S.No: 5	Exp. Name: ***Implementation of Queue using Linked List***	Date:2024-05-13

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Aim:

Write a C program that implements a **Queue** using linked list. The program should have **enqueue()**, **dequeue(), size()** and **isEmpty()**, **Display()** functions that uses switch cases and works on the choice of the user.

Source Code:

QueueListDequeueSize.c

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

struct queue {
   int data;
   struct queue *next;
};

typedef struct queue *Q;
Q front = NULL, rear = NULL;
Q temp; int siz =0;

void enqueue(int element) {
   // write your code here to insert an element into the queue
   Q new = (Q)malloc(sizeof(Q));
   new -> data = element; new -> next = NULL;
   if(front == NULL) front = rear = new;
   else {rear -> next = new; rear = new;}
   printf("Successfully inserted.\n"); siz++;
}

void dequeue() {
   // write your code here to delete an element from the queue
   temp = front;
   if(front == NULL) {printf("Queue is underflow.\n"); return;}
   printf("Deleted value = %d\n", front -> data);
   front = front -> next; free(temp); siz--;
}

void display() {
   // write your code here to print the elements of the queue
   if(front == NULL){printf("Queue is empty.\n");return;}
   printf("Elements in the queue : ");
   temp = front;
   while(temp != NULL){
      printf("%d ",temp -> data);
      temp = temp -> next;
   }
   printf("\n");
}

void size() {
   // write your code here to find the no of elements of the queue
   printf("Queue size : %d\n",siz);
```

```
}

void isEmpty() {
   // write your code here to check whether the queue is empty or not
   if(front != NULL) printf("Queue is not empty.\n");
   else printf("Queue is empty.\n");
}

int main() {
   int op, x;
   while(1) {
      printf("1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit\n");
      printf("Enter your option : ");
      scanf("%d",&op);
      switch(op) {
         case 1:
            printf("Enter element : ");
            scanf("%d",&x);
            enqueue(x);
            break;
         case 2:
            dequeue();
            break;
         case 3:
            display();
            break;
         case 4:
            isEmpty();
            break;
         case 5:
            size();
            break;
         case 6: exit(0);
      }
   }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 12
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 14
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 15

Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 3
Enter your option : 3
Elements in the queue : 12 14 15 5
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 3 4
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 4
Enter your option : 4
Queue is not empty. 2
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 2
Enter your option : 2
Deleted value = 12 2
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 2
Enter your option : 2
Deleted value = 14 2
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 2
Enter your option : 2
Deleted value = 15 3
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 3
Enter your option : 3
Queue is empty. 4
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 4
Enter your option : 4
Queue is empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 0 6
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 6
Enter your option : 6

Test Case - 2
User Output
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 2
Enter your option : 2
Queue is underflow. 4
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 4
Enter your option : 4
Queue is empty. 3
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 3
Enter your option : 3
Queue is empty. 5
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 5
Enter your option : 5
Queue size : 0 1
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 1
Enter your option : 1
Enter element : 23
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 1

```
Enter your option :  1
Enter element :  45
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 3
Enter your option :  3
Elements in the queue : 23 45  2
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 2
Enter your option :  2
Deleted value = 23 5
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 5
Enter your option :  5
Queue size : 1 6
1.Enqueue 2.Dequeue 3.Display 4.Is empty 5.Size 6.Exit 6
Enter your option :  6
```