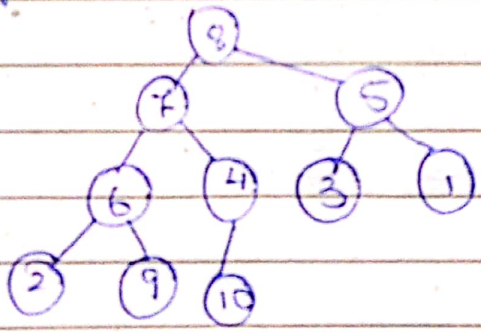
heapify on 3



Swap (9, 6)



Swap (8, 2)



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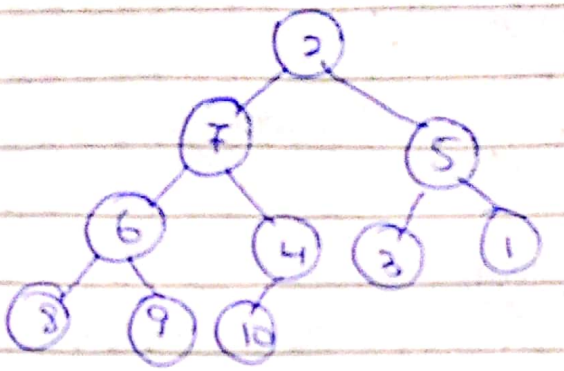
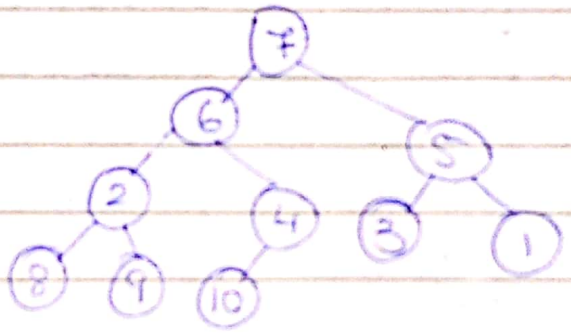
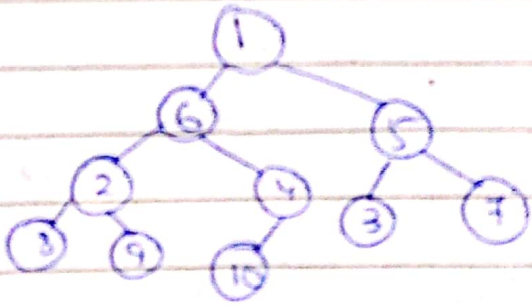
Swap (2,7) & (2,6)



Swap (7,1).



Heapifying 1



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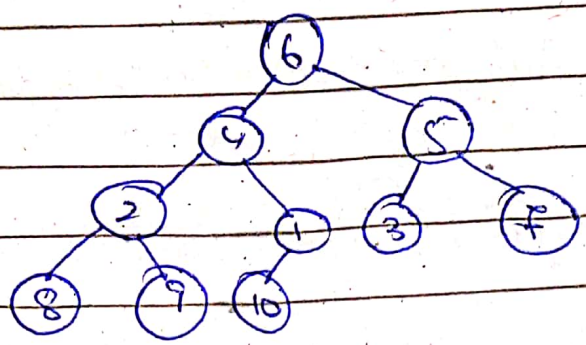
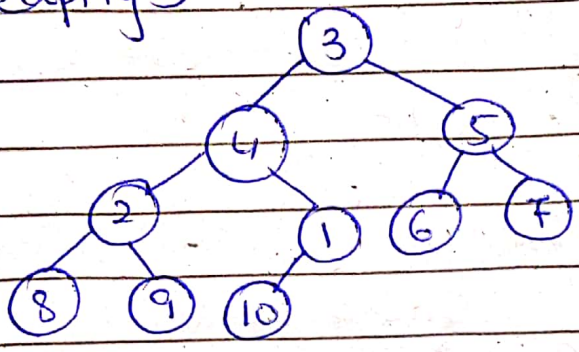
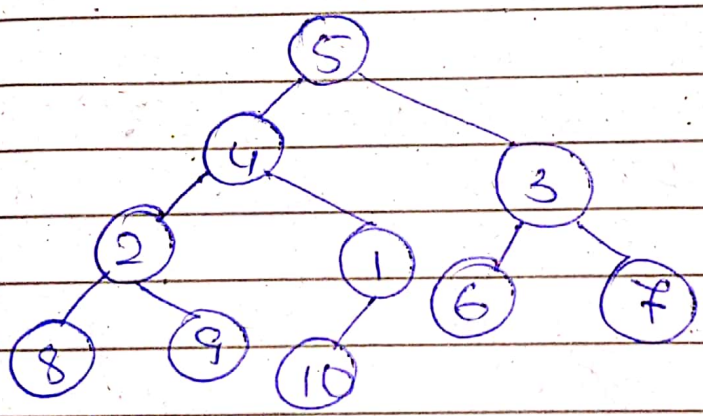
Swap (6,3)

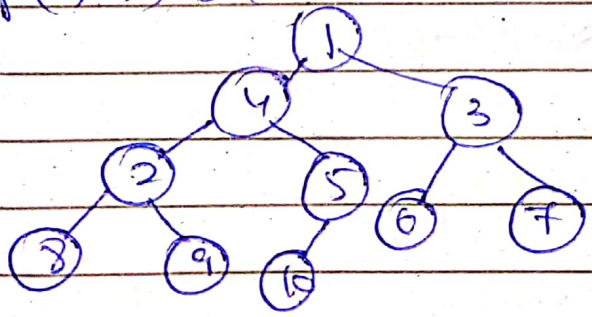


heapify 3





Swap(1,4) & (1,2)



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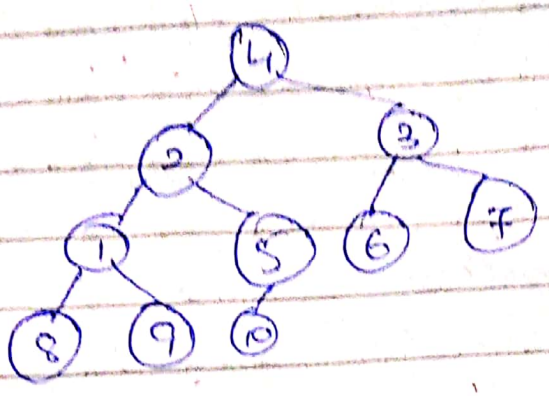
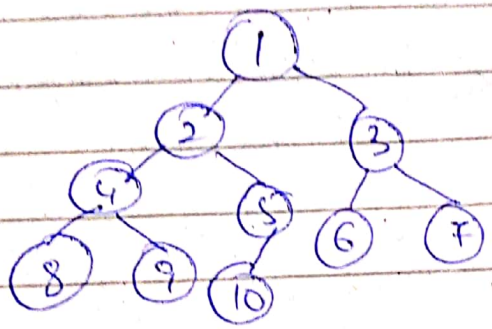
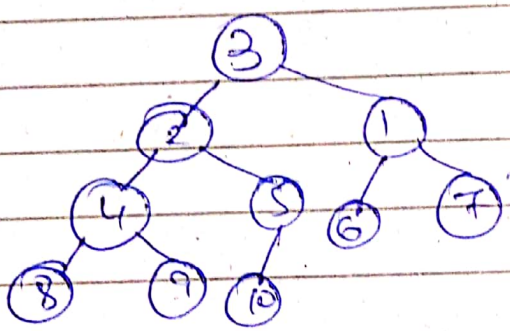
Swap (4, 1)



Heapify 1



Swap (1, 3)



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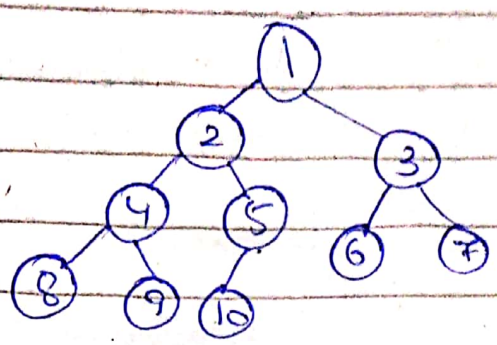
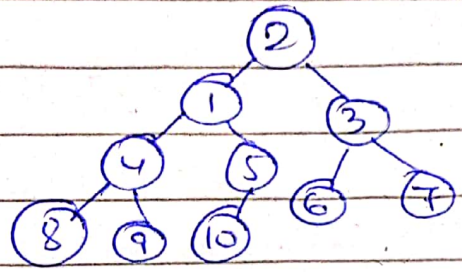
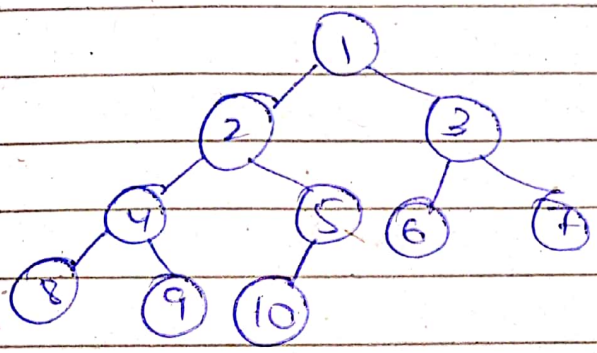
heapify 1



Swap (0, 1)





Sorted Array = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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