1)Bully Algorithm :-

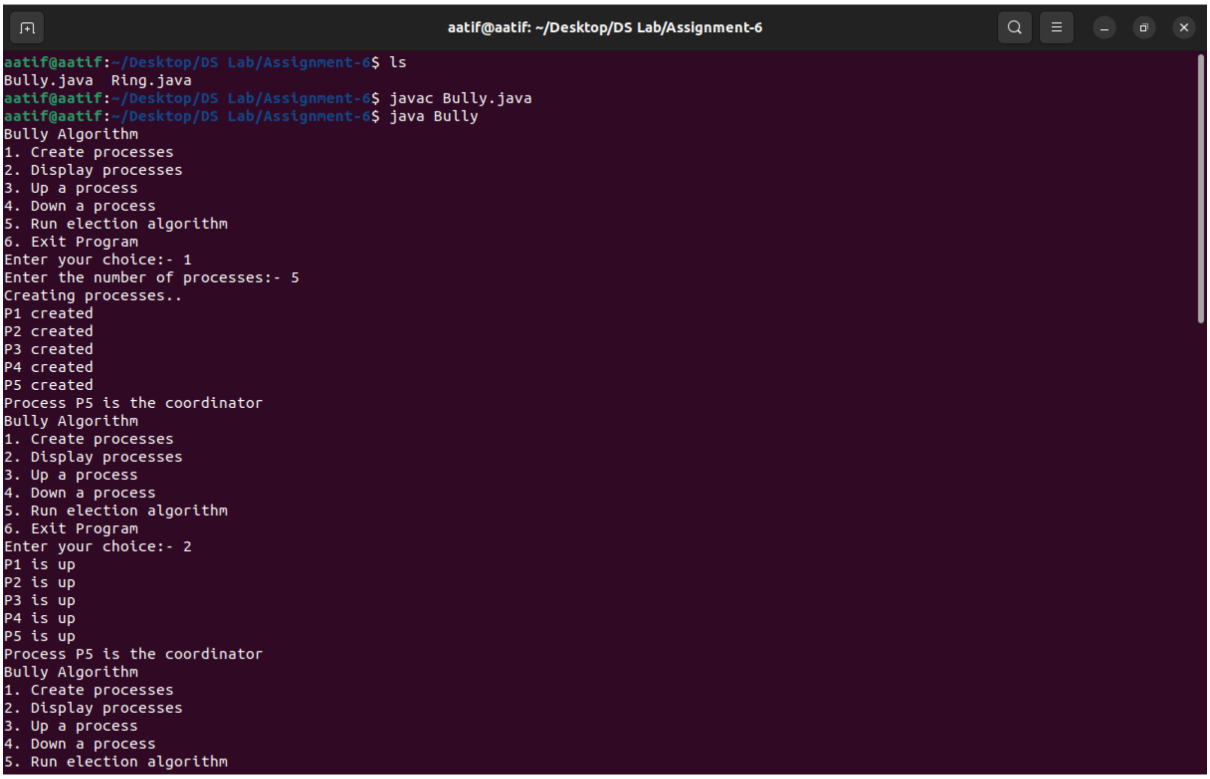
Code :

```
import java.util.*;


public class Bully {
    int coordinator;
    int max_processes;
    boolean processes[];



    public Bully(int max) {
        max_processes = max;
        processes = new boolean[max_processes];
        coordinator = max;

        System.out.println("Creating processes..");
        for(int i = 0; i < max; i++) {
            processes[i] = true;
            System.out.println("P"+ (i+1) + " created");
        }
        System.out.println("Process P" + coordinator + " is the coordinator");

    }
    void displayProcesses() {
        for(int i = 0; i < max_processes; i++) {
            if(processes[i]) {
                System.out.println("P" + (i+1) + " is up");
            } else {
                System.out.println("P" + (i+1) + " is down");
            }
        }
        System.out.println("Process P" + coordinator + " is the coordinator");
    }

    void upProcess(int process_id) {
        if(!processes[process_id - 1]) {
            processes[process_id - 1] = true;
            System.out.println("Process " + process_id + " is now up.");
        } else {
            System.out.println("Process " + process_id + " is already up.");
        }
    }

    void downProcess(int process_id) {
        if(!processes[process_id - 1]) {
            System.out.println("Process " + process_id + " is already down.");
        } else {
            processes[process_id - 1] = false;
            System.out.println("Process " + process_id + " is down.");
        }
    }

    void runElection(int process_id) {
        coordinator = process_id;
        boolean keepGoing = true;

        for(int i = process_id; i < max_processes && keepGoing; i++) {
            System.out.println("Election message sent from process " + process_id + " to process " +
(i+1));

            if(processes[i]) {
                keepGoing = false;
                runElection(i + 1);
            }
        }
```

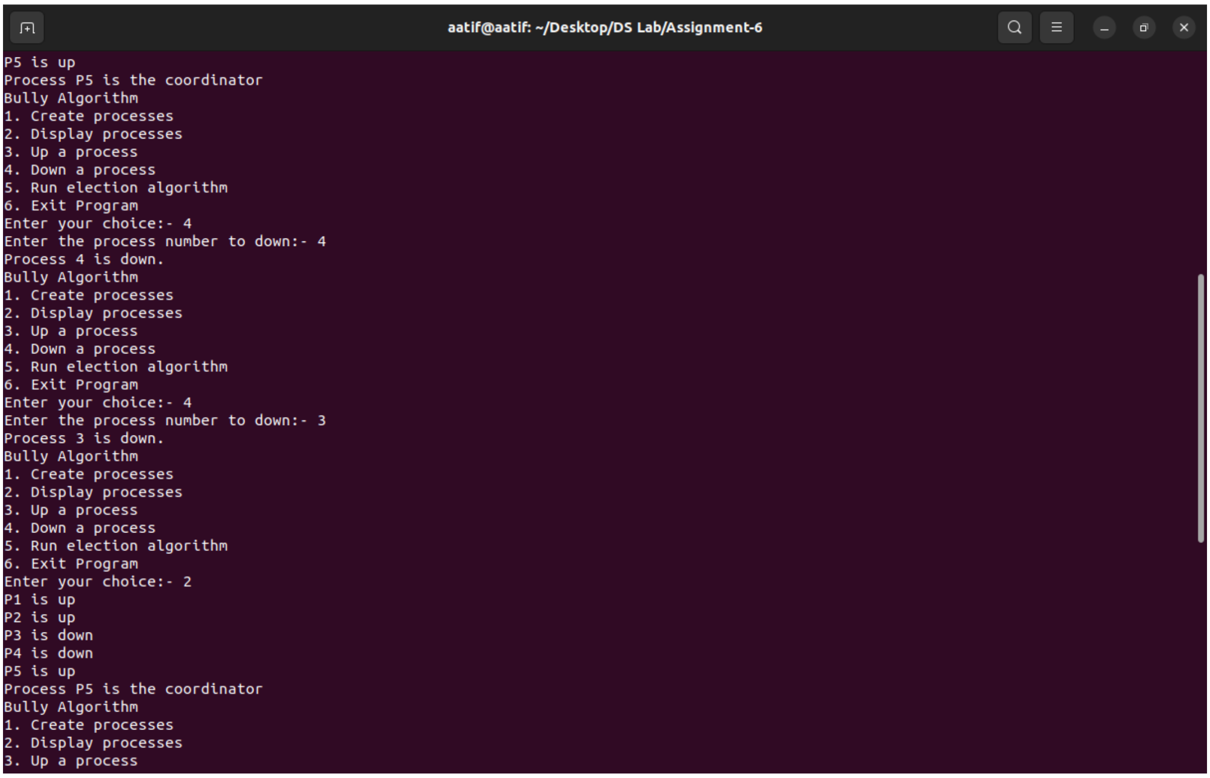
```
}

public static void main(String args[]) {
    Bully bully = null;
    int max_processes = 0, process_id = 0;
    int choice = 0;
    Scanner sc = new Scanner(System.in);

    while(true) {
        System.out.println("Bully Algorithm");
        System.out.println("1. Create processes");
        System.out.println("2. Display processes");
        System.out.println("3. Up a process");
        System.out.println("4. Down a process");
        System.out.println("5. Run election algorithm");
        System.out.println("6. Exit Program");
        System.out.print("Enter your choice:- ");
        choice = sc.nextInt();

        switch(choice) {
            case 1:
                System.out.print("Enter the number of processes:- ");
                max_processes = sc.nextInt();
                bully = new Bully(max_processes);
                break;
            case 2:
                bully.displayProcesses();
                break;
            case 3:
                System.out.print("Enter the process number to up:- ");
                process_id = sc.nextInt();
                bully.upProcess(process_id);
```

```
                    break;
                case 4:
                    System.out.print("Enter the process number to down:- ");
                    process_id = sc.nextInt();
                    bully.downProcess(process_id);
                    break;
                case 5:
                    System.out.print("Enter the process number which will perform election:- ");
                    process_id = sc.nextInt();
                    bully.runElection(process_id);
                    bully.displayProcesses();
                    break;
                case 6:
                    System.exit(0);
                    break;
                default:
                    System.out.println("Error in choice. Please try again.");
                    break;
            }
        }
    }
}
```

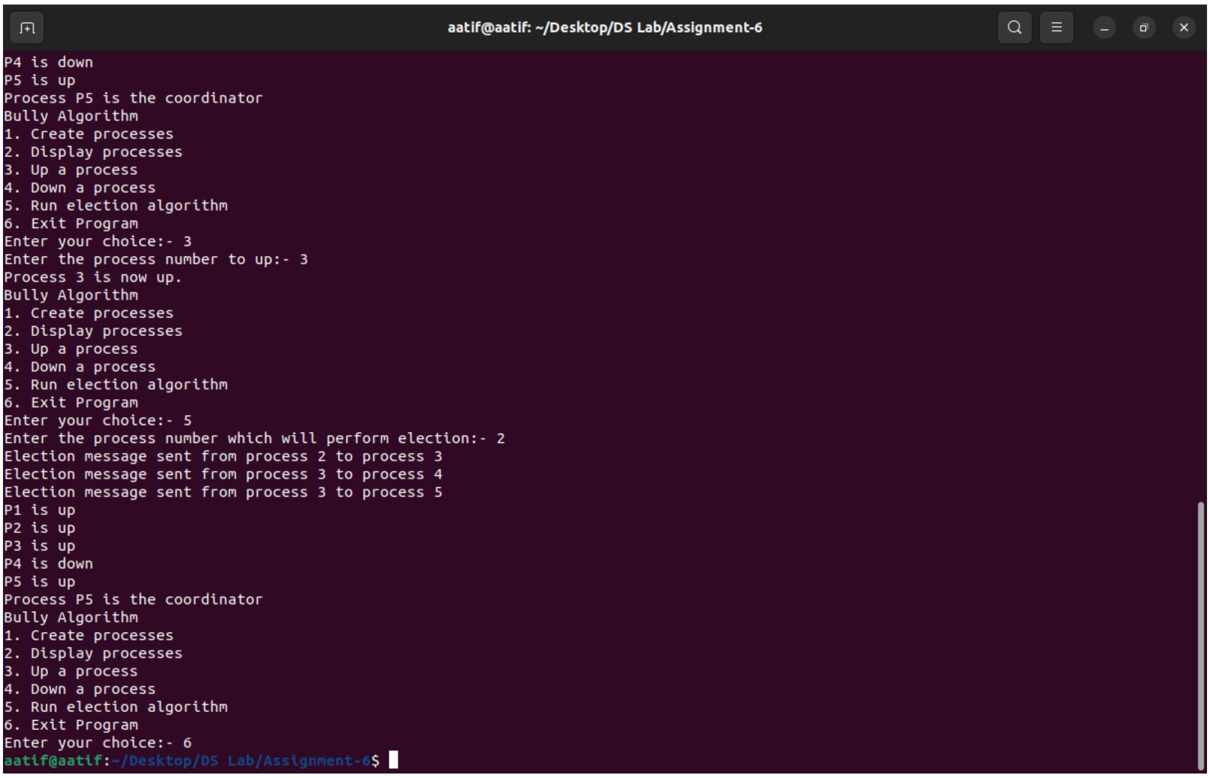
OUTPUT:



```
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ ls
Bully.java  Ring.java
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ javac Bully.java
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ java Bully
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 1
Enter the number of processes:- 5
Creating processes..
P1 created
P2 created
P3 created
P4 created
P5 created
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up
P2 is up
P3 is up
P4 is up
P5 is up
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
```



```
P5 is up
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 4
Enter the process number to down:- 4
Process 4 is down.
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 4
Enter the process number to down:- 3
Process 3 is down.
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up
P2 is up
P3 is down
P4 is down
P5 is up
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
```



```
P4 is down
P5 is up
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 3
Enter the process number to up:- 3
Process 3 is now up.
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 5
Enter the process number which will perform election:- 2
Election message sent from process 2 to process 3
Election message sent from process 3 to process 4
Election message sent from process 3 to process 5
P1 is up
P2 is up
P3 is up
P4 is down
P5 is up
Process P5 is the coordinator
Bully Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 6
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ 
```

2) Ring Algorithm :-

Code :

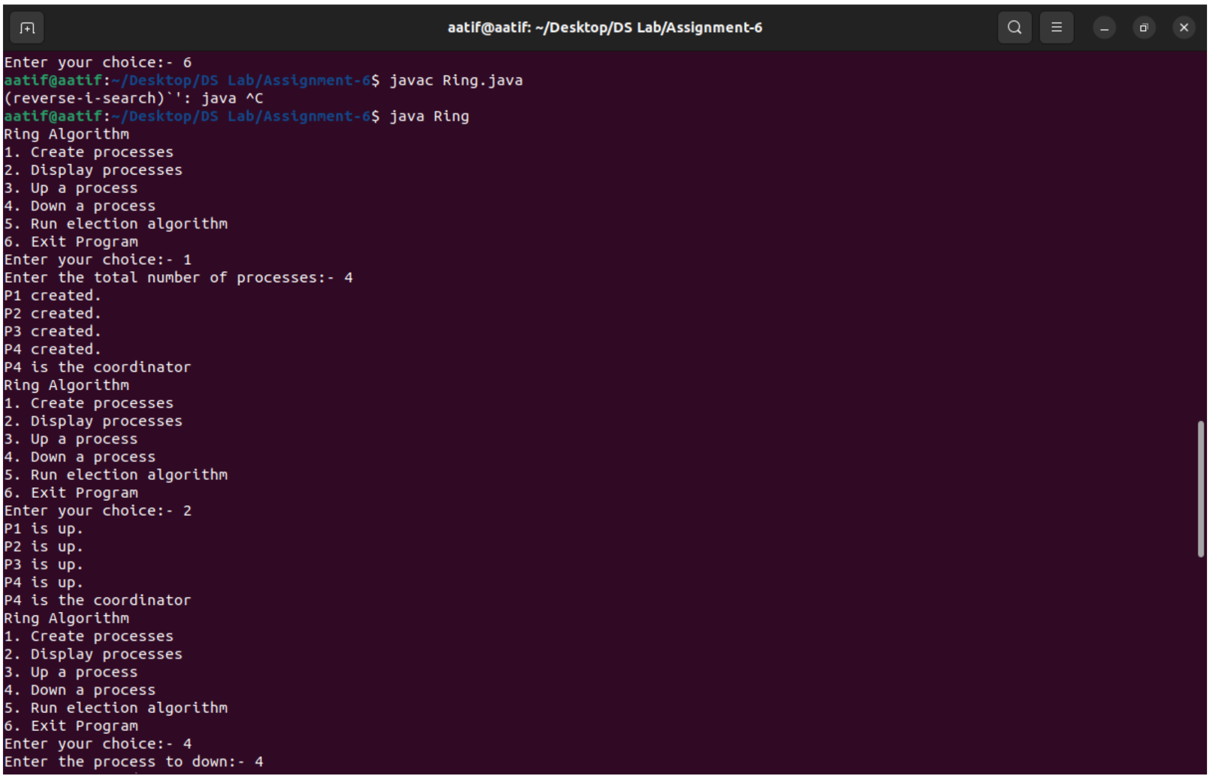
```
import java.util.*;

public class Ring {
    int max_processes;
    int coordinator;
    boolean processes[];
    ArrayList<Integer> pid;

    public Ring(int max) {
        coordinator = max;
        max_processes = max;
        pid = new ArrayList<Integer>();
        processes = new boolean[max];

        for(int i = 0; i < max; i++) {
            processes[i] = true;
            System.out.println("P" + (i+1) + " created.");
        }
        System.out.println("P" + (coordinator) + " is the coordinator");
    }

    void displayProcesses() {
        for(int i = 0; i < max_processes; i++) {
            if(processes[i])
                System.out.println("P" + (i+1) + " is up.");
            else
                System.out.println("P" + (i+1) + " is down.");
        }
        System.out.println("P" + (coordinator) + " is the coordinator");
    }
```

```
void upProcess(int process_id) {
    if(!processes[process_id-1]) {
        processes[process_id-1] = true;
        System.out.println("Process P" + (process_id) + " is up.");
    } else {
        System.out.println("Process P" + (process_id) + " is already up.");
    }
}

void downProcess(int process_id) {
    if(!processes[process_id-1]) {
        System.out.println("Process P" + (process_id) + " is already down.");
    } else {
        processes[process_id-1] = false;
        System.out.println("Process P" + (process_id) + " is down.");
    }
}

void displayArrayList(ArrayList<Integer> pid) {
    System.out.print("[ ");
    for(Integer x : pid) {
        System.out.print(x + " ");
    }
    System.out.print(" ]\n");
}

void initElection(int process_id) {
    if(processes[process_id-1]) {
        pid.add(process_id);

        int temp = process_id;
```

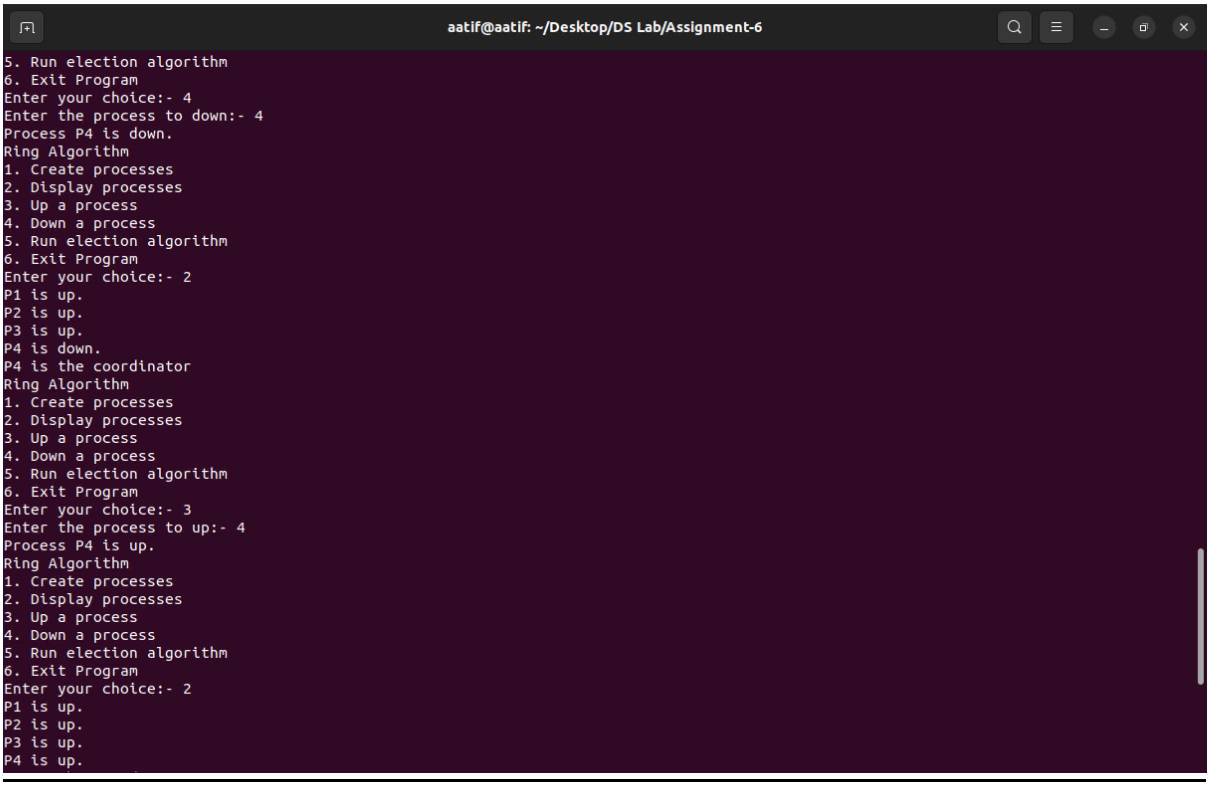
```
            System.out.print("Process P" + process_id + " sending the following list:- ");
            displayArrayList(pid);

            while(temp != process_id - 1) {
                if(processes[temp]) {
                    pid.add(temp+1);
                    System.out.print("Process P" + (temp + 1) + " sending the following list:- ");
                    displayArrayList(pid);
                }
                temp = (temp + 1) % max_processes;
            }
            coordinator = Collections.max(pid);
            System.out.println("Process P" + process_id + " has declared P" + coordinator + " as the
coordinator");
            pid.clear();
        }
    }

    public static void main(String args[]) {
        Ring ring = null;
        int max_processes = 0, process_id = 0;
        int choice = 0;
        Scanner sc = new Scanner(System.in);

        while(true) {
            System.out.println("Ring Algorithm");
            System.out.println("1. Create processes");
            System.out.println("2. Display processes");
            System.out.println("3. Up a process");
            System.out.println("4. Down a process");
            System.out.println("5. Run election algorithm");
            System.out.println("6. Exit Program");
System.out.print("Enter your choice:- ");
choice = sc.nextInt();

switch(choice) {
   case 1:
      System.out.print("Enter the total number of processes:- ");
      max_processes = sc.nextInt();
      ring = new Ring(max_processes);
      break;
   case 2:
      ring.displayProcesses();
      break;
   case 3:
      System.out.print("Enter the process to up:- ");
      process_id = sc.nextInt();
      ring.upProcess(process_id);
      break;
   case 4:
      System.out.print("Enter the process to down:- ");
      process_id = sc.nextInt();
      ring.downProcess(process_id);
      break;
   case 5:
      System.out.print("Enter the process which will initiate election:- ");
      process_id = sc.nextInt();
      ring.initElection(process_id);
      break;
   case 6:
      System.exit(0);
      break;
   default:
      System.out.println("Error in choice. Please try again.");
```

```
                    break;
                }
            }
        }
    }
```

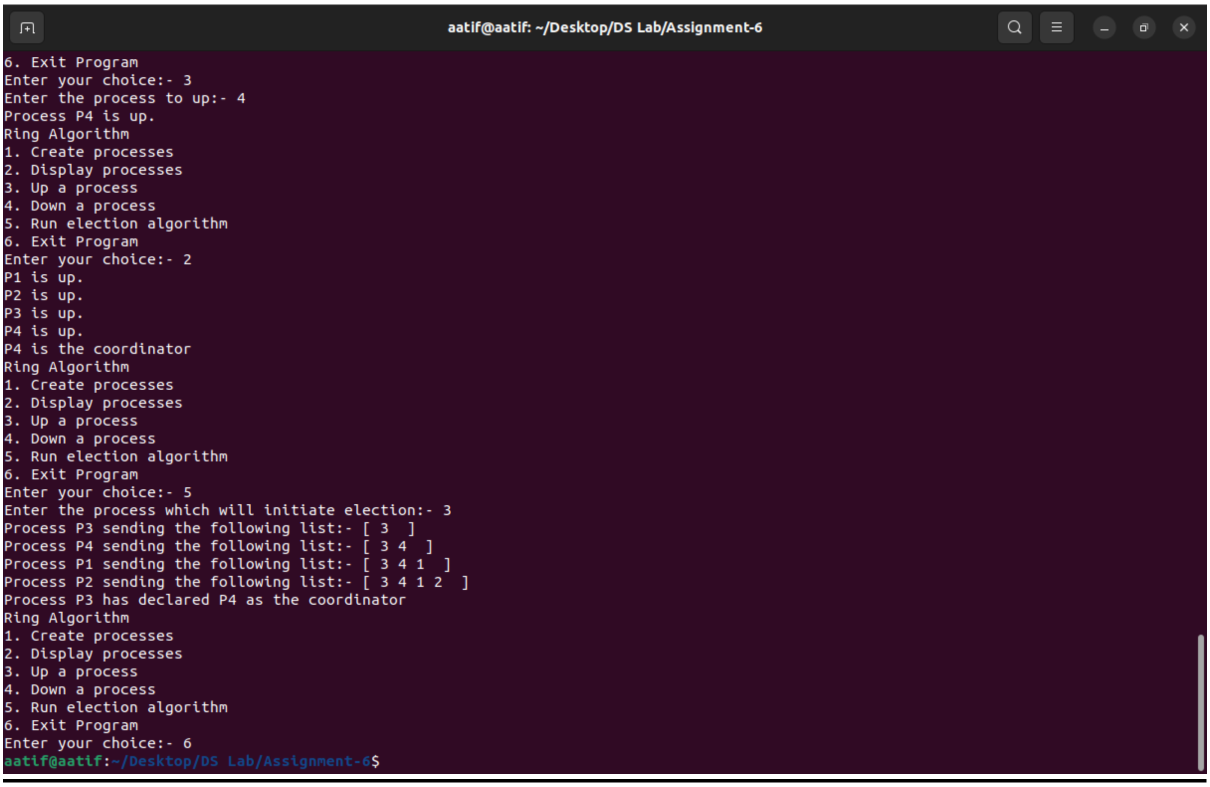
OUTPUT:



```
Enter your choice:- 6
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ javac Ring.java
(reverse-i-search)`': java ^C
aatif@aatif:~/Desktop/DS Lab/Assignment-6$ java Ring
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 1
Enter the total number of processes:- 4
P1 created.
P2 created.
P3 created.
P4 created.
P4 is the coordinator
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up.
P2 is up.
P3 is up.
P4 is up.
P4 is the coordinator
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 4
Enter the process to down:- 4
```



```
5. Run election algorithm
6. Exit Program
Enter your choice:- 4
Enter the process to down:- 4
Process P4 is down.
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up.
P2 is up.
P3 is up.
P4 is down.
P4 is the coordinator
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 3
Enter the process to up:- 4
Process P4 is up.
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up.
P2 is up.
P3 is up.
P4 is up.
```



```
6. Exit Program
Enter your choice:- 3
Enter the process to up:- 4
Process P4 is up.
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 2
P1 is up.
P2 is up.
P3 is up.
P4 is up.
P4 is the coordinator
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 5
Enter the process which will initiate election:- 3
Process P3 sending the following list:- [ 3  ]
Process P4 sending the following list:- [ 3 4  ]
Process P1 sending the following list:- [ 3 4 1  ]
Process P2 sending the following list:- [ 3 4 1 2  ]
Process P3 has declared P4 as the coordinator
Ring Algorithm
1. Create processes
2. Display processes
3. Up a process
4. Down a process
5. Run election algorithm
6. Exit Program
Enter your choice:- 6
aatif@aatif:~/Desktop/DS Lab/Assignment-6$
```