Name: Mrunal Sanjay Chaudhari
Roll No: 47006 Class: BE-IT-B
Subject: Distributed Systems

Assignment No. 6

Problem Statement: Implement Bully and Ring algorithm for leader election.

Code:

Bully.java:

```
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;}}}}
```

Ring.java:

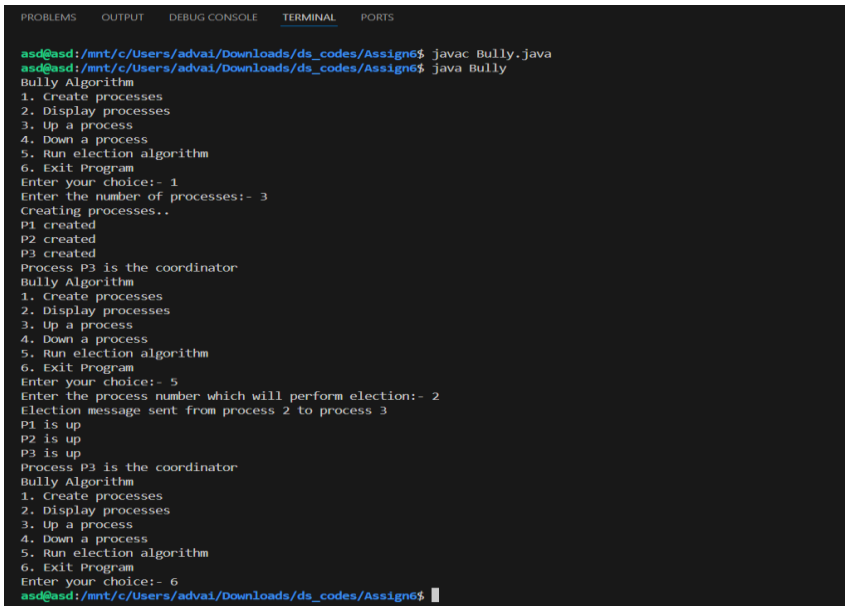
```
import java.util.*;
public class Ring {
   int max_processes;
   int coordinator;
   boolean processes[];
   ArrayList<Integer> pid;
   public Ring(int max) {
      coordinator = max;
      max_processes = max;
      pid = new ArrayList<Integer>();
      processes = new boolean[max];
      for(int 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:

Bully



Ring