# Data Structures and Algorithms

## Lab Report

## Lab03


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| Class | Data Structures and Algorithms CSC211 (**BCE-3B**) |
| Instructor's Name | Dilshad Sabir |

# In Lab Tasks

## Question no: 1

'Inserting nodes at the end' and 'inserting node after a given node' are already implemented in ***'SinglyLinkedList.c'***. Your task is to implement '***insert at the beginning***' and '***insert before***' functions in the file ***'SinglyLinkedList.c'***.

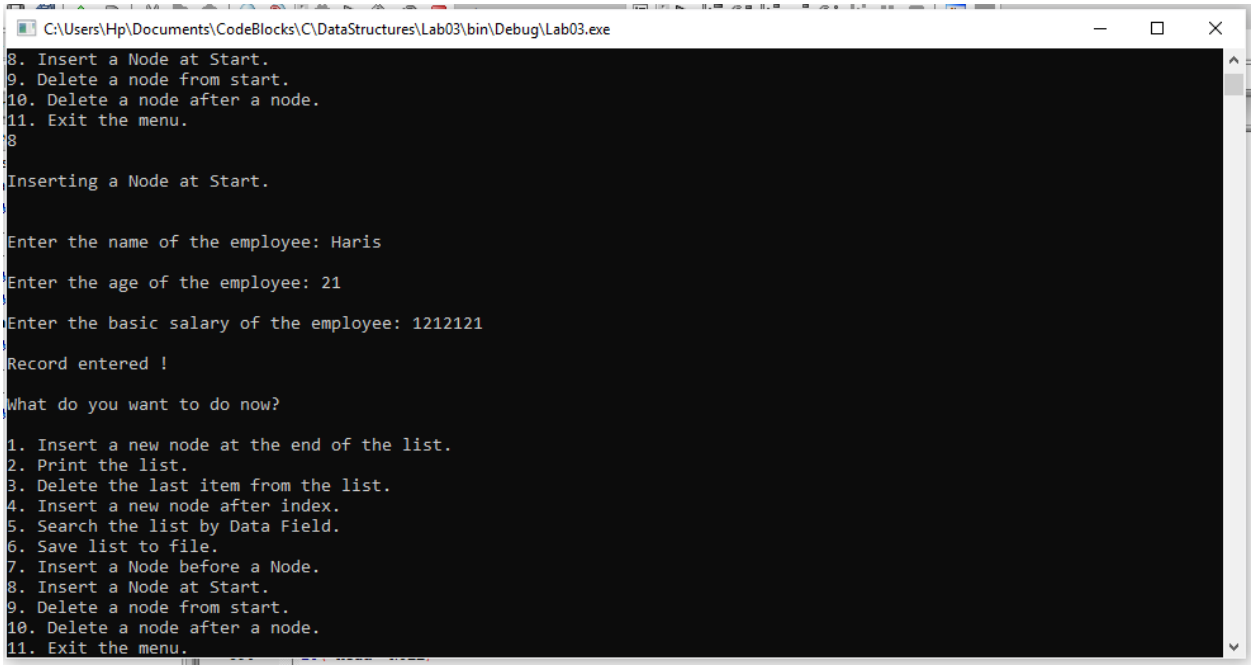
## Solution:

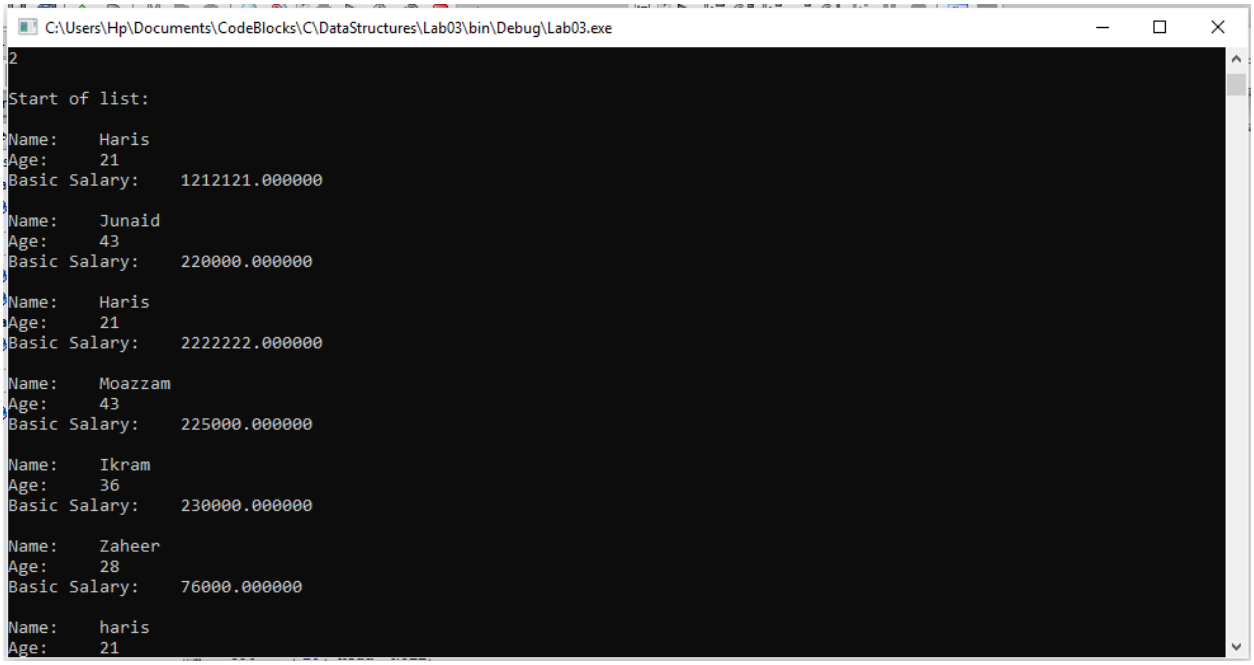
The code of the following code is attached below:

### INSERT AT THE BEGINNING

```
int  insertNodeAtStart(struct node ** head)
{
    /** Complete this function **/
 if(head==NULL)
 {
 *head= (struct node *) malloc(sizeof(struct node));

 }
 struct node * new_node = (struct node *) malloc(sizeof(struct node));

  inputNodeData(new_node);

 new_node->next=*head;
 *head=new_node;

}
```

the result is attached below,



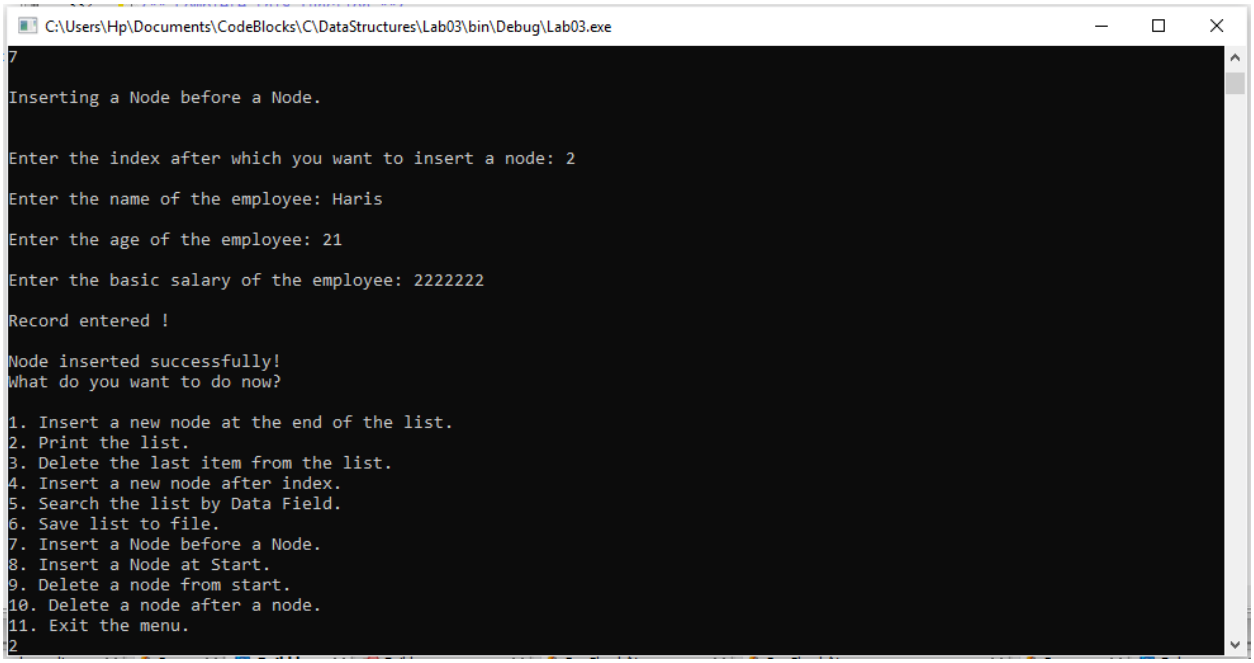



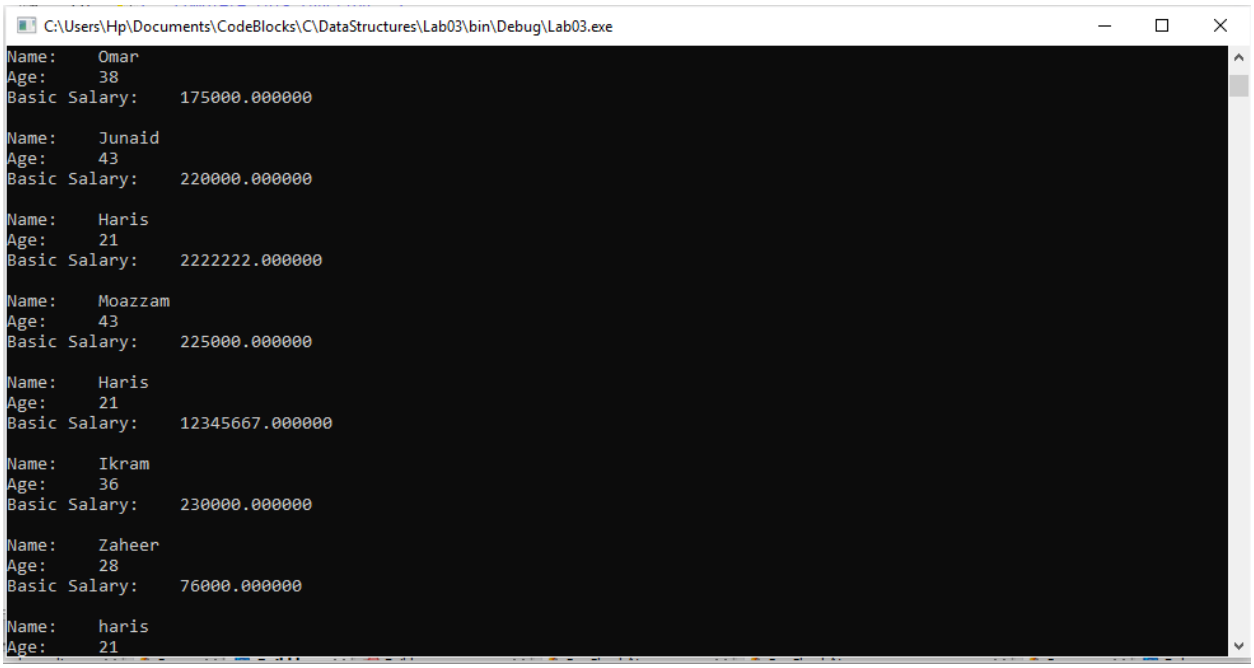
## INSERT BEFORE A NODE

The code of the following code is attached below:

```
int  insertNodeBefore(struct node * head, int idx)
{
/** Complete this function **/
   int index = 0;
    struct node * temp = head;

    if(isListEmpty(head))     /// if currently the list is empty return -1
    {
        return(-1);
    }
    ///create a new node
    struct node * new_node = (struct node *) malloc(sizeof(struct node));

    inputNodeData(new_node);  /// get data for the newly created node from the user.


    while((index != (idx-1) && (temp->next) != NULL))
    {
      index ++;
      temp = temp->next;       /// scroll to the end of the list
    }
    if((temp->next == NULL) && (index != (idx-1)) )      /// We reached the end of the list without
    {                                                    /// reaching the required index
        free(new_node);
        printf("\nNode insertion not done. New data is discarded!!\n");
        return(-1);
    }

    new_node->next = temp->next;     /// Setting up the pointers for insertion
    temp->next = new_node;
    return(0);                  ///
}
```

the result is attached below,




C:\Users\Hp\Documents\CodeBlocks\C\DataStructures\Lab03\bin\Debug\Lab03.exe
Name: Omar
Age: 38
Basic Salary: 175000.000000
Name: Junaid
Age: 43
Basic Salary: 220000.000000
Name: Haris
Age: 21
Basic Salary: 2222222.000000
Name: Moazzam
Age: 43
Basic Salary: 225000.000000
Name: Haris
Age: 21
Basic Salary: 12345667.000000
Name: Ikram
Age: 36
Basic Salary: 230000.000000
Name: Zaheer
Age: 28
Basic Salary: 76000.000000
Name: haris
Age: 21

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## Question no:2

Deleting a node from the end is already implemented in ***'SinglyLinkedList.c'*** your task is to implement '***delete from beginning***' and '***delete after***' a given node.

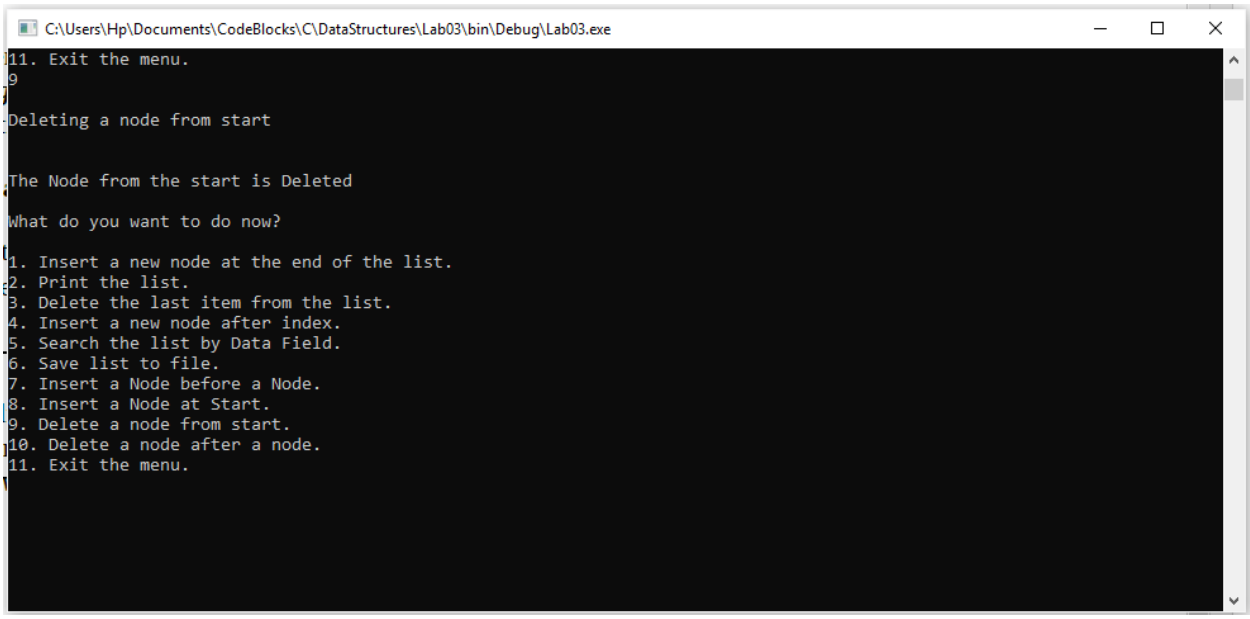
## Solution

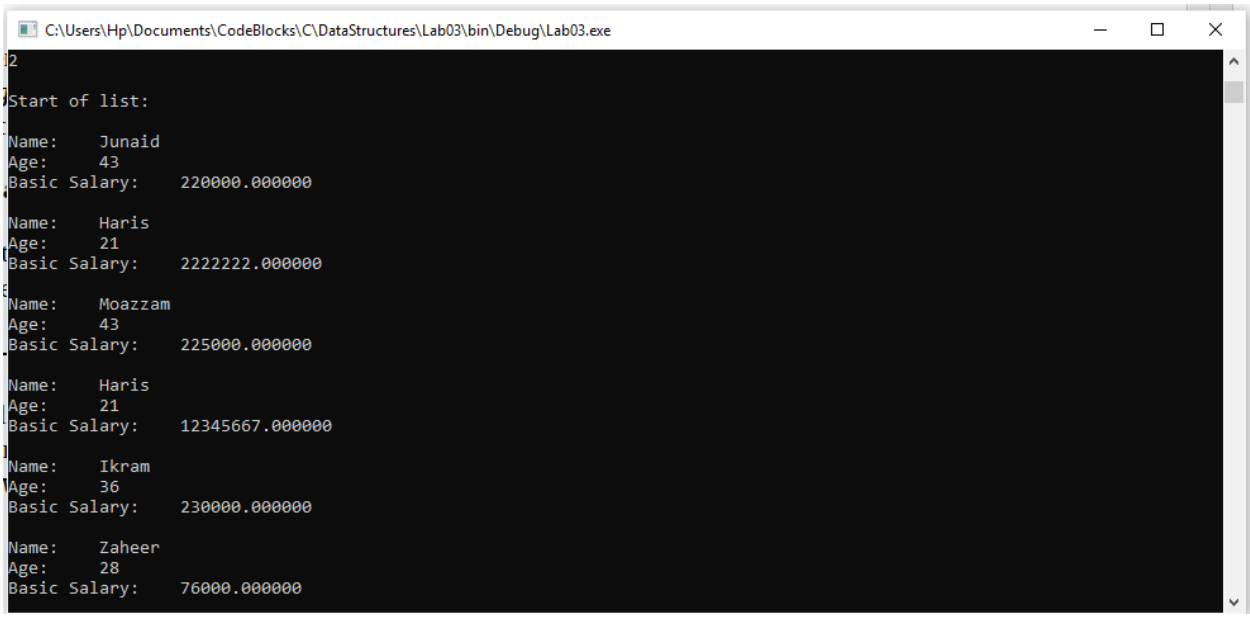
The code is shown below,

### DELETING FROM THE BEGINING

```
void deleteNodeFromStart(struct node ** head)
{

if(*head==NULL)
 {
 printf("\nthe list is already empty\n");

 }
 else
 {

 if((*head)->next==NULL)
 {
     free(*head);


 }

 else
    {
    *head=(*head)->next;


    }

printf("\nThe Node from the start is Deleted\n");
 }

}
```

The Result of the following code is attached below:

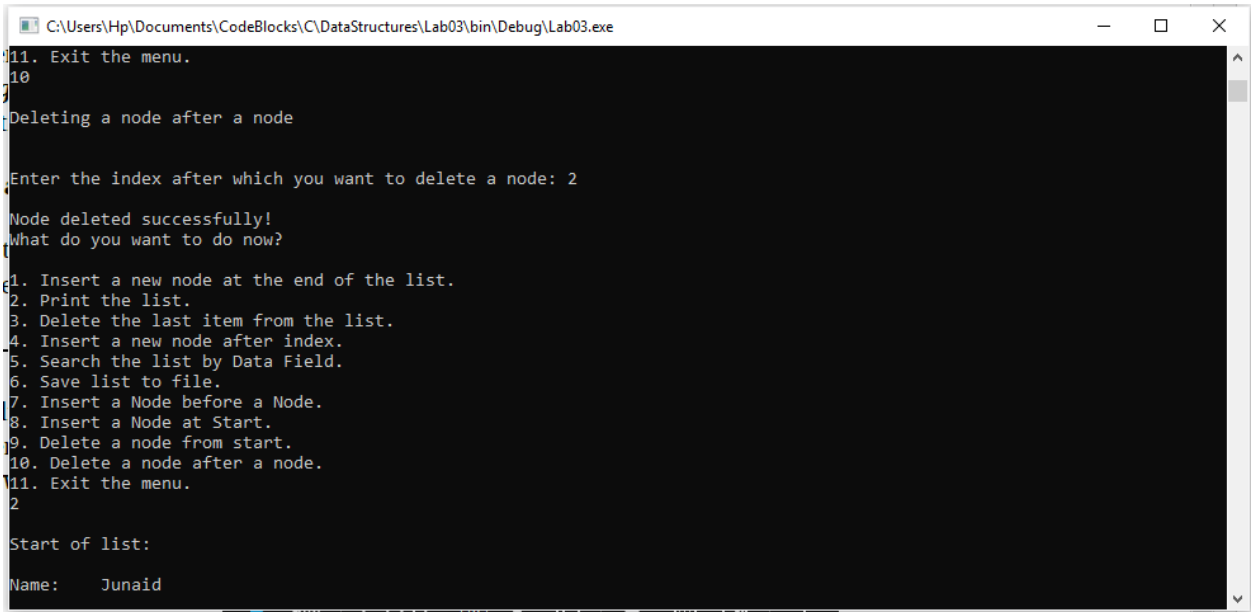


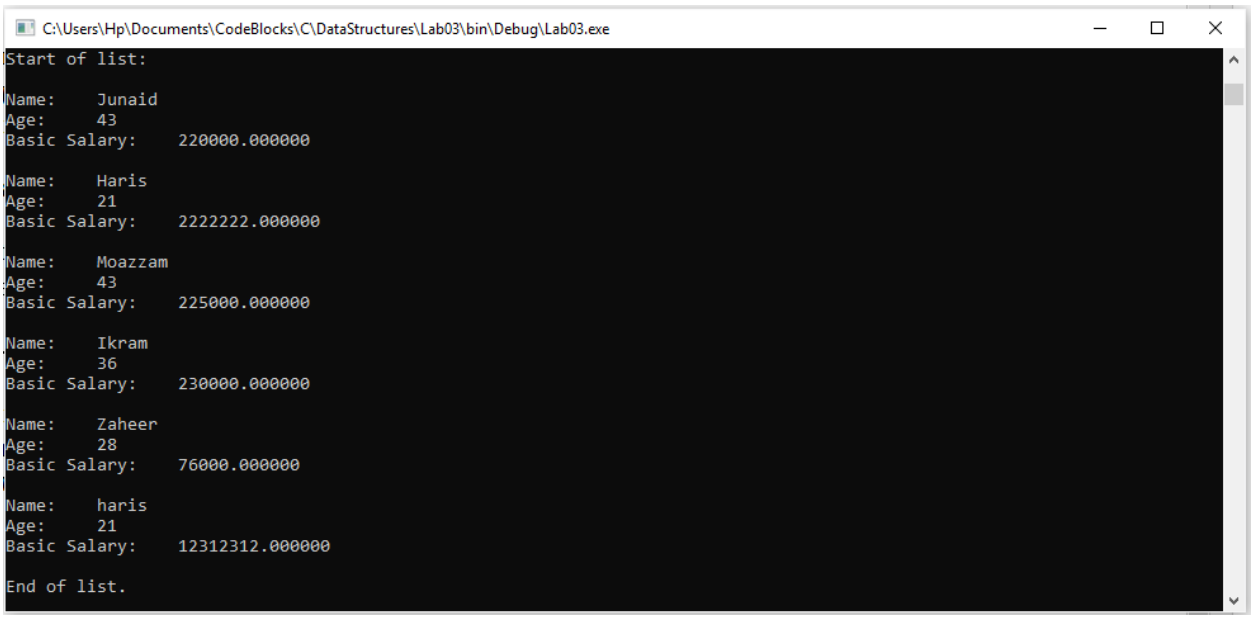



## DELETING AFTER A NODE

```
int  deleteNodeAfter(struct node * head, int idx)
{
    /** Complete this function **/

   int index=0;
    struct node * movinghead = head;
    struct node * del= head;
    struct node * last =head;


    if(head==NULL)
    {
        printf("\n The List is Empty\n");
        return;
    }



    for(index=1;index<=idx;index++)
    {
     del=del->next;
     last=last->next;

    }
    last=last->next;
    del->next=last->next;

      free(last);


return(0);
}
```

the Result of the following code is attached below:




C:\Users\Hp\Documents\CodeBlocks\C\DataStructures\Lab03\bin\Debug\Lab03.exe
Start of list:
Name: Junaid
Age: 43
Basic Salary: 220000.000000
Name: Haris
Age: 21
Basic Salary: 2222222.000000
Name: Moazzam
Age: 43
Basic Salary: 225000.000000
Name: Ikram
Age: 36
Basic Salary: 230000.000000
Name: Zaheer
Age: 28
Basic Salary: 76000.000000
Name: haris
Age: 21
Basic Salary: 12312312.000000
End of list.

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# POST LAB

## Question no:3

Reading database from a file on the hard disk is already implemented. Your first task is to study and understand this implementation. Then you will have to implement the write to file function ***'saveListToFile()'.*** Submit a report on your implementation.

## Solution

The code is shown below for the given program and its results are given below,

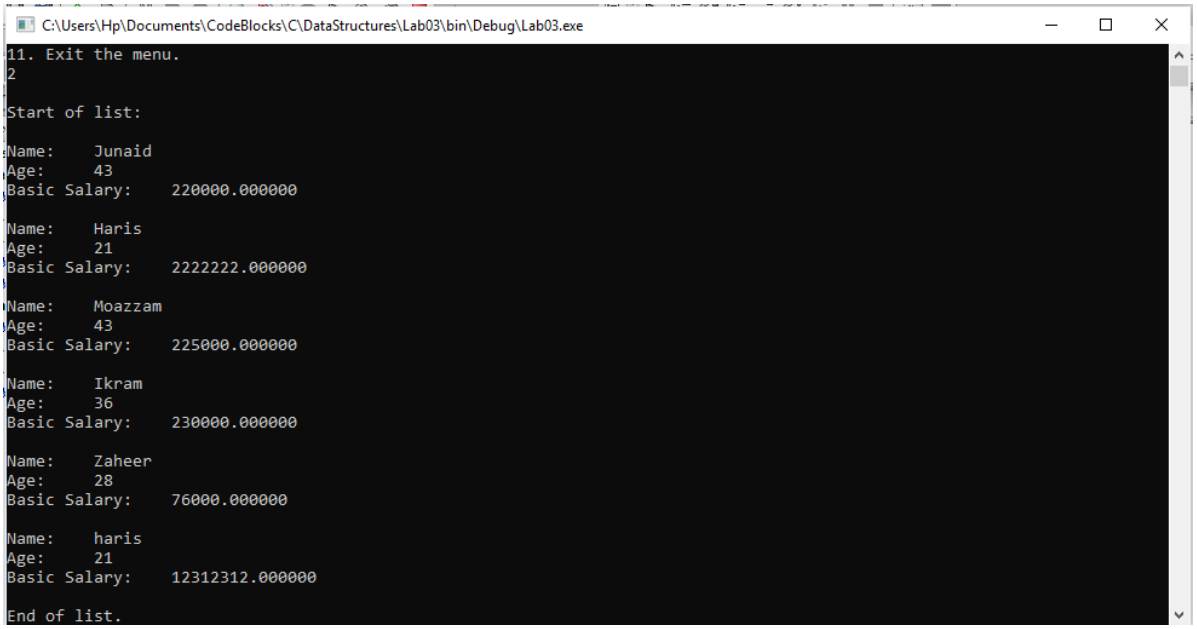
```
int saveListToFile(struct node * head, FILE * fptr)
{

    struct node * temp = head;
    if(head == NULL)
        return(-1);

    while(temp != NULL)
    {
        fwrite(&(temp->data), sizeof(struct employee), 1,  fptr);
        temp = temp->next;      /// scroll to the end of the list
    }
    return(0);

}
```

The Result of the following code is attached below:

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THE END