**3.** Write a Java Program to Implement Circular Doubly Linked List

**package** prog12;

**import** java.util.Scanner;

**class** Node

{

**protected** **int** data;

**protected** Node next, prev;

**public** Node()

{

next = **null**;

prev = **null**;

data = 0;

}

**public** Node(**int** d, Node n, Node p)

{

data = d;

next = n;

prev = p;

}

**public** **void** setLinkNext(Node n)

{

next = n;

}

**public** **void** setLinkPrev(Node p)

{

prev = p;

}

**public** Node getLinkNext()

{

**return** next;

}

/\* Function to get link to previous node \*/

**public** Node getLinkPrev()

{

**return** prev;

}

/\* Function to set data to node \*/

**public** **void** setData(**int** d)

{

data = d;

}

/\* Function to get data from node \*/

**public** **int** getData()

{

**return** data;

}

}

/\* Class linkedList \*/

**class** linkedList

{

**protected** Node start;

**protected** Node end ;

**public** **int** size;

**public** linkedList()

{

start = **null**;

end = **null**;

size = 0;

}

**public** **boolean** isEmpty()

{

**return** start == **null**;

}

**public** **int** getSize()

{

**return** size;

}

**public** **void** insertAtStart(**int** val)

{

Node nptr = **new** Node(val, **null**, **null**);

**if** (start == **null**)

{

nptr.setLinkNext(nptr);

nptr.setLinkPrev(nptr);

start = nptr;

end = start;

}

**else**

{

nptr.setLinkPrev(end);

end.setLinkNext(nptr);

start.setLinkPrev(nptr);

nptr.setLinkNext(start);

start = nptr;

}

size++ ;

}

/\*Function to insert element at end \*/

**public** **void** insertAtEnd(**int** val)

{

Node nptr = **new** Node(val, **null**, **null**);

**if** (start == **null**)

{

nptr.setLinkNext(nptr);

nptr.setLinkPrev(nptr);

start = nptr;

end = start;

}

**else**

{

nptr.setLinkPrev(end);

end.setLinkNext(nptr);

start.setLinkPrev(nptr);

nptr.setLinkNext(start);

end = nptr;

}

size++;

}

**public** **void** insertAtPos(**int** val , **int** pos)

{

Node nptr = **new** Node(val, **null**, **null**);

**if** (pos == 1)

{

insertAtStart(val);

**return**;

}

Node ptr = start;

**for** (**int** i = 2; i <= size; i++)

{

**if** (i == pos)

{

Node tmp = ptr.getLinkNext();

ptr.setLinkNext(nptr);

nptr.setLinkPrev(ptr);

nptr.setLinkNext(tmp);

tmp.setLinkPrev(nptr);

}

ptr = ptr.getLinkNext();

}

size++ ;

}

/\* Function to delete node at position \*/

**public** **void** deleteAtPos(**int** pos)

{

**if** (pos == 1)

{

**if** (size == 1)

{

start = **null**;

end = **null**;

size = 0;

**return**;

}

start = start.getLinkNext();

start.setLinkPrev(end);

end.setLinkNext(start);

size--;

**return** ;

}

**if** (pos == size)

{

end = end.getLinkPrev();

end.setLinkNext(start);

start.setLinkPrev(end);

size-- ;

}

Node ptr = start.getLinkNext();

**for** (**int** i = 2; i <= size; i++)

{

**if** (i == pos)

{

Node p = ptr.getLinkPrev();

Node n = ptr.getLinkNext();

p.setLinkNext(n);

n.setLinkPrev(p);

size-- ;

**return**;

}

ptr = ptr.getLinkNext();

}

}

/\* Function to display status of list \*/

**public** **void** display()

{

System.***out***.print("\nCircular Doubly Linked List = ");

Node ptr = start;

**if** (size == 0)

{

System.***out***.print("empty\n");

**return**;

}

**if** (start.getLinkNext() == start)

{

System.***out***.print(start.getData()+ " <-> "+ptr.getData()+ "\n");

**return**;

}

System.***out***.print(start.getData()+ " <-> ");

ptr = start.getLinkNext();

**while** (ptr.getLinkNext() != start)

{

System.***out***.print(ptr.getData()+ " <-> ");

ptr = ptr.getLinkNext();

}

System.***out***.print(ptr.getData()+ " <-> ");

ptr = ptr.getLinkNext();

System.***out***.print(ptr.getData()+ "\n");

}

}

**package** prog12;

**import** java.util.Scanner;

**public** **class** CircularDoublyLinkedList

{

**public** **static** **void** main(String[] args)

{

Scanner scan = **new** Scanner(System.***in***);

linkedList list = **new** linkedList();

System.***out***.println("Circular Doubly Linked List Test\n");

**char** ch;

**do**

{

System.***out***.println("\nCircular Doubly Linked List Operations\n");

System.***out***.println("1. insert at begining");

System.***out***.println("2. insert at end");

System.***out***.println("3. insert at position");

System.***out***.println("4. delete at position");

System.***out***.println("5. check empty");

System.***out***.println("6. get size");

**int** choice = scan.nextInt();

**switch** (choice)

{

**case** 1 :

System.***out***.println("Enter integer element to insert");

list.insertAtStart( scan.nextInt() );

**break**;

**case** 2 :

System.***out***.println("Enter integer element to insert");

list.insertAtEnd( scan.nextInt() );

**break**;

**case** 3 :

System.***out***.println("Enter integer element to insert");

**int** num = scan.nextInt() ;

System.***out***.println("Enter position");

**int** pos = scan.nextInt() ;

**if** (pos < 1 || pos > list.getSize() )

System.***out***.println("Invalid position\n");

**else**

list.insertAtPos(num, pos);

**break**;

**case** 4 :

System.***out***.println("Enter position");

**int** p = scan.nextInt() ;

**if** (p < 1 || p > list.getSize() )

System.***out***.println("Invalid position\n");

**else**

list.deleteAtPos(p);

**break**;

**case** 5 :

System.***out***.println("Empty status = "+ list.isEmpty());

**break**;

**case** 6 :

System.***out***.println("Size = "+ list.getSize() +" \n");

**break**;

**default** :

System.***out***.println("Wrong Entry \n ");

**break**;

}

list.display();

System.***out***.println("\nDo you want to continue (Type y or n) \n");

ch = scan.next().charAt(0);

} **while** (ch == 'Y'|| ch == 'y');

}

}

Output:

