

## 1) Problem 1

Makefile.mk

```
1  a.exe: client.o server.o
2  |      gcc -o a.exe client.o server.o
3  client.o : client.c server.h
4  |      gcc -c client.c
5  server.o : server.c server.h
6  |      gcc -c server.c
7
```

## Server.c

```
#include<stdio.h>
#include<stdlib.h>
#include "server.h"
int sumall(struct node *head)
{
    int sum=0;
    struct node *temp;
    temp=head;
    while(temp!=NULL)
    {
        sum=sum+(temp->data);
        temp=temp->next;
    }
    return sum;
}
int sumeven(struct node *head)
{
    int sum=0;
    struct node *temp;
    temp=head;
    while(temp!=NULL)
    {
        if((temp->data)%2==0)
            sum=sum+(temp->data);
        temp=temp->next;
    }
    return sum;
}
int sumodd(struct node *head)
{
    int sum=0;
    struct node *temp=head;
    while(temp!=NULL)
    {
        if((temp->data)%2!=0)
            sum=sum+(temp->data);
        temp=temp->next;
    }
    return sum;
}
int sumalternate(struct node *head)
{
    int sum=0, count=0;
    struct node *temp=head;
    while(temp!=NULL)
    {
        if(count%2==0)
        {
            sum=sum+(temp->data);
        }
        count++;
        temp=temp->next;
    }
    return sum;
}
```

```

56 void display(struct node *head)
57 {
58     struct node *temp=head;
59     int d,i=1;
60     while(temp!=NULL)
61     {
62         d=(temp->data);
63         temp=temp->next;
64         printf("node-%d:%d\n",i,d);
65         i++;
66     }
67     if(i==1 && temp==NULL)
68     {
69         printf("Linked list is empty!\n");
70     }
71 }
72 struct node* beg(struct node *head)
73 {
74     struct node *p;
75     int value;
76     printf("Enter the data to be inserted:");
77     scanf("%d",&value);
78     p=malloc(sizeof(struct node));
79     p->data=value;
80     p->next=head;
81     printf("Insertion successful!\n");
82     return (p);
83 }
84
85 struct node* end(struct node *head)
86 {
87     int new_data;
88     printf("Enter data to be inserted:");
89     scanf("%d",&new_data);
90     struct node* new_node = (struct node*) malloc(sizeof(struct node));
91
92     struct node *last = head;
93
94     new_node->data = new_data;
95
96     new_node->next = NULL;
97
98     if (head == NULL)
99     {
100         head = new_node;
101         return(head);
102     }
103
104     while (last->next != NULL)
105         last = last->next;
106     last->next = new_node;
107     printf("Insertion successful!\n");
108     return head;
109 }

```

Client.c

```

1  #include<stdio.h>
2  #include<stdlib.h>
3  #include "server.h"
4  int main()
5  {
6      int n;
7      struct node *head=NULL,*newnode,*temp;
8      printf("Enter the number of nodes:");
9      scanf("%d",&n);
10     for(int i=0;i<n;i++)
11     {
12         newnode=(struct node *)malloc(sizeof(struct node));
13         printf("Enter data of node-%d:",i+1);
14         scanf("%d",&newnode->data);
15         newnode->next=NULL;
16         if(head==NULL)
17         {
18             head=newnode;
19             temp=newnode;
20         }
21         else
22         {
23             (temp->next)=newnode;
24             temp=newnode;
25         }
26     }
27 }
28
29 int choice,sum=0,status=1;
30 while(status)
31 {
32     printf("-----\n1:Insert new node at the beginning\n2:Insert new node at the end\n3:Display all nodes' data\n
33     4:Sum of all nodes' data\n5:Sum of odd data\n6:Sum of even data\n7:Sum of alternate nodes' data\n8:quit
34     \n-----\n");
35     printf("Enter your choice:");
36     scanf("%d",&choice);

```

```

switch(choice)
{
    case 1:head=beg(head);
    break;
    case 2:head=end(head);
    break;
    case 3:display(head);
    break;
    case 4:sum=sumall(head);
    printf("Sum of all nodes' data=%d\n",sum);
    sum=0;
    break;
    case 5:sum=sumodd(head);
    printf("Sum of odd data=%d\n",sum);
    sum=0;
    break;
    case 6:sum=sumeven(head);
    printf("Sum of even data=%d\n",sum);
    sum=0;
    break;
    case 7:sum=sumalternate(head);
    printf("Sum of alternate nodes' data=%d\n",sum);
    sum=0;
    break;
    case 8:status=0;
    break;
    default:printf("Enter a choice between 1 and 8 only\nTry again!\n");
}
}
free(head);
free(temp);
free(newnode);
return 0;
}

```

## Server.h

```

1  struct node
2  {
3      int data;
4      struct Node *next;
5  };
6  int sumall(struct node *);
7  int sumalternate(struct node *);
8  int sumodd(struct node *);
9  int sumeven(struct node *);
10 void display(struct node *);
11 struct node* beg(struct node *);
12 struct node* end(struct node *);
13

```

## Output

```
Select Command Prompt

C:\cs lab\week 14\w14_1>make
make: 'a.exe' is up to date.

C:\cs lab\week 14\w14_1>a
Enter the number of nodes:5
Enter data of node-1:1
Enter data of node-2:2
Enter data of node-3:3
Enter data of node-4:4
Enter data of node-5:5
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:3
node-1:1
node-2:2
node-3:3
node-4:4
node-5:5
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:1
Enter the data to be inserted:0
Insertion successfull
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
```

Select Command Prompt

```
Enter your choice:3
node-1:0
node-2:1
node-3:2
node-4:3
node-5:4
node-6:5
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:6
Insertion successful!
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:3
```

```
node-1:0
node-2:1
node-3:2
node-4:3
node-5:4
node-6:5
node-7:6
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

Select Command Prompt

```
Enter your choice:4
Sum of all nodes' data=21
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:5
```

```
Sum of odd data=9
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:6
```

```
Sum of even data=12
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:7
```

```
Sum of alternate nodes' data=12
```

```
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:8
```

Command Prompt

```
Enter your choice:8
C:\cs lab\week 14\td1_1>a
Enter the number of nodes:0
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:1
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:2
Insertion successful
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:3
Insertion successful
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
```

Command Prompt

```
Enter your choice:2
Enter data to be inserted:3
Insertion successful
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:3
Insertion successful
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:2
Enter data to be inserted:5
Insertion successful
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
```

```
Enter your choice:3
node-1:1
node-2:2
node-3:3
node-4:3
node-5:5
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
```

```
Command Prompt
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:4
Sum of all nodes' data=14
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:5
Sum of odd data=12
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:6
Sum of even data=2
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:7
Sum of alternate nodes' data=9
-----
1:Insert new node at the beginning
-----
Command Prompt
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:5
Sum of odd data=12
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:6
Sum of even data=2
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:7
Sum of alternate nodes' data=9
-----
1:Insert new node at the beginning
2:Insert new node at the end
3:Display all nodes' data
4:Sum of all nodes' data
5:Sum of odd data
6:Sum of even data
7:Sum of alternate nodes' data
8:quit
-----
Enter your choice:8
C:\cs lab\week 14\w14_1>
```

## 2)Practice problem 1

Makefile.mk



```
1  a.exe: client.o server.o
2  | gcc -o a.exe client.o server.o
3  client.o : client.c server.h
4  | gcc -c client.c
5  server.o : server.c server.h
6  | gcc -c server.c
7
```

## Server.c

```
1  #include<stdio.h>
2  #include<stdlib.h>
3  #include "server.h"
4  int productall(struct node *head)
5  {
6      int p=1;
7      struct node *temp;
8      temp=head;
9      while(temp!=NULL)
10     {
11         p=p*(temp->data);
12         temp=temp->next;
13     }
14     return p;
15 }
```

```

16 void search(struct node *head)
17 {
18     int status=-1,node=1,ele;
19     printf("Enter the search element:");
20     scanf("%d",&ele);
21     struct node *temp;
22     temp=head;
23     while(temp!=NULL)
24     {
25         if((temp->data)==ele)
26         {
27             status=node;
28             break;
29         }
30         temp=temp->next;
31         node++;
32     }
33     if(status==1)
34     {
35         printf("Element not found!\n");
36     }
37     else
38     {
39         printf("%d found in node-%d from beginning\n",ele,node);
40     }
41 }
42 }

43 void display(struct node *head)
44 {
45     struct node *temp=head;
46     int d,i=1;
47     while(temp!=NULL)
48     {
49         d=(temp->data);
50         temp=temp->next;
51         printf("node-%d:%d\n",i,d);
52         i++;
53     }
54     if(i==1 && temp==NULL)
55     {
56         printf("Linked list is empty!\n");
57     }
58 }
59 struct node* beg(struct node *head)
60 {
61     if (head == NULL)
62         return NULL;
63
64     struct node* temp = head;
65     head = head->next;
66
67     free(temp);
68     printf("Succesfully Deleted!\n");
69     return head;
70 }

71 struct node* end(struct node *p_head)
72 {
73     struct node *p_cur, *p_prev;
74
75     if (p_head != NULL)
76     {
77         if (p_head->next == NULL)
78         {
79             free (p_head);
80             p_head = NULL;
81         }
82         else
83         {
84             for (p_cur = p_head; p_cur->next != NULL; p_prev=p_cur,p_cur = p_cur->next)
85                 ;
86             p_prev->next = NULL;
87             free (p_cur);
88         }
89     }
90     printf("Succesfully Deleted!\n");
91     return (p_head);
92 }

```

Client.c

```

1  #include<stdio.h>
2  #include<stdlib.h>
3  #include "server.h"
4  int main()
5  {
6      int n;
7      struct node *head=NULL,*newnode,*temp;
8      printf("Enter the number of nodes:");
9      scanf("%d",&n);
10     for(int i=0;i<n;i++)
11     {
12         newnode=(struct node *)malloc(sizeof(struct node));
13         printf("Enter data of node-%d:",i+1);
14         scanf("%d",&newnode->data);
15         newnode->next=NULL;
16         if(head==NULL)
17         {
18             head=newnode;
19             temp=newnode;
20         }
21         else
22         {
23             (temp->next)=newnode;
24             temp=newnode;
25         }
26     }
27 }
28
29 int choice,p=1,status=1;
30 while(status)
31 {
32     printf("-----\n1:Delete node at the beginning\n
33     2:Delete node at the end\n3:Display all nodes' data\n4:Product of all nodes' data\n5:Search data\n
34     6:quit\n-----\n");
35     printf("Enter your choice:");
36     scanf("%d",&choice);

```

```

37     switch(choice)
38     {
39         case 1:head=beg(head);
40             break;
41         case 2:head=end(head);
42             break;
43         case 3:display(head);
44             break;
45         case 4:p=productall(head);
46             printf("Product of all nodes' data=%d\n",p);
47             p=1;
48             break;
49         case 5:search(head);
50             break;
51         case 6:status=0;
52             break;
53         default:printf("Enter a choice between 1 and 8 only\nTry again!\n");
54     }
55 }
56 free(head);
57 free(temp);
58 free(newnode);
59 return 0;
60 }
61
62

```

Server.h

```

C server.h > search(node *)
1 struct node
2 {
3     int data;
4     struct Node *next;
5 };
6 int productall(struct node *);
7 void search(struct node *);
8 void display(struct node *);
9 struct node* beg(struct node *);
10 struct node* end(struct node *);
11
12

```

## Output

```

C:\cs lab\week 14\w14_practice_1>make
make: 'a.exe' is up to date.

C:\cs lab\week 14\w14_practice_1>a
Enter the number of nodes:6
Enter data of node-1:1
Enter data of node-2:2
Enter data of node-3:3
Enter data of node-4:4
Enter data of node-5:5
Enter data of node-6:6
-----
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
-----
Enter your choice:3
node-1:1
node-2:2
node-3:3
node-4:4
node-5:5
node-6:6
-----
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
-----
Enter your choice:1
Successfully Deleted!
-----
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
-----
Enter your choice:3
node-1:2
node-2:3
node-3:4
node-4:5

```

Command Prompt

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:2
Successfully Deleted!
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:3
node-1:2
node-2:3
node-3:4
node-4:5
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:4
Product of all nodes' data=120
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:5
Enter the search element:4
4 found in node-3 from beginning
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
```

Command Prompt

```
Enter your choice:3
node-1:2
node-2:3
node-3:4
node-4:5
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:4
Product of all nodes' data=120
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:5
Enter the search element:4
4 found in node-3 from beginning
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:5
Enter the search element:10
Element not found!
```

```
1:Delete node at the beginning
2:Delete node at the end
3:Display all nodes' data
4:Product of all nodes' data
5:Search data
6:quit
```

```
Enter your choice:6
```

C:\cs lab\week 14\w14\_practice\_1>

