



Experiment No.7
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.



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Case 2: The last node is deleted.

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

Algorithm

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



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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

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:



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```
#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 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);
```



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```
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 =  
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;
```



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```
} struct  
node *create_  
c1l(struct  
node  
*start) {  
struct node  
*new_no  
de, *ptr; int  
num;  
printf("\n  
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));
```



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```
new_nod
e -> data =
num;
if(start
== NULL)
{
new_nod
e -> next =
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
```



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```
*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 ->  
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;
```




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```
} 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);

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:



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```
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>
```

```
#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;
```



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```
// 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;

        }

    }

// 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;
```



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```
    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);

    }

}

int        main()        {

insertPage("Home    Page");

insertPage("About    Us");

insertPage("Contact    Us");

displayCurrentPage(); //
```



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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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