



<b>Experiment No.7</b>
Implement Circular Linked List ADT.
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### **Experiment No. 7: Circular Linked List Operations**

#### **Aim: Implementation of Circular Linked List ADT Objective:**

In circular linked list last node is connected to first node. On other hand circular linked list can be used to implement traversal along web pages.

#### **Theory:**

In a circular linked list, the last node contains a pointer to the first node of the list. We can have a circular singly linked list as well as a circular doubly linked list. While traversing a circular linked list, we can begin at any node and traverse the list in any one direction, forward or backward, until we reach the same node where we started. Thus, a circular linked list has no beginning and no ending.

#### **Inserting a New Node in a Circular Linked List Case**

1: The new node is inserted at the beginning.

Case 2: The new node is inserted at the end.

#### **Deleting a Node from a Circular Linked List Case**

1: The first node is deleted.

Case 2: The last node is deleted.

Insertion and Deletion after or before a given node is same as singly linked list.

#### **Algorithm**



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Algorithm to insert a new node at the beginning

Step 1: IF AVAIL = NULL

Write OVERFLOW

Go to Step 9 [END OF IF]

Step 2: SET NEW\_NODE = AVAIL

Step 3: SET AVAIL = AVAIL → NEXT

Step 4: SET NEW\_NODE → DATA = VAL

Step 5: SET PTR = START

Repeat Step 6 while PTR → NEXT ≠ START

Step 6: SET PTR = PTR → NEXT [END OF LOOP]

Step 7: SET NEW\_NODE → NEXT = START

Step 8: SET PTR → NEXT = START

Step 9: SET START = NEW\_NODE

Step 10: EXIT

Algorithm to insert a new node at the end

Step 1: IF AVAIL = NULL

Write OVERFLOW

Go to Step 11 [END OF IF]

Step 2: SET NEW\_NODE = AVAIL

Step 3: SET AVAIL = AVAIL → NEXT

Step 4: SET NEW\_NODE → DATA = VAL

Step 5: SET NEW\_NODE → NEXT = START

Step 6: SET PTR = START

Step 7: Repeat Step 8 while PTR → NEXT ≠ START

Step 8: SET PTR = PTR → NEXT [END OF LOOP]

Step 9: SET PTR → NEXT = NEW\_NODE

Step 10: EXIT

Algorithm to delete the first node

Step 1: IF START = NULL

Write UNDERFLOW



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Go to Step 6 [END OF IF]

Step 2: SET PTR = START

Step 3: Repeat Step 4 while PTR--> NEXT != START

Step 4: SET PTR = PTR -->NEXT [END OF LOOP]

Step 4: SET PTR □ NEXT = START -->NEXT

Step 5: FREE START

Step 6: EXIT

Algorithm to delete the last node

Step 1: IF START = NULL

Write UNDERFLOW

Go to Step 7 [END OF IF]

Step 2: SET PTR = START [END OF LOOP]

Step 3: Repeat Step 4 and Step 5 while PTR -->NEXT != START

Step 4: SET PREPTR = PTR

Step 5: SET PTR = PTR -->NEXT

Step 6: SET PREPTR-->NEXT = START

Step 7: FREE PTR

Step 8: EXIT

**Code:**

```
#include  
  
#include #include  
  
struct node { int  
data; struct node  
*next;  
}; struct node *start = NULL;  
struct node *create_cll(struct node *);  
struct node *display(struct node *); struct  
node *insert_beg(struct node *); struct
```



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```
node *insert_end(struct node *); struct
node *delete_beg(struct node *); struct
node *delete_end(struct node *); struct
node *delete_after(struct node *); struct
node *delete_list(struct node *); int
main() { int option; clrscr(); do {
printf("\n\n *****MAIN MENU *****");
printf("\n 1: Create a list"); printf("\n 2: Display
the list"); printf("\n 3: Add a node at the
beginning"); printf("\n 4: Add a node at the
end"); printf("\n 5: Delete a node from the
beginning"); printf("\n 6: Delete a node from
the end"); printf("\n 7: Delete a node after a
given node"); printf("\n 8: Delete the entire
list"); printf("\n 9: EXIT"); printf("\n\n Enter
your option : "); scanf("%d", &option);
switch(option) { case 1:
start = create_cll(start);
printf("\n CIRCULAR LINKED LIST CREATED");
break; case 2: start =
display(start); break;
case 3: start =
insert_beg(start); break;
case 4: start =
insert_end(start); break;
case 5: start =
```



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```
delete_beg(start); break;

case 6: start =

delete_end(start); break;

case 7: start =

delete_after(start); break;

case 8:

start = delete_list(start);

printf("\n CIRCULAR LINKED LIST DELETED");

break; }

}while(o

ption

!=9);

getch();

return 0;

} struct

node

*create_

circular(struct

node

*start) {

struct

node

*new_no

de, *ptr;

int num;

printf("\n
```



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Enter -1

to end");

printf("\n

Enter the

data : ");

scanf("%

d",

&num);

while(nu

m!=-1) {

new\_nod

e =

(struct

node\*)m

alloc(siz

eof(struc

t node));

new\_nod

e -> data

= num;

if(start

==

NULL) {

new\_nod

e -> next

=



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```
new_nod
e; start
=
new_nod
e;
} else { ptr = start; while(ptr
-> next != start) ptr = ptr ->
next; ptr -> next = new_node;
new_node -> next = start; }
printf("\n Enter the data : ");
scanf("%d", &num);
} return start;
} struct node *display(struct node *start) { struct
node *ptr; ptr=start; while(ptr -> next != start) {
printf("\t %d", ptr -> data); ptr = ptr -> next; }
printf("\t %d", ptr -> data); return start; } struct node
*insert_beg(struct node *start) { struct node
*new_node, *ptr; int num; printf("\n Enter the data :
"); scanf("%d", &num); new_node = (struct node
*)malloc(sizeof(struct node)); new_node -> data =
num;
ptr = start; while(ptr ->
next != start) ptr = ptr ->
next; ptr -> next =
new_node; new_node ->
```



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```
next = start; start =
new_node; return start;

} struct node *insert_end(struct node *start) {
struct node *ptr, *new_node; int num;
printf("\n Enter the data : "); scanf("%d",
&num);
new_node = (struct node *)malloc(sizeof(struct node));
new_node -> data = num;
ptr = start; while(ptr -> next != start) ptr =
ptr -> next; ptr -> next = new_node;
new_node -> next = start; return start; }
struct node *delete_beg(struct node *start) {
struct node *ptr; ptr = start; while(ptr ->
next != start) ptr = ptr -> next; ptr -> next =
start -> next; free(start); start = ptr -> next;
return start;
} struct node *delete_end(struct node *start) {
struct node *ptr,*preptr; ptr = start; while(ptr
-> next != start) { preptr = ptr; ptr = ptr ->
next;
} preptr -> next = ptr ->
next; free(ptr); return start;
} struct node *delete_after(struct node *start) { struct node *ptr,
*preptr; int val; printf("\n Enter the value after which the node
has to deleted : "); scanf("%d", &val);
```





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```
ptr = start; preptr = ptr;
while(preptr -> data != val) { preptr
= ptr; ptr = ptr -> next; } preptr ->
next = ptr -> next; if(ptr == start)
start = preptr -> next; free(ptr);
return start;
} struct node *delete_list(struct node *start) {
struct node *ptr; ptr = start; while(ptr -> next
!= start) start = delete_end(start); free(start);
return start;
}
```

#### Output:

```
Enter the data: 4
Enter the data: -1
CIRCULAR LINKED LIST CREATED
Enter your option : 3
Enter your option : 5
Enter your option : 2
5 1 2 4
Enter your option : 9
*****MAIN MENU *****
1: Create a list
2: Display the list
3: Add a node at the beginning
-----
8: Delete the entire list
9: EXIT
Enter your option : 1
Enter -1 to end
Enter the data: 1
Enter the data: 2
```

#### Conclusion:

Write an example of insertion and deletion in the circular linked list while traversing the web pages?

```
#include <stdio.h>
```



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```
#include <stdlib.h>
```

```
#include <string.h>
```

```
// Structure for a web page node in the circular linked list struct
```

```
WebPage {
```

```
    char title[50];    struct
```

```
WebPage* next;
```

```
};
```

```
struct WebPage* current = NULL;
```

```
// Function to insert a new web page void insertPage(char title[]) {    struct
```

```
WebPage* newPage = (struct WebPage*)malloc(sizeof(struct WebPage));
```

```
strcpy(newPage->title, title);
```

```
    if (current == NULL) {        current = newPage;        newPage->next =
```

```
newPage; // Make it point to itself in a circular list.
```

```
    } else {        newPage->next =
```

```
current->next;        current->next =
```

```
newPage;        current = newPage;
```

```
    }
```

```
}
```



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// Function to delete the current web page

```
void deletePage() {    if (current ==  
  
NULL) {        printf("No web page to  
  
delete.\n");        return;  
  
    }  
  
    struct WebPage* nextPage = current->next;  
  
    if (current == current->next) {  
free(current);        current = NULL;  
    } else {        current->next = nextPage-  
>next;        free(nextPage);  
  
    }  
}
```

// Function to display the current web page

```
void displayCurrentPage() {    if (current  
== NULL) {        printf("No current web  
page.\n");  
  
    } else {        printf("Current Page: %s\n",  
current->title);  
  
    }  
}
```



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```
int      main()      {  
  
insertPage("Home    Page");  
  
insertPage("About    Us");  
  
insertPage("Contact    Us");  
  
displayCurrentPage();    //  
  
Displays "Contact Us"  
  
  
  
deletePage();    // Deletes "Contact Us"  
  
displayCurrentPage(); // Displays "About Us"  
  
  
  
deletePage();    // Deletes "About Us"  
  
displayCurrentPage(); // Displays "Home Page"  
  
  
  
return 0;  
  
}
```



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