# PICT PRACTICAL EXAMINATION 2021

## SUBJECT-DSL LAB

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**PERFORMANCE DATE-28/12/2021**

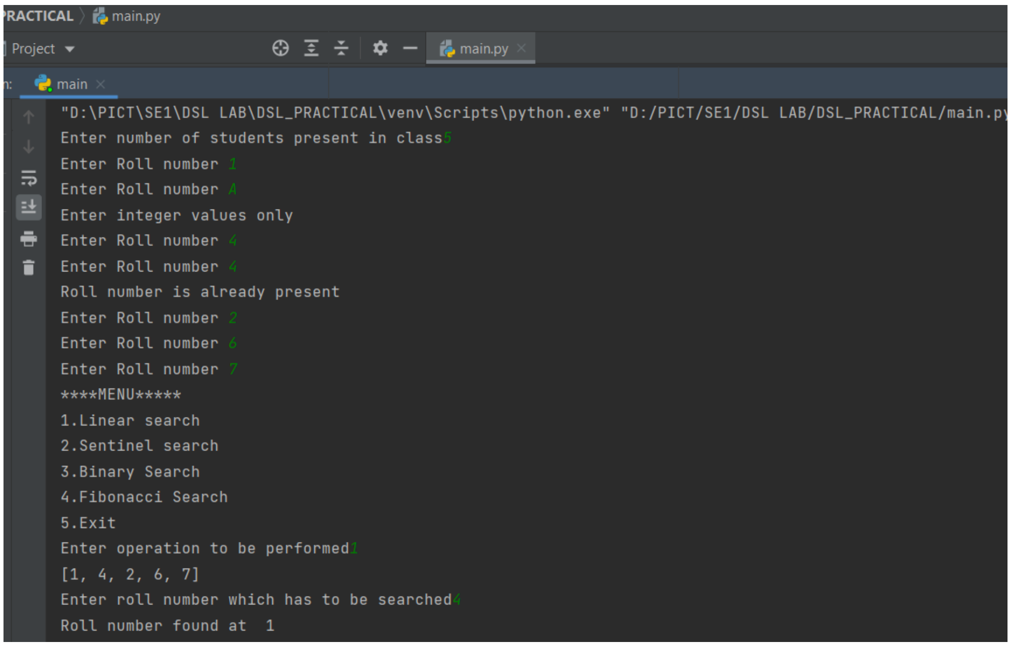
## CODE:

```
"""
Write python program for linear search sentinel search binary search
fibonacci search

"""
class Searching:
    def __init__(self):
        self.array=[]
        self.array_sorted=[]


    def create(self):
        go=True
        while go:
            try:
                n=int(input("Enter number of students present in class"))
                go=False
            except ValueError:
                print("Enter integer only")
        i=1
        while i<=n:
            try:
                x=int(input("Enter Roll number "))
                if x not in self.array:
                    self.array.append(x)
                    self.array_sorted.append(x)
                    i+=1
                else:
                    print("Roll number is already present")
            except ValueError:
                print("Enter integer values only")

        """Creating second list for searching using binary and fibonacci
search. They require a sorted list. SOrted using
            insertion sort."""
        for i in range(1,n):
            curr=self.array_sorted[i]
            j=i-1
            while j>=0 and self.array_sorted[j]>curr:
                self.array_sorted[j+1]=self.array_sorted[j]
                j-=1
            self.array_sorted[j+1]=curr



    def Linear_Search(self):
        """Best Case Time Complexity is o(1).Worst case Time complexity is
O(n)"""
        go = True
        while go:
            try:
                x = int(input("Enter roll number which has to be
searched"))
                go = False
            except ValueError:
                print("Enter integer only")

        for i in range(0,len(self.array)):
            if self.array[i]==x:
                return i
        return -1


    def Sentinel_search(self):
        """Time complexity of O(n).Difference between linear search and
sentinel search is that the co
           comparisons are less in sentinel search ."""
        go = True
        while go:
            try:
                x = int(input("Enter roll number which has to be
searched"))
                go = False
            except ValueError:
                print("Enter integer only")

        last=self.array[len(self.array)-1]
        self.array[len(self.array)-1]=x
        i=0
        while self.array[i]!=x:
            i+=1

        self.array[len(self.array)-1]=last

        if (i<len(self.array)-1) or (self.array[len(self.array)-1]==x):
            return i
        else:
            return -1

    def Binary_seach(self,low,high,search):
        """Works on sorted array.Divide and Conquer Technique. Time
complexity of O(logn)"""
        if high>=low:
            mid =(high+low)//2
            if self.array_sorted[mid]==search:
                return mid
            elif  self.array_sorted[mid]>search:
                return s1.Binary_seach(low,mid-1,search)
            else:
```

```python
                return s1.Binary_seach(mid+1,high,search)
        else:
            return -1

    def Fibonacci_search(self,search):
        """Works on sorted array.Preferred over Binary search because it
divides array in unequal parts.
        Does not use division instead use +.Time Complexity of O(logn)"""
        fib2=0
        fib1=1
        fibadd=fib1+fib2

        while(fibadd<len(self.array_sorted)):
            fib2=fib1
            fib1=fibadd
            fibadd=fib1+fib2

        offset=-1

        while(fibadd>1):
            if fib2+offset>len(self.array_sorted)-1:
                i=len(self.array_sorted)-1
            else:
                i=fib2+offset
                """If less than search eliminate left side"""
            if self.array_sorted[i]<search:
                fibadd=fib1
                fib1=fib2
                fib2=fibadd-fib1
                offset=i
                """If greater than search eliminate right side"""
            elif self.array_sorted[i]>search:
                fibadd=fib2
                fib1=fib1-fib2
                fib2=fibadd-fib1
            else:
                return i

        if fib1 and self.array_sorted[len(self.array_sorted)-1]==search:
            return len(self.array_sorted)-1
        return -1


s1 = Searching()
s1.create()
menu=True
while menu:
    print("****MENU*****")
    print("1.Linear search")
    print("2.Sentinel search")
    print("3.Binary Search")
    print("4.Fibonacci Search")
    print("5.Exit")
    ch = int(input("Enter operation to be performed"))

    if ch==1:
        print(s1.array)
        a=s1.Linear_Search()
        if a==-1:
            print("Roll number not found")
        else:
            print("Roll number found at ",a)

    if ch==2:
        print(s1.array)
        a = s1.Sentinel_search()
        if a == -1:
            print("Roll number not found")
        else:
            print("Roll number found at ", a)

    if ch==3:
        print(s1.array_sorted)
        x=int(input("Enter Roll number you want to search"))
        a=s1.Binary_seach(0,len(s1.array)-1,x)
        if a == -1:
            print("Roll number not found")
        else:
            print("Roll number found at ", a)
    if ch == 4:
        print(s1.array_sorted)
        x = int(input("Enter Roll number you want to search"))
        a = s1.Fibonacci_search(x)
        if a == -1:
            print("Roll number not found")
        else:
            print("Roll number found at ", a)
    if ch==5:
        print("THANK YOU")
        menu=False
```

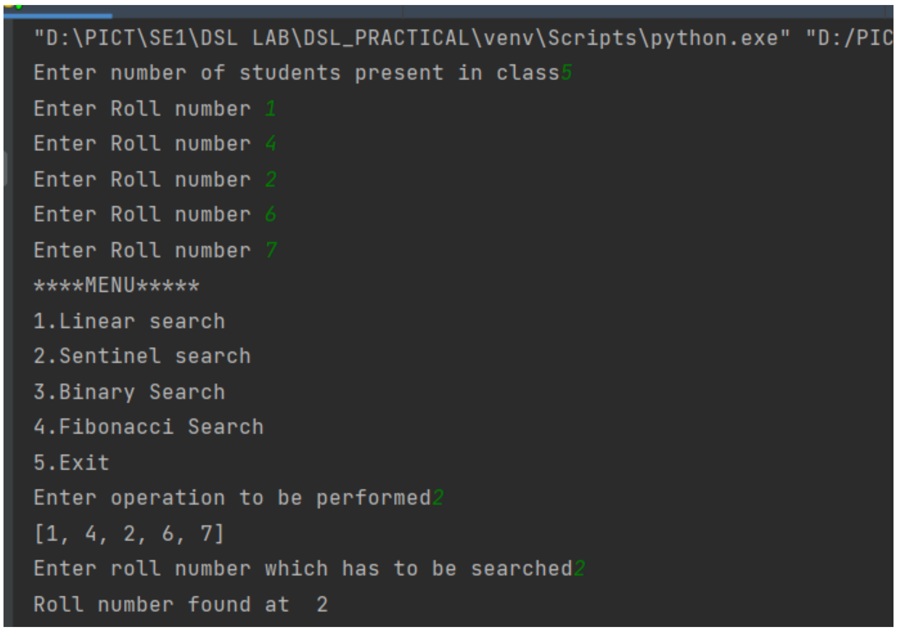
**OUTPUT:**

## 1.LINEAR SEARCH



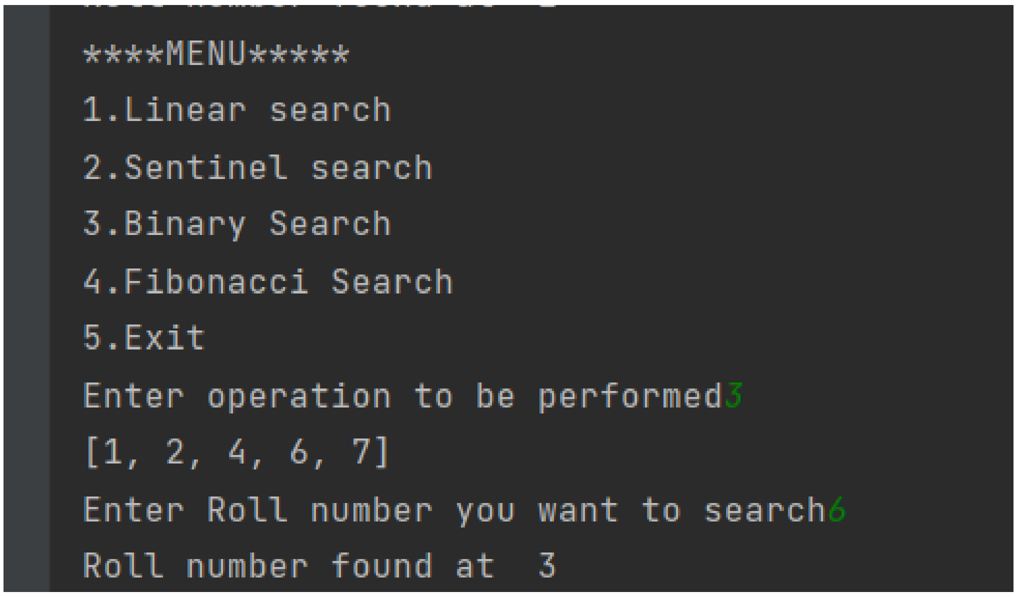
```
"D:\PICT\SE1\DSL LAB\DSL_PRACTICAL\venv\Scripts\python.exe" "D:/PICT/SE1/DSL LAB/DSL_PRACTICAL/main.py
Enter number of students present in class5
Enter Roll number 1
Enter Roll number A
Enter integer values only
Enter Roll number 4
Enter Roll number 4
Roll number is already present
Enter Roll number 2
Enter Roll number 6
Enter Roll number 7
****MENU*****
1.Linear search
2.Sentinel search
3.Binary Search
4.Fibonacci Search
5.Exit
Enter operation to be performed1
[1, 4, 2, 6, 7]
Enter roll number which has to be searched4
Roll number found at  1
```

## 2.SENTINEL SEARCH:



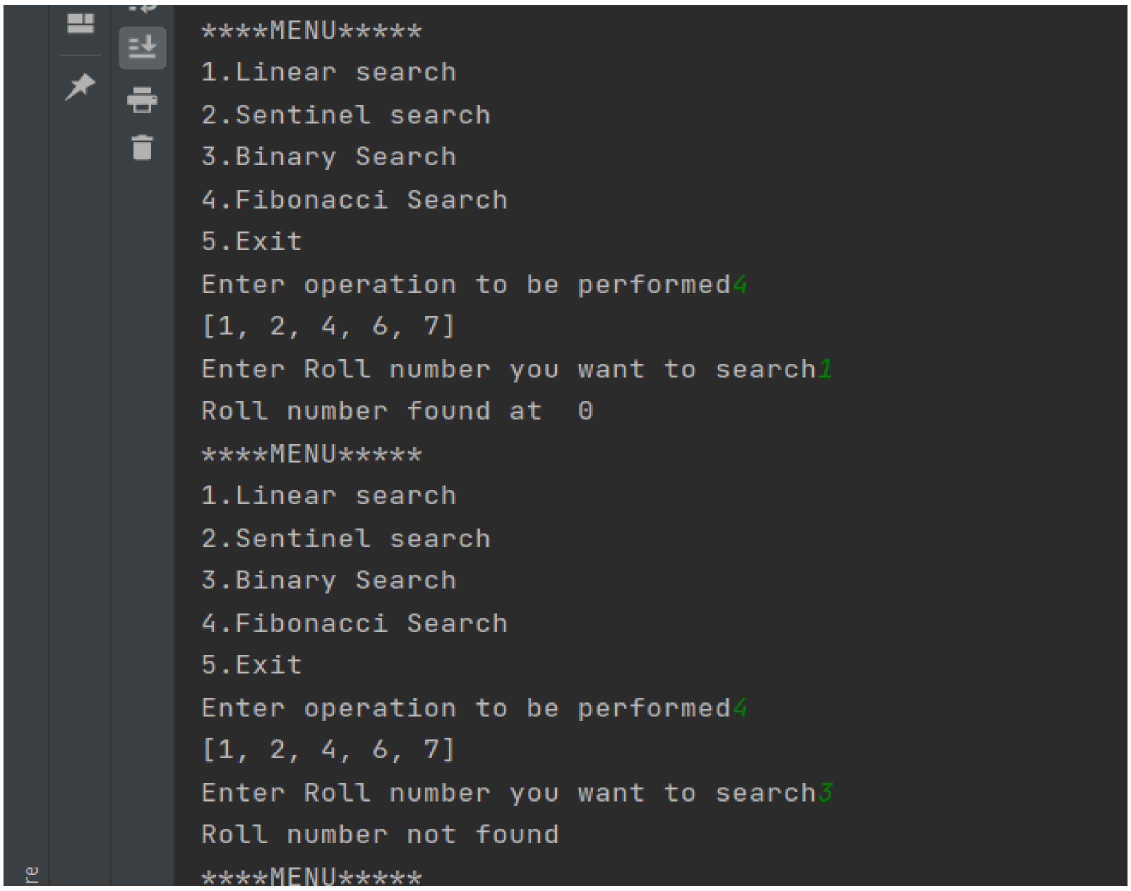
```
"D:\PICT\SE1\DSL LAB\DSL_PRACTICAL\venv\Scripts\python.exe" "D:/PIC
Enter number of students present in class5
Enter Roll number 1
Enter Roll number 4
Enter Roll number 2
Enter Roll number 6
Enter Roll number 7
****MENU*****
1.Linear search
2.Sentinel search
3.Binary Search
4.Fibonacci Search
5.Exit
Enter operation to be performed2
[1, 4, 2, 6, 7]
Enter roll number which has to be searched2
Roll number found at  2
```

## 3.BINARY SEARCH:



```
****MENU*****
1.Linear search
2.Sentinel search
3.Binary Search
4.Fibonacci Search
5.Exit
Enter operation to be performed3
[1, 2, 4, 6, 7]
Enter Roll number you want to search6
Roll number found at  3
```

## 4.FIBONACCI SEARCH:



```
****MENU*****
1.Linear search
2.Sentinel search
3.Binary Search
4.Fibonacci Search
5.Exit
Enter operation to be performed4
[1, 2, 4, 6, 7]
Enter Roll number you want to search1
Roll number found at  0
****MENU*****
1.Linear search
2.Sentinel search
3.Binary Search
4.Fibonacci Search
5.Exit
Enter operation to be performed4
[1, 2, 4, 6, 7]
Enter Roll number you want to search3
Roll number not found
****MENU*****
```