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VIDYAVIHAR

K J Somaiya Institute of Engineering and Information

Technology

An Autonomous Institute Permanently Affiliated to the University of Mumbai

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Name and Code: Data Structures Lab (ITL302)

Semester: III (Second Year)

Academic Year: 2024-25 (Odd Semester)

Experiment No. 04

Aim: Implementation of Double-ended Queue using Array for real-world application.

Objectives:

1. To introduce the concepts of data structures and analysis procedure.
2. To conceptualize linear data structures and its implementation for various real-world applications.

Theory:

- Introduction to Double-ended Queue.
- Examples.
- Algorithm.

Conclusion: Successfully learned and implemented the concept of DEQUEUE by performing operations.

Outcome:

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```
1 #include <stdbool.h>
2 #include <stdio.h>
3 #define MAX 5
4 int QUEUE[MAX], REAR = -1, FRONT = -1;
5 void insertRear();
6 void deleteFront();
7 void deleteRear();
8 void insertFront();
9 void display();
10 bool isFull();
11 bool isEmpty();
12 int main() {
13     int choice;
14     printf("Menu:\n 1. Insert from Rear\n 2. Delete from Front\n 3. "
15           "Insert from Front\n 4. Delete from Rear\n 5. Display\n 6. Exit\n");
16     while (true) {
17         printf("\nEnter choice: ");
18         scanf("%d", &choice);
19         switch (choice) {
20             case 1:
21                 insertRear();
22                 break;
23             case 2:
24                 deleteFront();
25                 break;
26             case 3:
27                 insertFront();
28                 break;
29             case 4:
30                 deleteRear();
31                 break;
32             case 5:
33                 display();
34                 break;
35             case 6:
36                 printf("Exiting...\n");
37                 return 0;
38             default:
39                 printf("Invalid choice");
40                 break;
41         }
42     }
```

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```
43 return 0;
44 }
45 bool isFull() { return REAR == MAX-1; }
46 bool isEmpty() { return FRONT < 0; }
47 void insertRear() {
48 int a;
49 if (isFull()) {
50 printf("Queue is full");
51 }
52 }
53 if (FRONT == -1)
54 FRONT++;
55 printf("Enter Element: ");
56 scanf("%d", &a);
57 QUEUE[++REAR] = a;
58 }
59 void deleteFront() {
60 int value;
61 if (isEmpty()) {
62 printf("Queue Empty");
63 return;
64 }
65 value = QUEUE[FRONT];
66 if (REAR == FRONT)
67 FRONT=REAR--1;
68 else
69 FRONT++;
70 printf("The deleted element from front is: %d", value);
71 }
72 void deleteRear() {
73 int value;
74 if (isEmpty()) {
75 printf("Queue Empty");
76 return;
77 }
78 value = QUEUE[REAR];
79 if (REAR == FRONT)
80 FRONT=REAR--1;
81 else
82 REAR--;
83 printf("The deleted element from rear is: %d", value);
84 }
85 FRONT=REAR--1;
86 else
87 FRONT++;
88 printf("The deleted element from front is: %d", value);
89 }
90 void deleteRear() {
91 int value;
92 if (isEmpty()) {
93 printf("Queue Empty");
94 return;
95 }
96 value = QUEUE[REAR];
97 if (REAR == FRONT)
98 FRONT=REAR--1;
99 else
100 REAR--;
101 printf("The deleted element from rear is: %d", value);
102 }
103 void insertFront() {
104 if (FRONT == 0) {
105 printf("Front is at the beginning- insertion not possible");
106 return;
107 }
108 if (FRONT == -1) {
109 FRONT++;
110 REAR++;
111 } else
112 FRONT--;
113 int x;
114 printf("Enter Element: ");
115 scanf("%d", &x);
116 QUEUE[FRONT] = x;
117 }
118 void display() {
119 if (isEmpty()) {
120 printf("Queue Empty");
121 return;
122 }
123 printf("Printing DeQueue:\n");
124 for (int i = FRONT; i <= REAR; i++)
125 printf("\t%d", QUEUE[i]);
126 }
```



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OUTPUT:

```
adminit@a00-G7-Microtower-PC:~$ ./a.out
Menu:
1. Insert from Rear
2. Delete from Front
3. Insert from Front
4. Delete from Rear
5. Display
6. Exit

Enter choice: 1
Enter Element: 45

Enter choice: 1
Enter Element: 32

Enter choice: 126
Invalid choice
Enter choice: 1
Enter Element: 12

Enter choice: 5
Printing DeQueue:
      45      32      12
Enter choice: 4
The deleted element from rear is: 12
Enter choice: 5
Printing DeQueue:
      45      32
Enter choice: █
```

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ROLL NO: 31

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